Temperature, temperature extremes, and mortality: a study of acclimatisation and effect modification in 50 US cities

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ORIGINAL ARTICLE

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Objectives: The authors examined the increase in mortality associated with hot and cold temperature in different locations, the determinants of the variability in effect estimates, and its implications for adaptation.
Methods: The authors conducted a case crossover study in 50 US cities. They used daily mortality and weather data for 6 513 330 deaths occurring during 1989 2000. Exposure was assessed using two approaches. First, the authors determined exposure to extreme temperatures using city specific indicator variables based on the local temperature distribution. Secondly, they used piecewise linear variables to assess exposure to temperature on a continuous scale above/below a threshold. Effects of hot and cold temperature were examined in season specific models. In a meta analysis of the city specific results, the authors examined several city characteristics as effect modifiers.
Results: Mortality increases associated with both extreme cold (2 day cumulative increase 1.59% (95% CI 0.56 to 2.63)) and extreme heat (5.74% (95% CI 3.38 to 8.15)) were found, the former being especially marked for myocardial infarction and cardiac arrest deaths. The increase in mortality was less marked at less extreme temperatures. The effect of extreme cold (defined as a percentile) was homogeneous across cities with different climates, suggesting that only the unusualness of the cold temperature (and not its absolute value) had a substantial impact on mortality (that is, acclimatisation to cold). Conversely, heat effects were quite heterogeneous, with the largest effects observed in cities with milder summers, less air conditioning and higher population density. Adjustment for ozone led to similar results, but some residual confounding could be present due to other uncontrolled pollutants.
Conclusions: The authors confirmed in a large sample of cities that both cold and hot temperatures increase mortality risk. These findings suggest that increases in heat related mortality due to global warming are unlikely to be compensated for by decreases in cold related mortality and that population acclimatisation to heat is still incomplete.

Determining the potential health impacts of climate change is a complex issue. Both direct physical impacts from weather changes (for example, temperature increase, severe storms) and indirect impacts from changes in other factors (for example, vector borne diseases, food production, population dislocation, etc) are expected to occur and should be taken into account when assessing the global impact of climate change.[1] This paper focuses exclusively on the direct health effects of changes in temperature, and particularly on the impact on mortality. Climate change is predicted not only to increase the average temperature of the planet by between 1.7 and 4.9°C by 2100,[2 3] but also to change the frequency of extreme weather events increasing extremely hot days and decreasing extremely cold days.[1] Because variations in morbidity and mortality rates have been associated with temperature changes,[4 7] controversy exists regarding what the overall effect of climate change will be. Some authors have suggested that increases in heat related mortality will be so dramatic that they will not be compensated for by drops in cold related mortality,[8] while others believe that human populations will adjust to warmer temperatures and any small increases in heat related mortality will be outweighed by larger declines in cold related mortality.[9]

Increases in mortality during the cold months have been widely reported in the literature, often referred to as *excess winter mortality*, and an important proportion of these deaths have been attributed to cardiovascular diseases.[7] Similarly, the effect of elevated temperatures on mortality, especially those occurring during heat waves, have also been described in several studies where cardiovascular and respiratory diseases were reported as the most common mortality causes.[4 6] Fewer studies have looked at the association between more specific cardiovascular causes of death and temperature. A recent study in 12 US cities showed moderate increases in myocardial infarction deaths associated with both cold and hot temperatures.[10] Consistently, in a previous study looking at susceptibility to temperature extremes in 50 US cities, we identified myocardial infarction and cardiac arrest as the primary causes of death that experienced the largest relative increases during extremely cold days.[11]

Estimates of the magnitude of the temperature effect on mortality have differed substantially across different regions, but few studies have investigated which factors account for this variability. In the Eurowinter study, the cold effects were milder in cities with cooler winters, where protective measures against cold were more effective.[12] A study in the US found that cities with a greater variability in temperature showed stronger temperature effects, while use of air conditioning reduced the heat mortality.[5] Another US study found differing shapes of the mortality temperature relation for northern and southern cities, and reported as modifiers of the heat effect use of air conditioning and some demographic characteristics of the population.[13]

Recognising the determinants of regional variability in the impact of temperature on mortality and understanding the role of adaptive mechanisms in modifying that impact is key to

Abbreviation: ICD-9, International Classification of Diseases-9th revision; ICD-10, International Classification of Diseases-10th revision

better ascertain the potential public health consequences of global warming. We therefore conducted a large multicity study in 50 US cities to evaluate the effect of cold and hot temperatures on both all cause and cause specific mortality and to determine how several city characteristics may influence the impact of temperature on mortality.

METHODS

Study design and population

We conducted a case crossover analysis in 50 US cities during the period 1989 2000. We used daily mortality data from all counties in the Metropolitan Statistical Area of cities presented in figure 1. Cities were randomly chosen from the country's most populated Metropolitan Statistical Areas with urban counties near appropriate weather stations. A few less populated cities were also included from census regions that would otherwise have been unrepresented.

The case crossover design is commonly used in air pollution studies. It is a variation of the matched case control design in which each case subject (a decedent in this instance) serves as his own control on days when no event (death) occurs.[14] In other words, each stratum consists of one case day and multiple control days such that the subject's exposure at the time of the event is compared with his exposure on the reference days. An advantage of this design is that, if control days are chosen close in time to the event day, there is no confounding by slowly varying personal characteristics (because each subject is the perfect match for himself) and even very strong seasonal confounding of exposure can be removed.[15 16]

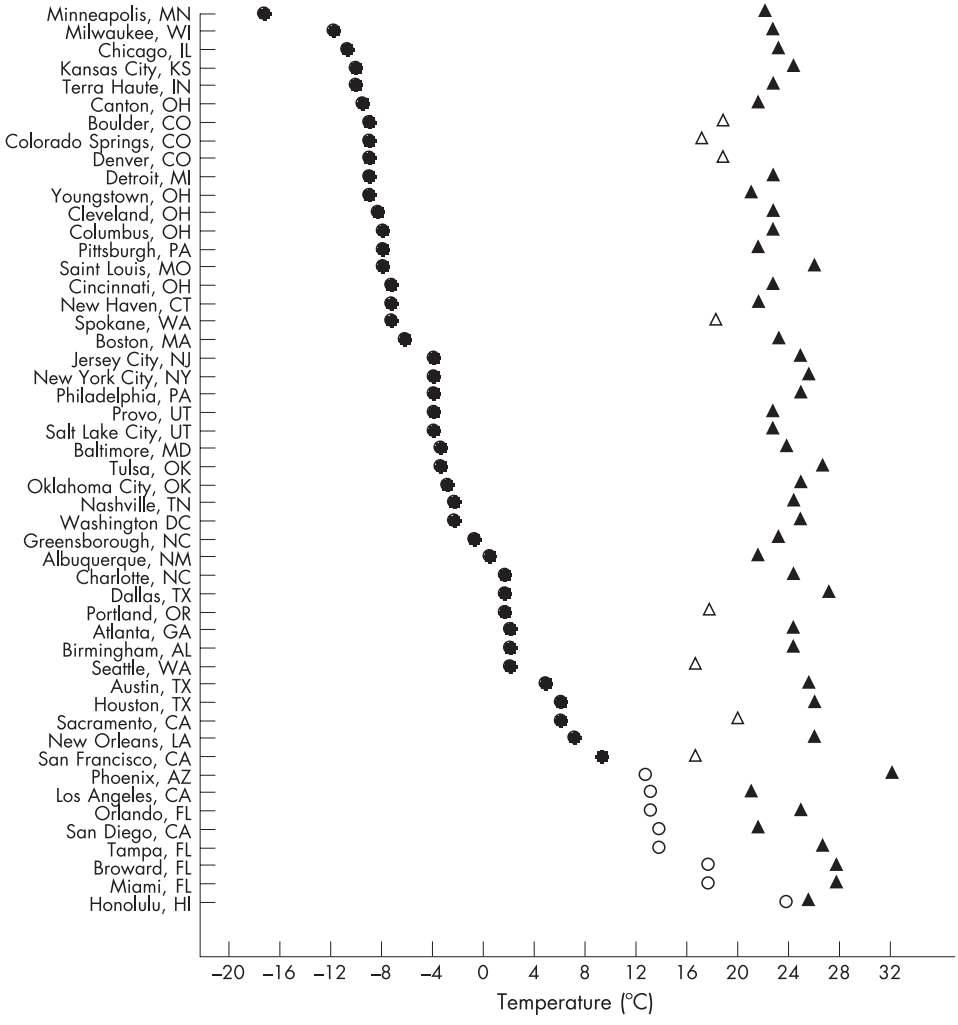
Mortality data

For each city, we obtained daily mortality data from the National Center for Health Statistics, which included individual information on primary and secondary causes of death and other personal characteristics. We examined all cause mortality as well as two specific primary causes of death that we had previously identified as particularly sensitive to extreme cold:[11] myocardial infarction (International Classification of Diseases 9th revision (ICD 9) code: 410; ICD 10: I21, I22) and cardiac arrest (ICD 9: 427.5; ICD 10: I46).

Exposure assessment

For each city, we obtained hourly weather data from the nearest National Weather Service Surface Station (Earthinfo Inc, Boulder, CO, USA) and calculated the daily maximum and minimum temperatures to examine exposure to cold and heat, respectively. We made that choice to capture situations in which cold temperatures are sustained during the day and hot temperatures do not cool at night.

We used two different approaches to assess exposure to temperature. First, we determined exposure to *extreme* cold and *extreme* heat using city specific indicator variables based on the distribution of temperatures *in each city*. Specifically, we defined extremely cold days as those with a daily *maximum* temperature ⩽1st percentile and extremely hot days as those with a daily *minimum* temperature ⩾99th percentile. Using this definition, the cutoff points defined as extreme temperatures in some cities were in fact quite mild. For that reason, those cities with a cutoff for extreme cold ⩾10°C or a cutoff for extreme heat



Cutoff points used to define extreme temperatures in each city. Circles correspond to the 1st percentile of daily maximum temperature and triangles to the 99th percentile of daily minimum temperature. Those cities excluded from analysis are represented by white symbols.

⩽20℃ were excluded from the cold and heat analysis, respectively, leaving a total of 42 cities for each analysis.

In the second approach, we used two piecewise linear exposure variables to describe exposure to temperature on a continuous scale but reflecting the fact that U or J shaped relations have been reported.[4 13] The exposure variable for cold took a constant value of zero when the daily *maximum* temperature was ⩾17℃ and then increased with increasing cold. Likewise, the exposure variable for heat took value zero when the daily *minimum* temperature was ⩽17℃ and increased with increasing hot temperature. We chose these two knots to ensure at least 10% of the days took a value different from zero in all cities. It is worth noting that in our sample the average range between the maximum and the minimum daily temperature was 10℃, allowing for some variation across cities in the temperature at which the inflection in the U shaped curve occurs, as described by Curriero *et al*.[13] For comparability reasons, cities excluded from the extreme tempera tures analysis were also excluded in this second approach.

We obtained daily concentrations of ozone (8 h mean) from the US Environmental Protection Agency's Aerometric Information Retrieval System. We assigned daily ozone levels to all cities included in the heat analyses (except Minneapolis, where it was missing) using an algorithm that averaged levels reported by multiple monitoring locations.[17]

City characteristics

Based on previous studies, we examined several city character istics as potential determinants of the impact of temperature on mortality. As a proxy for the local climatology, we examined the mean and variance of the daily mean temperature during the cold (November through March) and warm (May through September) months. We also examined the population density, calculated using data from the 2000 US Census, as an indicator of urbanisation. Finally, we examined the percentage of households in each city with central heating and central air conditioning, two major technological adaptive mechanisms for which data were available from the American Housing Survey of the US Census Bureau (1994 2002).[18]

Statistical analyses

We conducted separate analyses for the cold (November through March) and warm (May through September) months to examine the association between temperature (either extreme or piecewise linear) and both all cause and cause specific mortality. None of the cold months included "extremely hot days" and vice versa.

In a first stage, we fitted city specific conditional logistic regression models (PROC PHREG in SAS, SAS software release 8.2 2001, SAS Institute, Cary, NC, USA). To avoid seasonal confounding, we applied a time stratified approach by choosing control days only within the same month of the same year that death occurred.[19] We used every third day of that month as control days to reduce serial correlation in the exposure variable, given that in the US weather fronts generally pass through a city every 3 4 days. All models controlled for day of the week using indicator variables. Temperature was included as a binary variable (for extreme temperature) or as a piecewise linear variable (for continuous temperature). We estimated the effect of temperature on the same day (lag 0) and on the day before (lag 1) by including both lags in the model simulta neously. Then, we calculated the 2 day cumulative risk estimate by summing the estimates for lag 0 and lag 1. To assess potential confounding by ozone air pollution, we repeated the models that examined the heat effect on total mortality adjusting for ozone exposure at lag 0 and 1.

In a second stage of the analyses, we combined the city specific estimates in a random effects meta analysis using the restricted maximum likelihood method in the metareg proce dure in Stata (version 8, Stata Corporation, College Station, TX, USA).[20] This procedure calculates the overall effect estimate by fitting a weighted regression model with weights $w_i = 1/(v_i+\tau^2)$, where v_i is the variance within city i and τ^2 is the between cities variance. First we fitted meta analyses without covariates, then for models estimating the overall two day cumulative effect we included each city characteristic as a covariate to test whether heterogeneity in city specific estimates could be explained by that characteristic. Based on results from the last models, we predicted the effect of temperature on mortality at the 25th and the 75th percentile of the distribution of each city characteristic. Note that because the overall two day cumulative estimates were based on the meta analysis of the city specific cumulative estimates, their value was not necessarily the same as the sum of the overall estimates for lag 0 and lag 1, which ignores covariance between the two estimates.

RESULTS

Our analyses included a total of 6 513 330 deaths across 50 US cities. Myocardial infarction and cardiac arrest were the primary cause of 8.4% and 0.8% of all deaths, respectively.

Table 1 Distribution of mortality counts and city characteristics across 50 US cities during the period 1989 2000

	Percentile				
	5%	25%	50%	75%	95%
All cities (n = 50)					
Total deaths (n)	14048	50832	88225	168178	477588
Myocardial infarction deaths (n)	1475	4054	6249	15299	49975
Cardiac arrest deaths (n)	111	269	722	1344	3174
Cities included in the cold analysis (n = 42)					
Daily temperature during cold months (℃)					
Mean	0.1	1.5	4.1	6.9	13.4
Variance	11.8	30.5	35.1	43.4	51.8
Central heating (%)*	80	89	96	98	99
Population density (population/km^2)	94	315	518	1034	4340
Cities included in the heat analysis (n = 42)					
Daily temperature during warm months (℃)					
Mean	19.0	19.8	22.1	24.8	27.8
Variance	2.0	11.5	18.6	21.1	26.8
Central air conditioning (%)*	17	35	67	76	90
Population density (population/km^2)	129	360	515	905	3621

*Data available only for 38 cities.

Table 2 Percent change in total and cause-specific mortality associated to temperature. Results from the meta-analysis of 42 US cities during the period 1989–2000

	Extreme temperature*			Piecewise linear temperature†		
	Lag 0, % (95% CI)	Lag 1, % (95% CI)	2-day cumulative, % (95% CI)	Lag 0, % (95% CI)	Lag 1, % (95% CI)	2-day cumulative, % (95% CI)
Cold exposure						
Total mortality	0 03 (−1 09 to 1 16)	1 79 (0 87 to 2 72)	1 59 (0 56 to 2 63)	−0 19 (−0 22 to −0 15)	0 23 (0 18 to 0 27)	0 04 (0 01 to 0 08)
Myocardial infarction	2 43 (−0 79 to 5 75)	1 51 (−1 56 to 4 67)	3 90 (0 18 to 7 76)	0 00 (−0 11 to 0 11)	0 25 (0 14 to 0 36)	0 26 (0 15 to 0 36)
Cardiac arrest	7 29 (−1 92 to 17 4)	11 9 (2 32 to 22 4)	16 2 (5 12 to 28 4)	−0 25 (−0 61 to 0 12)	0 62 (0 25 to 1 00)	0 39 (0 07 to 0 71)
Heat exposure						
Total mortality	3 85 (2 54 to 5 18)	2 04 (0 54 to 3 56)	5 74 (3 38 to 8 15)	0 70 (0 55 to 0 84)	−0 13 (−0 29 to 0 02)	0 52 (0 31 to 0 72)
Total mortality (ozone adjusted)	3 17 (1 92 to 4 43)	1 89 (0 43 to 3 38)	4 91 (2 72 to 7 13)	0 52 (0 41 to 0 63)	−0 09 (−0 24 to 0 07)	0 43 (0 24 to 0 61)
Myocardial infarction	1 24 (−1 57 to 4 13)	4 68 (1 56 to 7 89)	4 37 (0 15 to 8 78)	0 25 (−0 12 to 0 63)	−0 05 (−0 38 to 0 28)	0 17 (−0 29 to 0 63)
Cardiac arrest	3 70 (−4 84 to 13 0)	5 96 (−2 72 to 15 4)	6 75 (−3 68 to 18 3)	0 10 (−0 92 to 1 14)	0 60 (−0 43 to 1 64)	0 67 (−0 23 to 1 58)

*Per cent change in mortality on extreme temperature days relative to all other days
†For cold exposure, this refers to per cent change in mortality per each degree of maximum daily temperature below 17°C; for heat exposure, this refers to per cent change in mortality per each degree of minimum daily temperature above 17°C

Table 1 shows the distribution of mortality counts and city characteristics across all cities. The average temperature ranged from 4.1°C to 14.5°C during the cold months across those cities included in the cold analyses, and from 18.5°C to 32.1°C during the warm months for cities in the heat analyses. Air conditioning was more common in cities with a low variability and a high mean of temperature during the warm months (Spearman's r = 0.45 and 0.81, respectively), two city characteristics that, in turn, were inversely correlated with each other (r = 0.63). Cities with a lower mean temperature during the cold months had a larger percentage of heating (r = 0.64) and a larger temperature variability during the cold season (r = 0.52).

The cutoff points used to define extreme temperatures in each city are shown in figure 1. Phoenix (AZ) had the highest temperature cutoff for extreme heat with 32.2°C, and Minneapolis (MN) had the lowest for extreme cold with 17.2°C.

Table 2 shows the per cent change in mortality associated with cold and hot temperatures across all cities. Extremely cold days were associated with significant increases in total mortality (two day cumulative increase 1.59% (95% CI 0.56 to 2.63)), and this was particularly noticeable for myocardial infarction (3.90% (95% CI 0.18 to 7.76)) and cardiac arrest (16.2% (95% CI 5.12 to 28.4)) deaths. Extremely hot days were also associated with large increases in total mortality, with a two day cumulative increase of 5.74% (95% CI 3.38 to 8.15). When assessing the effect of piecewise linear temperature, the increase in mortality was less marked than for extreme temperatures and, in the case of heat, the initial increase in all cause mortality at lag 0 was followed by a slight mortality decrease at lag 1. Adjustment for ozone reduced the effect of extreme heat and linear hot temperature on total mortality by 15% and 16%, respectively.

The effect of cold temperatures was quite homogeneous across cities for both extreme temperatures and piecewise linear temperature. The proportion of total variation in all cause mortality estimates (two day cumulative) that was due to between cities heterogeneity was 2.6% for extreme cold and 26% for piecewise linear cold temperature, as ascertained by the I^2 statistic.[21] Conversely, the heat effect was very heterogeneous across cities. In this instance, the proportion of total variation in all cause mortality estimates attributable to between cities differences was 86% for extreme heat and 82% for piecewise linear hot temperature.

When examining effect modification by city characteristics, we did not find any evidence of significant modification of the cold effect (table 3), whereas some of the heterogeneity observed for the heat estimates was explained by several city characteristics (table 4). Overall, the largest increases in mortality due to extreme heat were observed in those cities with milder warm seasons. For instance, in a city with a mean temperature of 19.8°C during the warm months (that is, in the 25th percentile of the distribution) all cause mortality increased 9.25% on extremely hot days, while in a city in the 75th percentile (that is, 24.8°C) the increase was only 3.81%. Similarly, the effects of extreme heat were consistently lower in cities with a low variability in warm months' temperature, in those with a large proportion of central air conditioning and in those with a low population density. When looking at modifiers of the effect of linear hot temperature (above 17°C), results were very similar to those presented in table 4. After adjusting the total mortality estimates for ozone, effect modification remained essentially the same for both extreme and less extreme heat.

DISCUSSION

In a large case crossover study we found an effect of both cold and hot temperatures on mortality, the former being especially marked for myocardial infarction and cardiac arrest mortality.

Table 3 Modification by city characteristics of the two day cumulative effect of extreme cold on mortality. Comparison of the predicted change in mortality at the 25th and 75th percentile of the effect modifier distribution

	Mean of cold months' temperature (℃), % (95% CI)	Variance of cold months' temperature (℃), % (95% CI)	Central heating (%), % (95% CI)	Population density (population/km^2), % (95% CI)
Change in total mortality at the:				
25th percentile	1.31 (0.04 to 2.60)	1.88 (0.75 to 3.03)	1.79 (0.28 to 3.32)	1.87 (0.50 to 3.26)
75th percentile	1.81 (0.62 to 3.02)	1.13 (0.14 to 2.41)	1.22 (0.11 to 2.57)	1.70 (0.60 to 2.82)
Change in MI mortality at the:				
25th percentile	3.10 (1.36 to 7.77)	4.65 (0.27 to 9.22)	4.38 (1.61 to 10.7)	4.66 (0.43 to 10.0)
75th percentile	4.71 (0.17 to 9.46)	3.13 (1.42 to 7.89)	3.92 (1.05 to 9.14	4.26 (0.17 to 8.51)
Change in CA mortality at the:				
25th percentile	11.9 (1.65 to 27.4)	18.00 (4.71 to 32.9)	18.0 (2.28 to 36.2)	17.8 (3.96 to 33.5)
75th percentile	19.0 (6.29 to 33.3)	14.00 (0.19 to 29.7)	14.2 (0.90 to 29.2)	16.7 (5.29 to 29.3)

MI, myocardial infarction; CA, cardiac arrest.

Overall, the effect of temperature became more evident when temperature was at the very end of its distribution as opposed to less extreme cold and hot temperatures (treated linearly as absolute temperature above/below a threshold). In this last instance, we observed some evidence that the deaths occurring on warm days were partially counterbalanced by reduced deaths the next day. We also found evidence of a successful acclimatisation to cold in all regions, with homogeneous effects across cities when cold was defined as a percentile of local temperatures. The heat effects, in contrast, showed heterogeneity, which was explained in part by mean and variance of temperature during the warm months, air conditioning and population density.

Our study showed important increases in daily mortality with cold temperatures, particularly for myocardial infarction and cardiac arrest mortality. Consistently, a study in 12 US cities found moderate increases in myocardial infarction mortality associated with cold temperatures[10] and the Eurowinter study in Europe found increases in all cause and ischaemic heart disease mortality per 1℃ fall in temperature that were comparable to our estimates for the piecewise linear effect.[12] However, our estimates of mortality on extremely cold days were higher than would be predicted by our models of mortality increase per 1℃ fall in temperature, suggesting that treating temperature continuously may understate the effect of rare extreme conditions. This is also consistent with our finding that the effect of extreme cold was homogeneous across a 26℃ wide range of local definition of extreme cold. This suggests that unexpectedly cold days have effects that are poorly captured by looking at absolute temperature. Also of special interest was the large increase in cardiac arrest deaths we observed on extremely cold days, which reached 16% when two days in a row were extremely cold. In a previous case only analysis a high susceptibility of cardiac arrest deaths to cold temperature was reported, but the absolute increase in mortality could not be estimated.[11] To our knowledge, no other epidemiological study has reported increases in cardiac arrest mortality associated with outdoor cold temperatures. There is some evidence, though, for large increases in emergency department presentation of cardiac arrest on snowfall days.[22]

The underlying mechanisms related to the increase in cardiac deaths with cold temperatures have been postulated. An increase in plasma cholesterol and plasma fibrinogen with cold temperatures,[23 25] coupled with a higher blood pressure in winter,[26 27] could lead to thrombosis through haemoconcentration and trigger an acute cardiac event. Moreover, the inclement weather that is often associated with cold days may also contribute to cardiac mortality by reducing access to a hospital or by increasing physical activity in the cold (for example, shovelling snow).[28] Overexertion in a cold environment may trigger surges in blood pressure that could lead to coronary plaque rupture and subsequent coronary thrombosis.[29]

We found large increases in all cause and myocardial infarction mortality associated with hot temperatures, which is consistent with previous studies.[4 6] Of particular interest was the difference we observed in the heat effect when temperatures were extreme as compared with less extreme values. In the last situation, there appeared to be a harvesting effect that is, an initial increase in mortality followed by a period of lower than average mortality. This pattern has been observed by other studies on heat mortality[8 10] and it is often interpreted as a displacement of deaths that would have occurred in subsequent days regardless of the weather.[9] The absence of such a pattern for extreme temperatures suggests a stronger and more stable effect than for less extreme values. However, our study was not designed to appropriately assess the presence of harvesting by

Table 4 Modification by city characteristics of the two day cumulative effect of extreme heat on mortality. Comparison of the predicted change in mortality at the 25th and 75th percentile of the effect modifier distribution

	Mean of warm months' temperature (℃), % (95% CI)	Variance of warm months' temperature (℃), % (95% CI)	Central air conditioning (%), % (95% CI)	Population density (population/km^2), % (95% CI)
Change in total mortality at the:				
25th percentile	9.25* (6.22 to 12.4)	4.33* (1.90 to 6.83)	9.68* (6.55 to 12.9)	3.36* (1.17 to 5.61)
75th percentile	3.81* (1.42 to 6.25)	7.77* (5.03 to 10.6)	3.24* (0.44 to 6.13)	5.46* (3.51 to 7.44)
Change in MI mortality at the:				
25th percentile	7.86** (2.44 to 13.6)	3.66 (1.07 to 8.61)	7.99** (2.70 to 13.6)	2.87 (2.09 to 8.08)
75th percentile	2.62** (1.98 to 7.43)	5.20 (0.12 to 10.8)	2.05** (3.38 to 7.78)	3.99 (0.27 to 8.43)
Change in CA mortality at the:				
25th percentile	15.0 (1.08 to 33.6)	0.29* (10.8 to 12.8)	11.8 (2.19 to 27.9)	0.96* (12.5 to 12.2)
75th percentile	1.64 (10.4 to 15.3)	15.8* (2.04 to 31.3)	3.65 (10.6 to 20.2)	3.79* (6.67 to 15.4)

MI, myocardial infarction; CA, cardiac arrest.
*Two sided p value <0.05 in the meta regression model; **two sided p value <0.1 in the meta regression model.

Main messages

- Changes in the frequency of temperature extremes as a result of climate change will likely result in changes in temperature related mortality.
- Our results support the hypothesis that the expected increases in heat related mortality as a result of global warming will not be compensated for by decreases in cold related mortality in the US.
- Despite a wide range of temperatures, the US population seems fully acclimatised to cold temperatures, but not to heat. This may reflect the near universality of central heating in the US, as opposed to central air conditioning, which explained a substantial fraction of the heterogeneity between cities in the heat effects.
- Even though the heat effects in the hottest cities were much lower, increases in heat related mortality in those cities were still large and significant.

Policy implications

- Any assessment of the public health consequences of global warming should take into account the ability of populations to adapt to the new temperatures. Central heating and air conditioning are important elements of that adaptation, but in themselves contribute to greenhouse gas emissions. Improved efficiency needs to be emphasised along with the spread of these technologies, to mitigate the effects of temperature.
- The variance of summer temperature is an important predictor of the effect of very hot days, and more attention needs to be paid to the possibility that this variance will change as the climate changes.

examining longer lags, and thus we cannot rule out the occurrence of a harvesting effect for extreme temperatures beyond lag 1. Consistent with our results, a recent study during the 2003 heat wave in France reported that, at such exceptionally high temperatures, less than 10% of the excess mortality corresponded to harvesting.[30] The underlying mechanisms for the observed increase in mortality may be related to the stress placed on the respiratory and circulatory systems to increase heat loss through skin surface blood circulation.[4 31] This coupled with an increase in blood viscosity and cholesterol levels[32] may increase the risk for cardiorespiratory deaths.

Our results support the existence of population acclimatisation, understood as the adaptation of humans to their local weather conditions. If acclimatisation is complete, one might expect that only temperatures out of the ordinary would produce a substantial effect on mortality and, thus, similar effects should be observed in all cities for temperatures at a given percentile. Our findings for extreme cold are consistent with this pattern, as we saw no heterogeneity across cities where the 1st percentile of maximum daily temperature varied from 9℃ to 17℃. Central heating, which constitutes an important adaptive mechanism against cold, is almost universal in the US and this may explain why the US population seemed fully acclimatised to cold. Thus, little reduction in wintertime mortality should be expected in the US as a result of global warming.

In contrast, we did not find similar effects of minimum daily temperatures exceeding the 99th percentile across cities, indicating that something more than the unusualness of the temperature was affecting the mortality response. We found that heat effects were greater in cities with lower and more variable temperatures during the warm months, which is consistent with results from Braga *et al*.[5] Cities with a high variance in their warm months' temperature have, perforce, a greater absolute difference between the 99th percentile and the mean temperature, as well as more sudden changes in temperature. Our results suggest that, at least for extreme heat, these differences matter. Moreover, the prevalence of air conditioning, which reduced the heat effects in our study and in others,[5 13] was also lower in these cities. This indicates that adaptation to heat may not be complete in those locations where summer temperatures are not consistently high and may explain why extreme heat behaves differently than extreme cold.

We also found a greater effect of hot temperatures on more densely populated locations. Urban living may involve not only a different lifestyle but also a greater exposure to heat, especially for those residing on the top floor of apartment buildings.[33 34] Temperatures are usually higher and heat is more efficiently retained throughout the night time in the urban core than in the surrounding areas (the so called "urban heat island effect").[6 35] Thus, for a given temperature averaged throughout a region, urban inhabitants will likely be more exposed to heat and suffer worse consequences than those in the outlying suburban and rural areas.[36] Because we used airport weather stations for temperature measures, this disparity between the actual urban temperature and the one used in our analysis will likely occur for a larger proportion of the population in more densely populated locations.

It is controversial whether decreases in cold related mortality as a result of global warming will compensate for increases in heat related mortality.[8 9] Although mortality rates peak during the winter, a considerable proportion of winter excess deaths have been attributed to respiratory infections,[7] which are not directly related to ambient temperature. In our study, the effects of extreme heat on all cause mortality were much stronger than the cold effects, and the effects of extreme cold appeared driven only by the percentile, and not the absolute temperature, suggesting adaptation. Although the overall effect of climate change on mortality will ultimately depend on the temperature changes that take place, our study supports the hypothesis that decreases in cold related mortality will likely not offset the dramatic increases in heat related mortality. This may still be true even if a harvesting for heat effects occurs, given previous suggestions that the proportion of deaths representing short term mortality displacement during heat waves is approximately 10% to 40%.[30 37]

Our findings strongly suggest that any assessment of the public health impact of global warming should take into account the ability of populations to adapt. Central heating prevalence may be a key to cold adaptation. Heat effects show more regional variation in the US, and likely elsewhere in the world. Given that significant increases in heat related mortality were observed even in the hottest cities, where adaptive mechanisms are common, heat effects may not be fully compensated for. Moreover, it is important to bear in mind that technological adaptations, such as air conditioning, may not be easily accessible to socially disadvantaged groups[38] or to populations living in developing countries. Making air conditioning universally available may reduce heat related mortality but would, on the other hand, have a perverse effect by enhancing global warming through carbon dioxide emissions from electricity consumption.

One of the limitations of our study is the failure to control for the effects of particulate matter air pollution due to the limited number of measurements available for the study period. Even though adjustment for ozone in our study reduced the heat effect on total mortality by 15 16%, associations remained significant. Recently, O'Neill *et al* examined the impact of control for both ozone and particulate matter and found that the effect of high temperature on mortality was reduced by about 30% but associations persisted.[39] Another limitation of our study is the use of ambient temperature as a surrogate for personal exposure. The misclassification derived from this assumption will be largely determined by the extent to which ambient and microenvironmental temperatures are correlated,[4] which will likely be affected by adaptive mechanisms such as use of air conditioning. In our analyses we partially controlled for the latter, but misclassification of individual exposure remains inherent to the use of an ecological measure of exposure. Increased adaptation may also change the misclassi fication over time. Finally, because with climate change temperatures in the hottest cities will likely exceed the range here studied, the effects on mortality at those extremely high values remain uncertain.

In conclusion, our study confirmed in a large sample of cities that both cold and hot temperatures increase the risk of dying, especially at extreme temperature values. Although myocardial infarction and cardiac arrest mortality increase considerably on cold days, increases in all cause mortality appear to be more pronounced on extremely hot days. Our findings suggest that decreases in cold weather as a result of global warming are unlikely to result in decreases in cold related mortality in the US. Heat related mortality, in contrast, may increase, particu larly if global warming is associated with increased variance of summer temperature.

ACKNOWLEDGEMENTS

The authors would like to thank David P Cavanagh for his assistance in data management and Andrea Baccarelli for his helpful comments.

Authors' affiliations
M Medina-Ramón, J Schwartz, Department of Environmental Health, Harvard School of Public Health, Boston, MA, USA
J Schwartz, Department of Epidemiology, Harvard School of Public Health, Boston, MA, USA

Funding: This study was funded by EPA Grant R832416-010 and NIEHS grant ES-0002. None of the funding institutions was involved in the study design, collection, analysis or interpretation of data, or in the writing of the report or submission for publication.

Competing interests: None.

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EPA-1564

Lesley Jantarasami/DC/USEPA/US
11/09/2009 01:36 PM

To Jason Samenow, Marcus Sarofim
cc Ben DeAngelo
bcc
Subject vol 10 and 11 comments from Carol

Hey Jason and Marcus,

Apologies if I already sent you these, but since we're meeting with Carol later this week, I wanted to be sure you saw these redistributed comments from her categories. I think (b)(5) Deliberative

(b)(5) Deliberative

Redist Comments_Vol10.doc

(b)(5) Deliberative

Redist Comments_Vol11.doc

Thanks,

Lesley

EPA-1565

William Perkins/DC/USEPA/US
11/09/2009 03:14 PM

To Lesley Jantarasami
cc
bcc
Subject for review -- comms materials round 2

(b)(5) Deliberative Talking Points for Final Endangerment Findings 110909 BP.doc

(b)(5) Deliberative Endangerment Q&As 110909 BP.doc

(b)(5) Deliberative Fact Sheet 110909 lcj BP.doc

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(O) 202.343.9460
(F) 202.343.2202
(C) (b)(6)

EPA-1566

Michael Kolian/DC/USEPA/US
11/09/2009 03:49 PM

To Doug Grano
cc Anne Grambsch, Ben DeAngelo, Dale Evarts, Darrell Winner, Erika Sasser, Rona Birnbaum
bcc
Subject Re: volume 5 Human Health and Air Quality (EPA only)

Hi Doug,
This comment and response was moved in its entirety to Volume 10: Proposed Endangerment Finding, in section (b)(5) Deliberative
.

The RTC now consists of 12 volumes (see attached outline).

Cheers,
Mike

(b)(5) Deliberative
RTC Outline 102609_a.doc

Doug Grano A key Air Quality comment/response th... 11/09/2009 02:19:11 PM

From: Doug Grano/RTP/USEPA/US
To: Michael Kolian/DC/USEPA/US@EPA
Cc: Anne Grambsch/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, Darrell Winner/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA, Erika Sasser/RTP/USEPA/US@EPA, Dale Evarts/RTP/USEPA/US@EPA
Date: 11/09/2009 02:19 PM
Subject: Re: volume 5 Human Health and Air Quality (EPA only)

A key Air Quality comment/response that we had in earlier versions is missing from this version. Maybe it's in another section, but I'd like to review it. Here's what we had.
--Doug

(b)(5) Deliberative

Comment:

(b)(5) Deliberative

Response:

(b)(5) Deliberative

[redacted]

(b)(5) Deliberative

[redacted]

I've re-reviewed the AQ section and responded to the comments/questions/style suggestions (attached).
(b)(5) Deliberative
Darrell should take a look at that portion of the RTC document (in 2 comment/responses).
Any word on next steps for the RTC? I'm assuming we will have more chances to go over the AQ section; e.g., once OGC review is completed.

--Doug

(b)(5) Deliberative

RTC draft Volume 5 HH and AQ 110409a-DG.doc

Michael Kolian Hi Doug and Darrell, (b)(5) Deliberative 11/04/2009 12:26:42 PM

From: Michael Kolian/DC/USEPA/US
To: Doug Grano/RTP/USEPA/US@EPA, Darrell Winner/DC/USEPA/US@EPA, Anne Grambsch/DC/USEPA/US@EPA

Cc: Ben DeAngelo/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA
Date: 11/04/2009 12:26 PM
Subject: volume 5 Human Health and Air Quality (EPA only)

Hi Doug and Darrell,

(b)(5) Deliberative

It would be great if you and your team could re-review the AQ section. There are a few outstanding minor comments/questions in the AQ section in particular. We anticipate additional comments/edits to the section (in red-line) from other reviewers so I'll will keep you in the loop.

Hi Anne,
I wonder if you could review the human heath section if you have the time. Any feedback would be great.

We're shooting for consistency in and among the various volumes by following some general guidelines (attached). It would be great if you could turn this around by the end of the week (preferably sooner). Please let me know if you have any questions.

Many thanks,
Mike

[attachment "RTC draft Volume 5 HH and AQ 110409a.doc" deleted by Doug Grano/RTP/USEPA/US]
[attachment "Reminders on Style and Wording v2.doc" deleted by Doug Grano/RTP/USEPA/US]

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EPA-1567

Rona Birnbaum/DC/USEPA/US
11/09/2009 04:43 PM

To Ben DeAngelo, Jason Samenow, Jeremy Martinich, William Perkins, Marcus Sarofim, Michael Kolian, Lesley Jantarasami, David Chalmers
cc
bcc
Subject Fw: Greenwire News alert: EPA sends endangerment proposal to White House

EPA C02 endangerment finding to White House

Mon Nov 9, 2009 2:23pm EST

By Tom Doggett

WASHINGTON (Reuters) - The U.S. Environmental Protection Agency has sent its final proposal on whether gas emissions pose a danger to human health and welfare to the White House for review, EPA Administrato

The EPA's final finding, if it follows the agency's earlier assessment and is approved by the Office of Manag to issue rules later to regulate greenhouse gas emissions, even if Congress fails to pass legislation to cut U gases that contribute to global warming.

"We sent the final proposal over to OMB on Friday," Jackson said in an interview at her EPA headquarters'

She said the OMB has up to 90 days to review the proposal, but the EPA would like a quicker timetable.

"We've briefed them a couple of times. So we're hoping for an expedited review," Jackson said.

Along with its final endangerment finding, the EPA also sent to OMB the agency's final finding on whether c that pollution," Jackson said.

Such a finding would allow the federal government to regulate tailpipe emissions by increasing vehicle mile

Jackson said the government is facing a "hard deadline" of next March to let automakers know of any requ standards that would affect vehicles built for the 2012 model year.

She said the EPA received more than 300,000 comments on its initial proposed public health endangermen were issued last April.

(Reporting by Tom Doggett; Editing by Marguerita Choy and Lisa Shumaker)

EPA-1568

Jason Samenow/DC/USEPA/US
11/09/2009 06:03 PM

To Marcus Sarofim
cc
bcc
Subject Re: volume 2 references

Thanks, Marcus.

Jason

Marcus Sarofim I don't know what the quickr status is of... 11/06/2009 06:18:47 PM

From: Marcus Sarofim/DC/USEPA/US
To: Jason Samenow/DC/USEPA/US@EPA
Cc: sarofim.marcus@epa.gov
Date: 11/06/2009 06:18 PM
Subject: Re: volume 2 references

I don't know what the quickr status is of the reference document, (b)(5) Deliberative

Volume 2 References

(b)(5) Deliberative

(b)(5) Deliberative

[redacted]

Jeremy Martinich Hey Jason, You've already got all of t... 11/06/2009 03:55:18 PM

From: Jeremy Martinich/DC/USEPA/US
To: Jason Samenow/DC/USEPA/US@EPA
Cc: Marcus Sarofim/DC/USEPA/US@EPA
Date: 11/06/2009 03:55 PM
Subject: Re: volume 2 references

Hey Jason,

You've already got all of the references for my contributions to V2.

Thanks,
Jeremy

****
Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

Jason Samenow At some point (can we maybe shoot fo... 11/03/2009 08:00:14 PM

From: Jason Samenow/DC/USEPA/US
To: Marcus Sarofim/DC/USEPA/US@EPA, Jeremy Martinich/DC/USEPA/US@EPA
Date: 11/03/2009 08:00 PM
Subject: volume 2 references

At some point (can we maybe shoot for by Friday?), can you all add any references from Volume 2 that are not in here. I've got a bunch to add and Marcus, I think you do too. Jeremy, maybe not so much, but please check. A reminder that we don't need to add TSD references.

If you can just add yours to the end of the attached document, we can worry about alphabetizing later.

Thanks,
Jason

[attachment "Volume 2 References.doc" deleted by Jeremy Martinich/DC/USEPA/US]

EPA-1569

Michael Kolian/DC/USEPA/US
11/09/2009 06:17 PM

To Doug Grano
cc Anne Grambsch, Ben DeAngelo, Dale Evarts, Darrell Winner, Erika Sasser, Rona Birnbaum
bcc
Subject Re: volume 5 Human Health and Air Quality (EPA only)

Hi Doug et al,
I have incorporated your comments along with others (thank you!).

1) [redacted] (b)(5) Deliberative
2) I have attached a track changes version of the volume containing changes to the AQ section since it was created and a clean copy as of today.
3) It is still being reviewed and expect more changes so you will continue to get subsequent opportunities to review, etc... One thing going forward is we'll have [redacted] (b) 5 deliberative

[redacted] (b)(5) Deliberative
RTC draft Volume 5 HH and AQ 110909.doc

[redacted] (b)(5) Deliberative
RTC draft Volume 5 HH and AQ 110909 clean.doc

Cheers,
Mike

Doug Grano I've re-reviewed the AQ section and res... 11/06/2009 03:24:28 PM

From: Doug Grano/RTP/USEPA/US
To: Michael Kolian/DC/USEPA/US@EPA
Cc: Anne Grambsch/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, Darrell Winner/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA, Erika Sasser/RTP/USEPA/US@EPA, Dale Evarts/RTP/USEPA/US@EPA
Date: 11/06/2009 03:24 PM
Subject: Re: volume 5 Human Health and Air Quality (EPA only)

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[redacted] (b)(5) Deliberative
Darrell should take a look at that portion of the RTC document (in 2 comment/responses).
Any word on next steps for the RTC? I'm assuming we will have more chances to go over the AQ section; e.g., once OGC review is completed.
--Doug
[attachment "RTC draft Volume 5 HH and AQ 110409a-DG.doc" deleted by Michael Kolian/DC/USEPA/US]

Michael Kolian Hi Doug and Darrell, We have combine... 11/04/2009 12:26:42 PM

From: Michael Kolian/DC/USEPA/US
To: Doug Grano/RTP/USEPA/US@EPA, Darrell Winner/DC/USEPA/US@EPA, Anne Grambsch/DC/USEPA/US@EPA
Cc: Ben DeAngelo/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA
Date: 11/04/2009 12:26 PM
Subject: volume 5 Human Health and Air Quality (EPA only)

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[redacted] (b) 5 deliberative
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outstanding minor comments/questions in the AQ section in particular. We anticipate additional comments/edits to the section (in red-line) from other reviewers so I'll will keep you in the loop.

Hi Anne,
I wonder if you could review the human heath section if you have the time. Any feedback would be great.

We're shooting for consistency in and among the various volumes by following some general guidelines (attached). It would be great if you could turn this around by the end of the week (preferably sooner). Please let me know if you have any questions.

Many thanks,
Mike

[attachment "RTC draft Volume 5 HH and AQ 110409a.doc" deleted by Doug Grano/RTP/USEPA/US]
[attachment "Reminders on Style and Wording v2.doc" deleted by Doug Grano/RTP/USEPA/US]

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EPA-1570

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Redist Comments_Vol12_orig.doc

(b)(5) Deliberative - Redist Comments_Vol12_orig.doc

EPA-1571

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Excerpts Comments_Vol12.doc

(b)(5) Deliberative [redacted] - Excerpts Comments_Vol12.doc

EPA-1572

Michael Kolian/DC/USEPA/US
11/10/2009 08:16 AM

To Rona Birnbaum
cc Lesley Jantarasami
bcc
Subject Re: volume 5 Human Health and Air Quality (EPA only)

The changes were mainly to the AQ portion. You can see where she's at and slip her this version - It includes Lesley's changes to the title and forward as well.

(b)(5) Deliberative

RTC draft Volume 5 HH and AQ 110909.doc

Rona Birnbaum are these changes big enough that I sh... 11/09/2009 10:06:51 PM

From: Rona Birnbaum/DC/USEPA/US
To: Michael Kolian/DC/USEPA/US@EPA
Cc: Lesley Jantarasami/DC/USEPA/US@EPA
Date: 11/09/2009 10:06 PM
Subject: Re: volume 5 Human Health and Air Quality (EPA only)

---

are these changes big enough that I should see if Dina wants a newer version?

Rona Birnbaum
Chief, Climate Science and Impacts Branch
USEPA, Climate Change Division
birnbaum.rona@epa.gov
202-343-9076

Michael Kolian Hi Doug et al, I have incorporated your... 11/09/2009 06:17:53 PM

From: Michael Kolian/DC/USEPA/US
To: Doug Grano/RTP/USEPA/US@EPA
Cc: Anne Grambsch/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, Dale Evarts/RTP/USEPA/US@EPA, Darrell Winner/DC/USEPA/US@EPA, Erika Sasser/RTP/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA
Date: 11/09/2009 06:17 PM
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[attachment "RTC draft Volume 5 HH and AQ 110909.doc" deleted by Rona Birnbaum/DC/USEPA/US]
[attachment "RTC draft Volume 5 HH and AQ 110909 clean.doc" deleted by Rona Birnbaum/DC/USEPA/US]

Cheers,
Mike

Doug Grano I've re-reviewed the AQ section and res... 11/06/2009 03:24:28 PM

From: Doug Grano/RTP/USEPA/US
To: Michael Kolian/DC/USEPA/US@EPA
Cc: Anne Grambsch/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, Darrell Winner/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA, Erika Sasser/RTP/USEPA/US@EPA, Dale Evarts/RTP/USEPA/US@EPA
Date: 11/06/2009 03:24 PM
Subject: Re: volume 5 Human Health and Air Quality (EPA only)

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[attachment "RTC draft Volume 5 HH and AQ 110409a-DG.doc" deleted by Michael Kolian/DC/USEPA/US]

Michael Kolian Hi Doug and Darrell, [redacted] (b)(5) Deliberative... 11/04/2009 12:26:42 PM

From: Michael Kolian/DC/USEPA/US
To: Doug Grano/RTP/USEPA/US@EPA, Darrell Winner/DC/USEPA/US@EPA, Anne Grambsch/DC/USEPA/US@EPA
Cc: Ben DeAngelo/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA
Date: 11/04/2009 12:26 PM
Subject: volume 5 Human Health and Air Quality (EPA only)

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[redacted] (b) 5 deliberative
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Many thanks,
Mike

[attachment "RTC draft Volume 5 HH and AQ 110409a.doc" deleted by Doug Grano/RTP/USEPA/US]
[attachment "Reminders on Style and Wording v2.doc" deleted by Doug Grano/RTP/USEPA/US]

Michael Kolian, USEPA
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Climate Change Division
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Washington, DC 20460
Phone: (202) 343-9261
Email: kolian.michael@epa.gov

EPA-1573

Lesley Jantarasami/DC/USEPA/US
11/10/2009 08:58 AM

To Jason Samenow
cc
bcc
Subject Re: no volume 10 in Quickr...

Hmm, it's there but it's currently checked out for editing by Mike. Maybe that's why it's not showing up? Or it could be that I listed it as Volume .10 so that the list of volumes would appear in order on the pages. Either way, I've attached it for your convenience.

(b)(5) Deliberative [redacted]
RTC draft Volume 10 Endangerment 110609.doc

Lesley

Jason Samenow Lesley -- I went to Quickr earlier this e... 11/09/2009 06:30:05 PM

From: Jason Samenow/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US@EPA
Date: 11/09/2009 06:30 PM
Subject: no volume 10 in Quickr...

Lesley -- I went to Quickr earlier this evening to download Volume 10 and didn't see it there... Can you please upload?

Thanks,
Jason

EPA-1574

Michael Kolian/DC/USEPA/US
11/10/2009 09:53 AM

To Jason Samenow
cc Ben DeAngelo, Rona Birnbaum
bcc
Subject Re: important heat vs. cold studies (including a new one we need to consider)

Great. [redacted] (b)(5) Deliberative [redacted]

Thanks,
Mike

Jason Samenow Here is the PDF of Medina Ramon an... 11/09/2009 01:29:10 PM

From: Jason Samenow/DC/USEPA/US
To: Michael Kolian/DC/USEPA/US@EPA
Cc: Ben DeAngelo/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA
Date: 11/09/2009 01:29 PM
Subject: important heat vs. cold studies (including a new one we need to consider)

Here is the PDF of Medina Ramon and Schwartz article as well as a [redacted] (b)(5) Deliberative [redacted] from Andersen and Bell.

[redacted] (b)(5) Deliberative [redacted]

[redacted]

[redacted]:

We investigated lag times from same day to 28 days previous. Earlier heat-mortality studies identified risk from recent exposure (ie, same day and a few days previous).(5-8,11,16) Most studies applied lags of 1 or 2 days, although some used up to 3 days.(30) We found the strongest heat-related mortality association for same- and previous-day exposure. The short lag required to capture the effects of heat on mortality suggests a rapid physical response. Some of the effects observed could be the result of short-term mortality displacement, and further study is warranted.

For cold-related mortality, most US studies applied 2- to 5-day lags, (1,5,6,11) whereas other researchers found cold effects after 1 or more weeks for some communities. (16,31) Findings indicate that longer lags are required to capture cold's impact on mortality and that using identical lag structures for cold and heat effects is not appropriate. A limitation of longer lag structures is the introduction of more measurement error due to increased time between the exposure and event. Heat and cold effects were similar in magnitude for absolute and relative estimates, which contrasts with earlier

US studies finding larger heat effects than cold effects. (5,11) We hypothesize that previous studies underestimated cold-related effects through use of shorter lags. Results agree with a European study finding mortality effects occurring days to weeks after cold exposure.(16) Findings suggest that cold temperatures more indirectly affect mortality than heat. Infectious diseases, which are more common in industrialized countries during colder weather (when people spend more time indoors and in proximity) could account for much of the cold-related effect. Although we found that heat effects were impacted by shorter exposures and cold effects were affected by longer exposures, the specific lag structures used here (Tlag0-25 and Tlag0-1) are intended to be representative, not to reflect the only or the exact lag measurements appropriate for temperature-mortality studies

Jason

----- Forwarded by Jason Samenow/DC/USEPA/US on 11/09/2009 01:17 PM -----

From:	"Dave Mills" <DMills@stratusconsulting.com>
To:	Jason Samenow/DC/USEPA/US@EPA
Date:	11/09/2009 12:33 PM
Subject:	Medina Ramon and Anderson Schwartz

Jason,

The Medina-Ramon article is attached. Also included the recent article from Anderson and Bell that also uses a common method to look at heat-mortality risks in multiple US cities.

Will send a confirming note in a second.

Thanks and hope the meeting goes well.

David M. Mills
Senior Analyst

_____
STRATUS CONSULTING
1881 Ninth Street, Suite 201
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Mail: PO Box 4059, Boulder, CO 80306-4059
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[attachment "ID51989.Anderson&Bell.2009.pdf" deleted by Michael Kolian/DC/USEPA/US]
[attachment "ID49691.Medina-Ramon&Schwartz.2007.pdf" deleted by Michael Kolian/DC/USEPA/US]

EPA-1575

Jason Samenow/DC/USEPA/US
11/10/2009 11:28 AM

To Lesley Jantarasami
cc
bcc
Subject Re: no volume 10 in Quickr...

I see it there now.

Thanks,
Jason

Lesley Jantarasami Volume 10 should be back up now... 11/10/2009 11:26:45 AM

From: Lesley Jantarasami/DC/USEPA/US
To: Jason Samenow/DC/USEPA/US@EPA
Cc: Michael Kolian/DC/USEPA/US@EPA
Date: 11/10/2009 11:26 AM
Subject: Re: no volume 10 in Quickr...

Volume 10 should be back up now - let me know if it's not.

Thanks!

Jason Samenow Lesley -- I went to Quickr earlier this e... 11/09/2009 06:30:05 PM

From: Jason Samenow/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US@EPA
Date: 11/09/2009 06:30 PM
Subject: no volume 10 in Quickr...

Lesley -- I went to Quickr earlier this evening to download Volume 10 and didn't see it there... Can you please upload?

Thanks,
Jason

EPA-1576

"Mae Thomas"
<Mae.Thomas@erg.com>
11/10/2009 11:46 AM

To William Perkins
cc "Mae Thomas"
bcc
Subject "new" comments


EPA-HQ-OAR-2009-0171-5846.pdf

EPA-HQ-OAR-2009-0171-5852.pdf

EPA-HQ-OAR-2009-0171-11460.pdf

EPA-HQ-OAR-2009-0171-11458.pdf

EPA-HQ-OAR-2009-0171-11459.pdf

available at regulations.gov

EPA-1577

Jason Samenow/DC/USEPA/US
11/10/2009 12:57 PM

To Marcus Sarofim
cc Rona Birnbaum
bcc
Subject Fw: PhysicsToday [letters] 11/2009: Interpretations of climate-change data<--Scafetta/West, Jordan, Duffy/Santer/Wigley + Scafetta 11/8: Informal comments on the Duffy et al Physics Today letter

FYI

----- Forwarded by Jason Samenow/DC/USEPA/US on 11/10/2009 12:56 PM -----

From: John Davidson/DC/USEPA/US
To: Neil Stiber/DC/USEPA/US@EPA, Jason Samenow/DC/USEPA/US@EPA
Date: 11/10/2009 07:13 AM
Subject: Fw: PhysicsToday [letters] 11/2009: Interpretations of climate-change data<--Scafetta/West, Jordan, Duffy/Santer/Wigley + Scafetta 11/8: Informal comments on the Duffy et al Physics Today letter

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----- Forwarded by John Davidson/DC/USEPA/US on 11/10/2009 07:13 AM -----

General OP Econ Discussions

Category: Climate Change

Specific Topic: PhysicsToday [letters] 11/2009: Interpretations of climate-change data<--Scafetta/West, Jordan, Duffy/Santer/Wigley + Scafetta 11/8: Informal comments on the Duffy et al Physics Today letter

Author: John Davidson Date: 11/09/2009

Interpretations of climate-change data - Physics Today November 2009.pdf

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After the Physics Today November 2009 letters were published Dr. Scafetta sent me the following informal update :

[slightly edited by yours truly]

I did not see the reply of Duffy et al. before its publication.

In any case this is a quick update:

1) Duffy et al. do not seem to have any detailed knowledge of the difference between PMOD and ACRIM. In the attachment I am sending you the statements from the ACRIM and NIMBUS experimental teams that reject the alteration of their data made by the PMOD team. I do not say that ACRIM and NIMBUS7 experimental teams are necessarily correct, but it is singular that their opinions are not even taken into account nor by Duffy et al. nor by the promoter of the AGW theory nor by the IPCC. You already saw these statements in my seminar at EPA.

2) Duffy et al. continue to misunderstand the paper by North et al. It seems that Duffy et al. have just read the abstract of that paper. North et al. show that the solar cycle as predicted by the ENERGY BALANCE MODELS is quite small (just a few hundredths of a degree). However, when the model predictions are tested against the actual temperature data, a fact that they do in their figure 4 the models are found to severely underestimate the 11-year solar signature on average by a factor of two. So, there is no contradiction between what found by North et al and what stated by us! Duffy et al. seem not to have been been able to understand the difference between climate model
SIMULATION and actual MEASUREMENTS in temperature data. In all my papers it is said that the actual climate models predict an 11-year solar signature with an amplitude from maximum to minimum of about 0.03 K, while the measurements based on the analysis of the temperature data show a signature of about 0.1 K, that is three times larger. The last results is acknowledged also by the IPCC, see their page 674.

3) Duffy et al. claim that the difference between the PMOD and ACRIM data is insignificant and reference a work of Lockwood. Lockwoood's paper has been confuted by my last publication
http://www.fel.duke.edu/~scafetta/pdf/Scafetta-JASP_1_2009.pdf
See in particular the comments in the conclusion paragraph regarding the existence of short and long characteristic time responses that Lockwoood ignored in his papers.
A comment on this paper is here
http://wattsupwiththat.com/2009/08/18/scafetta-on-tsi-and-surface-temperature/

4) Duffy et al. claim that our calculations are poor and erroneous and reference a recent paper by Benestad and Schmith to support their claim. The Benestad and Schmith paper is filled with errors from the abstract to the last
paragraph. A preliminary rebuttal of this paper by myself is here

http://wattsupwiththat.com/2009/08/04/scafetta-benestad-and-schmidt%E2%80%99s-calculations-are-%E2%80%9Crobustly%E2%80%9D-flawed/
We have already wrote a formal rebuttal paper. Apparently Duffy et al. are not able to see the macroscopic errors in Benestad and Schmith.

5) Duffy et al. states that it is not true that the climate models do not assume that only human can change GHG concentration. It is true that some model take into account some carbon cycle mechanisms. However, what the IPCC energy balance and general circulation model do is to take the measurements in the atmosphere of the CO2 and CH4 and use them as forcings of the models. No GHGs feedback mechanisms is taken into account. The IPCC "calls" the measured change of GHGs that occurred since 1750 "anthropogenic". In other words it is assumed that only humans can change GHGs. Our argument is that CO2 and CH4 are also regulated by natural feedback mechanisms that are ignored in the IPCC models. These include gas exchange from the ocean, vegetation and bacteria. The existence of these feedback mechanisms, which depend on the temperature,

is evident if we look at the ice core data. So,part of the increased GHGs concentration observed in climate since 1750 can be due to the increased solar activity and does not make any sense to say that 100% of it is anthropogenic as the IPCC does.

I hope that this is of help.

Nicola


Statement Hoyt.pdf


Statement Willson.pdf

Deposited by John Davidson on 11/09 at 08:06 AM

URL: http://ptonline.aip.org/journals/doc/PHTOAD-ft/vol_62/iss_11/8_2.shtml

Published: November 2009

LETTERS

Interpretations of climate-change data

November 2009, page 8

In the January 2009 issue of PHYSICS TODAY, Philip Duffy, Benjamin Santer, and Tom Wigley attempted (page 48) to rebut our argument that there is significant climate response to solar variability (PHYSICS TODAY, March 2008, page 50). We find their arguments unconvincing.

The composite curve in their figure 1 is the PMOD composite of satellite data for total solar irradiance (TSI), which has no upward trend for the period 1980–2000. However, the second well-known composite, ACRIM, does show a significant upward trend during that period. [1] We find it curious that Duffy and coauthors cite the PMOD composite as the only one of consequence.

For the period before 1995, any TSI composite is constructed with data from ACRIM1, NIMBUS7, and ACRIM2 satellite experiments. The ACRIM composite uses these data as they are published by the experimental teams, while the PMOD composite is constructed by altering the published data on the basis of a TSI proxy model and the low-quality ERBS (Earth Radiation Budget Satellite) record. The ACRIM and NIMBUS7 experimental teams have rejected the PMOD alterations as arbitrary. [2,3]

Recent work [3] that uses measurements of solar magnetic fluxes at Earth's surface establishes that a significant degradation of the TSI record from ERBS occurred during the gap in the ACRIM records (1989–92), as the ACRIM team has always claimed. That degradation invalidates the trust placed in the PMOD composite and its downward alterations of the NIMBUS7 record. Thus one is forced to select the ACRIM composite, which shows a TSI increase between 1980 and 2002, as we discussed in our Opinion piece.

Duffy and coauthors' choice of preferring an arbitrary TSI composite that shows no upward trend from 1980 to 2000 clearly undercuts their first major claim, that the Sun could not contribute to the warming observed since 1980, and consequently everything they deduced from it.

The second claim by Duffy and coauthors is that climate sensitivity to solar variability is low. To support that conclusion, they cite a 2004 study [4] by Gerald North and coworkers that summarizes findings obtained from simple energy-balance models. However, Duffy and coauthors omitted that study's major finding: that the empirical solar signature exceeds the energy-balance model predictions by a factor of two on average, implying that the climate is much more sensitive to solar changes than what climate models predict. Also, they do not realize that us-ing a 10-year running average in their figure 2 suppresses the solar cycle's 11-year signature on climate.

The authors also ignore three other important points. First, our findings are consistent with secular paleoclimate temperature reconstructions that were recently made and confirmed. [5] Second, the glacial epochs were induced by small changes in the redistribution of sunlight due to the Milankovitch astronomical cycles—variations in the eccentricity, obliquity, and precession of Earth's orbit; that fact suggests significant climate sensitivity to changes in TSI inputs. And third, the oscillations of greenhouse gases observed between the glacial epochs were not induced by human activity but were a complex climate-dynamics response to the small redistribution of sunlight produced by Milankovitch cycles; that fact contradicts the assumption implicit in all climate models adopted in the Intergovernmental Panel on Climate Change 2007 report, that only humans can modify greenhouse gas concentrations.

Finally, the assumption underlying the piece by Duffy and coworkers is that the anthropogenic global warming theory is settled, those who claim otherwise are in error, and their studies should be dismissed. Yet an international team of scientists has published a comprehensive research review [6] disproving that claim by summarizing and organizing the findings of thousands of scientific papers; their review contradicts several conclusions of the IPCC 2007 report, which ignored many of the papers reviewed in *Climate Change Reconsidered*. [6] The review also lists more than 30,000 US scientists who have signed a petition stating that there is no convincing evidence to support the anthropogenic global

warming theory. We remind readers about the dangers of dogma replacing science.

References

1. 1. C. Fröhlich, J. Lean, *Geophys. Res. Lett.* **25**, 4377 (1998) [INSPEC]; C. Fröhlich, *Space Sci. Rev.* **125**, 53 (2006) [INSPEC].
2. 2. R. C. Willson, A. V. Mordvinov, *Geophys. Res. Lett.* **30**, 1199 (2003) [SPIN], doi:10.1029/2002GL016038.
3. 3. N. Scafetta, R. C. Willson, *Geophys. Res. Lett.* **36**, L05701 (2009) [SPIN], doi:10.1029/2008GL036307.
4. 4. G. R. North, Q. Wu, M. Stevens, in *Solar Variability and Its Effects on Climate*, J. M. Pap, P. Fox, eds., Geophysical Monograph 141, American Geophysical Union, Washington, DC (2004), p. 251.
5. 5. A. Moberg et al., *Nature* **433**, 613 (2005) [MEDLINE]; A. Eichler et al., *Geophys. Res. Lett.* **36**, L01808 (2009) [SPIN], doi:10.1029/2008GL035930.
6. 6. C. Idso, S. F. Singer, *Climate Change Reconsidered: The Report of the Nongovernmental International Panel on Climate Change*, Heartland Institute, Chicago (2009), [LINK].

Nicola Scafetta
(ns2002@duke.edu)
Bruce J. West
(bruce.j.west@us.army.mil)
Duke University
Durham, North Carolina

The rather passionate rebuttal of the Scafetta and West solar variability hypothesis by Philip Duffy, Benjamin Santer, and Tom Wigley seems to clearly show some weaknesses in the Scafetta and West model. Nevertheless, Duffy and coauthors ignore a data trend that weakens the argument for climate change based almost solely on greenhouse gas emissions. Their own figure 2 clearly illustrates that although GHG emissions have continued to increase at an enormous rate, global temperatures have not increased over the past decade and have actually slightly decreased overall since the record-setting warmth of the 1998 El Niño maximum. Also, last year's apparently anomalous low temperatures occurred during a year of extremely low solar activity (and a possibly weak La Niña), despite the aforementioned increase in GHG emissions and without a significant volcanic eruption.

Although the various current climate models are getting better at re-creating the past, they still fail in accurately predicting the future, especially with their emphasis on GHG emissions. So it certainly doesn't hurt to examine other models such as Scafetta and West's. If there exists a single climate model from a decade ago that based climate change predominantly on GHGs and that predicted the past 10 years of cooling, I would love to see a reference to it.

Benjamin R. Jordan
(jordanb@byui.edu)
Brigham Young University–Idaho
Rexburg

Duffy, Santer, and Wigley reply: Solar irradiance measurements have been made by a number of satellites covering different time periods. Several investigators have stitched together the multiple records into composites, correcting for small instrumental differences (for a comparison, click here). Nicola Scafetta and Bruce West make much of the fact that our figure showed the PMOD composite rather than their favorite, ACRIM. The differences between the two, however, are insignificant in terms of implications for climate; neither produces anything close to the observed late-20th-century warming, even if one assumes a climate sensitivity much greater than the most commonly accepted value. Furthermore, the superiority of the ACRIM composite is not established. [1]

Scafetta and West's characterization of the 2004 paper by Gerald North and coworkers (reference 4 in Scafetta and West's letter) contradicts that paper's abstract. Far from finding that "the climate is much more sensitive to solar changes than what climate models predict," North and coworkers find "a faint response to the solar cycle" with amplitude "roughly what we would expect (a few hundredths of a degree) based on simple energy-balance model estimates." That finding contradicts Scafetta and West's argument that the climate is mysteriously hypersensitive to solar variations.

We used a 10-year running mean in our figure 2 precisely because it masks the 11-year solar cycle; our point was that there is no significant multidecadal trend due to solar variability.

Scafetta and West's discussion of glacial and interglacial cycles does not support their assertion that climate is exceptionally sensitive to solar variations. As is well established, glacial and interglacial temperature differences result from extremely large changes—not "small" ones as Scafetta and West claim—in the spatial and seasonal patterns of

incoming solar radiation, which trigger two powerful but slow feedbacks: changes in atmospheric carbon dioxide and changes in surface reflectivity resulting from the advance and retreat of land ice sheets. Certainly, neither feedback can be responsible for late-20th-century warming.

Although this is irrelevant to the main point of contention, climate models do not assume that "only humans can modify greenhouse gas concentrations." Naturally occurring CO_2 variations are included either by prescription or through modeling of climate and carbon-cycle feedbacks.

Finally, a recent paper [2] explains in detail the serious flaws in the work of Scafetta and West. Primarily, multicollinearity between different climate forcing agents makes it impossible to unravel their relative effects by considering only a single forcing, as Scafetta and West attempt. Reference 2 further shows that the statistical method they used leads to grossly incorrect results; when applied to a situation with a known solar contribution, it gives a greatly and unrealistically enhanced solar effect.

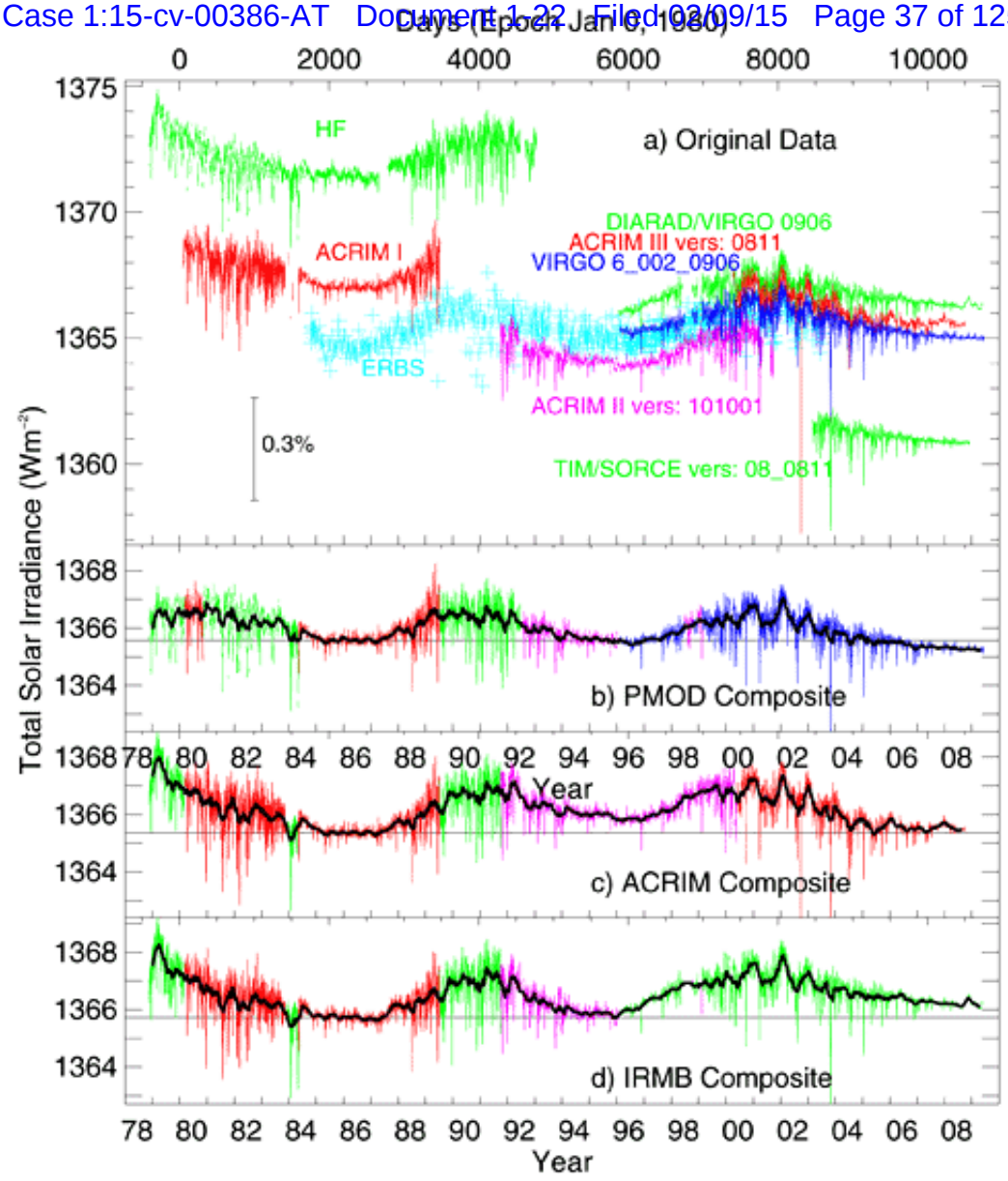
In response to Benjamin Jordan, we note that observed temperatures reflect both natural variability and the effects of forcings such as greenhouse gases and solar variability. So in an era of increasing greenhouse gases, each year need not be warmer than the previous, even as temperatures trend generally upward. Climate models correctly predict that phenomenon. [3] However, because climate simulations are not initialized from observations in the same way that weather forecasts are, they are not expected to predict the *timing* of natural variations, including cooling episodes. Hence, the lack of any warming trend since 1998 is not cause for concern about climate models.

In summary, we do not claim that the climate is insensitive to solar forcing, only that the sensitivities to different types of forcing appear to be very similar. We are open to the possibility that unknown feedbacks might amplify solar forcing; however, Scafetta and West have provided no evidence of such and no reason to discard an explanation of late-20th-century warming that is consistent with theory, models, and observations—namely, increased greenhouse gases.

References

1. 1. See, for example, M. Lockwood, C. Fröhlich, *Proc. R. Soc. A* 464, 1367 (2008).
2. 2. R. E. Benestad, G. A. Schmidt, *J. Geophys. Res. D* **114**, 14101 (2009) , doi:10.1029/2008JD011639.
3. 3. See, for example, D. R. Easterling, M. F. Wehner, *Geophys. Res. Lett.* **36**, L08706 (2009) [SPIN], doi:10.1029/2009GL037810.

Philip Duffy
(pduffy@climatecentral.org)
Climate Central Inc
Palo Alto, California
Benjamin Santer
Lawrence Livermore National Laboratory
Livermore, California
Tom Wigley
National Center for Atmospheric Research
Boulder, Colorado



Raw solar irradiance measurements (top) and three compositesýestimated irradiance records that continuously span the entire period of observations. Raw measurements reflect differences in instrument calibrations among different satellites. The composites attempt to correct for those differences. Although the relative merits of each composite are debatable, the differences are insignificant in terms of implications for climate; none of the composites can explain the warming of the late 20th century.

Dr. Richard C. Willson
Principal Investigator
ACRIM Experiments
12 Bahama Bend,
Coronado, CA, 92118
Phone: 619-407-7716
Fax: 619-365-9579
E-mail: rwillson@acrim.com

September 16, 2008

Dear. Dr. Scafetta:

Regarding Frohlich's PMOD TSI composite:

1. Frohlich made unauthorized and incorrect adjustments to the SMM/ACRIM1 and UARS/ACRIM2 TSI results. In the case of ACRIM1 he arbitrarily miss-applied the degradation correction published by the ACRIM1 Science team for the SMM 'spin mode' (1981 – 1984) to the 1980 results. He did this without any detailed knowledge of the ACRIM1 instrument or on-orbit performance, original analysis or consultation with the ACRIM1 team. His intent was clearly to revise the solar cycle 21 TSI to agree with Judith Lean's TSI proxy model.
2. Frohlich chose the ERBS/ERBE database to 'bridge' the ACRIM gap when it was clearly inferior to the Nimbus7/ERB gap data. His justification was based on hypothetical 'upward steps' in the Nimbus7/ERB results ('glitches' in Frohlich's words) that no other researchers, including both the original PI (Hickey) and the final science team (Hoyt and Kyle) believe exist. As with ACRIM1 above, Frohlich had no detailed knowledge of the Nimbus7/ERB instrument and made no original analysis or computations. The only obvious purpose appears to be to obtain a TSI composite that agreed with the predictions of Lean's TSI proxy model.
3. The TSI proxy models, such as Lean's, are not competitive in accuracy or precision with even the worst satellite TSI observations. To 'adjust' satellite data to agree with such models is incompatible with the scientific method.
4. The PMOD TSI composite panders to those who promote anthropogenic causes as the principal component of global warming, despite mounting evidence to the contrary. They cite its lack of significant TSI trending as evidence of relatively insignificant solar climate forcing during the past 30 years.

Sincerely,

Dr. Richard C. Willson

Douglas Hoyt
dhoyt@toast.net

September 16, 2008

Dear Dr. Scafetta:

Concerning the supposed increase in Nimbus7 sensitivity at the end of September 1989 and other matters as proposed by Frohlich's PMOD TSI composite:

1. There is no known physical change in the electrically calibrated Nimbus7 radiometer or its electronics that could have caused it to become more sensitive. At least neither Lee Kyle nor I could never imagine how such a thing could happen and no one else has ever come up with a physical theory for the instrument that could cause it to become more sensitive.

2. The Nimbus7 radiometer was calibrated electrically every 12 days. The calibrations before and after the September shutdown gave no indication of any change in the sensitivity of the radiometer. Thus, when Bob Lee of the ERBS team originally claimed there was a change in Nimbus7 sensitivity, we examined the issue and concluded there was no internal evidence in the Nimbus7 records to warrant the correction that he was proposing. Since the result was a null one, no publication was thought necessary.

3. Thus, Frohlich's PMOD TSI composite is not consistent with the internal data or physics of the Nimbus7 cavity radiometer.

4. The correction of the Nimbus7 TSI values for 1979-1980 proposed by Frohlich is also puzzling. The raw data was run through the same algorithm for these early years and the subsequent years and there is no justification for Frohlich's adjustment in my opinion.

Sincerely,

Douglas Hoyt

EPA-1578

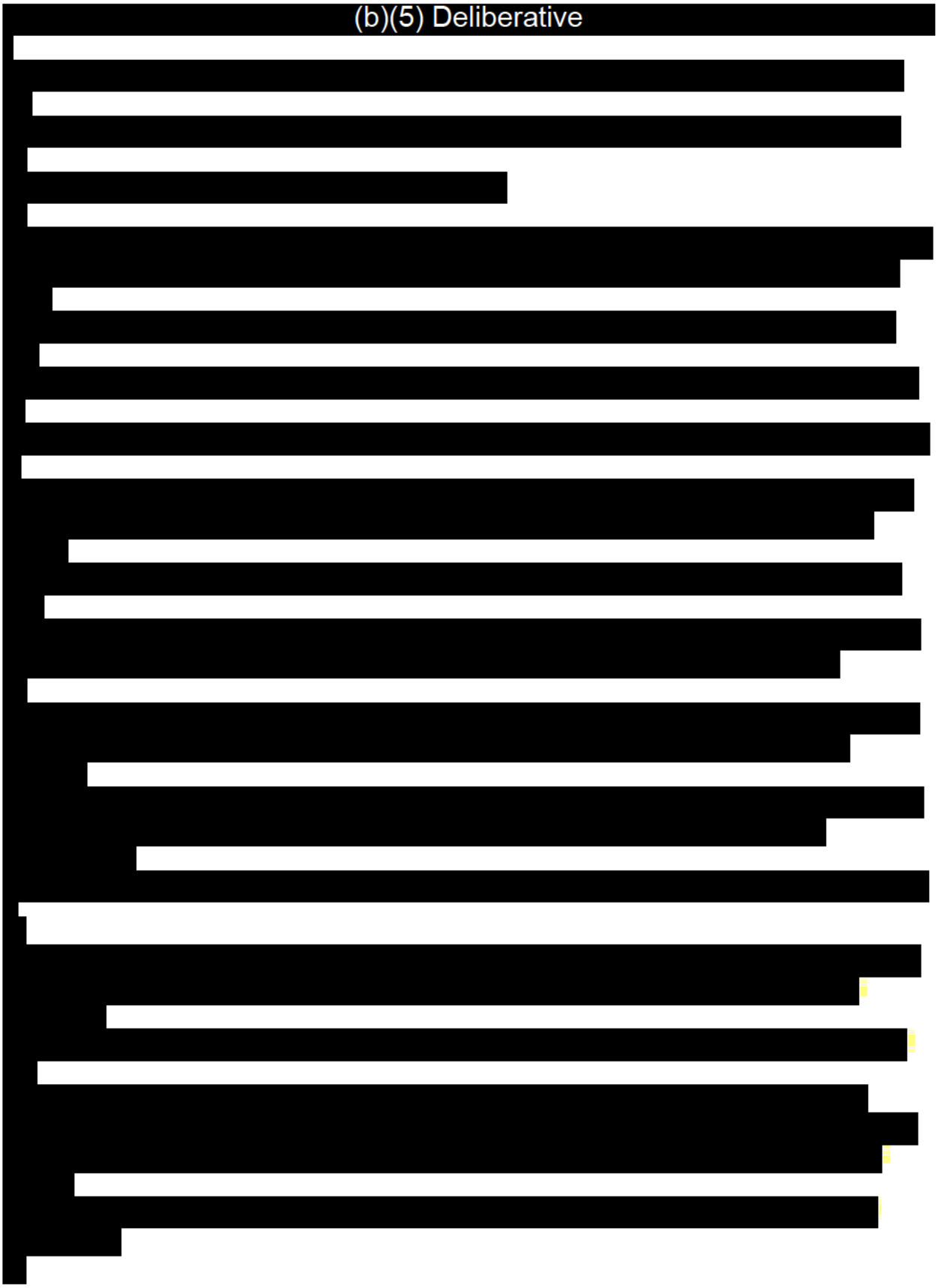
David Chalmers/DC/USEPA/US
11/10/2009 01:54 PM

To Lesley Jantarasami
cc
bcc
Subject economic and societal ramification language

Some language from the findings (p. 43-44) that may be of use. See in particular (b)(5) Deliberative [redacted]

Cheers,
David

(b)(5) Deliberative [redacted]


(b)(5) Deliberative

(b)(5) Deliberative

[redacted]

David Chalmers
ORISE Fellow
U.S. EPA, Climate Change Division
202.343.9814

EPA-1579

Michael Kolian/DC/USEPA/US
11/10/2009 02:01 PM

To Jason Samenow
cc
bcc
Subject Re: important heat vs. cold studies (including a new one we need to consider)

Another little supporting nugget regarding AC:

"Heat wave effects, however, were not strongly associated with AC. It is possible that the protection afforded by AC is sufficient to reduce effects of high temperatures, but not to prevent more extreme heat wave effects."

Jason Samenow | Here is the PDF of Medina Ramon an... | 11/09/2009 01:29:10 PM

From: Jason Samenow/DC/USEPA/US
To: Michael Kolian/DC/USEPA/US@EPA
Cc: Ben DeAngelo/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA
Date: 11/09/2009 01:29 PM
Subject: important heat vs. cold studies (including a new one we need to consider)

Here is the PDF of Medina Ramon and Schwartz article as well as a (b)(5) Deliberative from Andersen and Bell.

(b)(5) Deliberative .

(b)(5) Deliberative

(b)(5) Deliberative from Andersen and Bell:

We investigated lag times from same day to 28 days previous. Earlier heat-mortality studies identified risk from recent exposure (ie, same day and a few days previous).(5-8,11,16) Most studies applied lags of 1 or 2 days, although some used up to 3 days.(30) We found the strongest heat-related mortality association for same- and previous-day exposure. The short lag required to capture the effects of heat on mortality suggests a rapid physical response. Some of the effects observed could be the result of short-term mortality displacement, and further study is warranted.

For cold-related mortality, most US studies applied 2- to 5-day lags, (1,5,6,11) whereas other researchers found cold effects after 1 or more weeks for some communities. (16,31) Findings indicate that longer lags are required to capture cold's impact on mortality and that using identical lag structures for cold and heat effects is not appropriate. A limitation of longer lag structures is the introduction of more measurement error due to increased time between the exposure and event. Heat and cold effects were similar in magnitude for absolute and relative estimates, which contrasts with earlier US studies finding larger heat effects than cold effects. (5,11) We

hypothesize that previous studies underestimated cold-related effects through use of shorter lags. Results agree with a European study finding mortality effects occurring days to weeks after cold exposure.(16) Findings suggest that cold temperatures more indirectly affect mortality than heat. Infectious diseases, which are more common in industrialized countries during colder weather (when people spend more time indoors and in proximity) could account for much of the cold-related effect. Although we found that heat effects were impacted by shorter exposures and cold effects were affected by longer exposures, the specific lag structures used here (Tlag0-25 and Tlag0-1) are intended to be representative, not to reflect the only or the exact lag measurements appropriate for temperature-mortality studies

Jason

----- Forwarded by Jason Samenow/DC/USEPA/US on 11/09/2009 01:17 PM -----

From:	"Dave Mills" <DMills@stratusconsulting.com>
To:	Jason Samenow/DC/USEPA/US@EPA
Date:	11/09/2009 12:33 PM
Subject:	Medina Ramon and Anderson Schwartz

Jason,

The Medina-Ramon article is attached. Also included the recent article from Anderson and Bell that also uses a common method to look at heat-mortality risks in multiple US cities.

Will send a confirming note in a second.

Thanks and hope the meeting goes well.

David M. Mills
Senior Analyst

_____
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[attachment "ID51989.Anderson&Bell.2009.pdf" deleted by Michael Kolian/DC/USEPA/US]
[attachment "ID49691.Medina-Ramon&Schwartz.2007.pdf" deleted by Michael Kolian/DC/USEPA/US]

EPA-1580

Carol Holmes/DC/USEPA/US
11/10/2009 03:12 PM

To Lesley Jantarasami
cc
bcc
Subject Re: Vol 12 significant comments

In meantime you could take a look at [redacted] (b)(5) Deliberative ACP [redacted]

Confidential communication for internal deliberations only; Attorney-client, attorney work product and/or enforcement privilege; Do not distribute outside EPA or DOJ

Carol S. Holmes
Office of General Counsel
U.S. Environmental Protection Agency
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Phone (202) 564-8709
Fax (202) 564-5603

Lesley Jantarasami Yes, that sounds good, I was just tr... 11/10/2009 03:08:51 PM

From: Lesley Jantarasami/DC/USEPA/US
To: Carol Holmes/DC/USEPA/US@EPA
Date: 11/10/2009 03:08 PM
Subject: Re: Vol 12 significant comments

Yes, that sounds good, I was just trying to get a jump-start on Thursday's team meeting discussion because I know the others will want to talk to you about their sections as well. I personally think it would be helpful if you could make it in person to our meeting (easier to walk through summary by summary). Hopefully nothing else will come up between now and then!

Lesley

Carol Holmes Hi Lesley -- short answer is that [redacted] (b)(5) Deliberative 11/10/2009 02:51:29 PM

From: Carol Holmes/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US
Date: 11/10/2009 02:51 PM
Subject: Re: Vol 12 significant comments

Hi Lesley -- short answer is that [redacted] (b)(5) Deliberative [redacted] I think we plan to discuss these at the 10am team mtg Thursday, so maybe we can try to walk through my summaries, agree where they go and who has lead on response then? I may be able to come over if that makes it easier (and I don't have another mtg until 12). Does that make sense? THANKS

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Carol S. Holmes
Office of General Counsel

U.S. Environmental Protection Agency
1200 Pennsylvania Ave, NW (MC 2344A)
Washington, DC 20460
Phone (202) 564-8709
Fax (202) 564-5603

Lesley Jantarasami Hi Carol, Since Ben is enroute to C... 11/10/2009 02:45:46 PM

From: Lesley Jantarasami/DC/USEPA/US
To: Carol Holmes/DC/USEPA/US@EPA
Date: 11/10/2009 02:45 PM
Subject: Vol 12 significant comments

Hi Carol,

Since Ben is enroute to Copenhagen, (b)(5) Deliberative . I just wanted to touch base with you on some of the questions/issues you raised in the email below.

- (b)(5) Deliberative
- I've read your comment summaries that you attached (old section 5) and I agree (b)(5) Deliberative
- (b)(5) Deliberative
- (b)(5) Deliberative

Please let me know if this approach works for you.

Thanks!

Lesley

Lesley Jantarasami
US EPA, Climate Change Division
Climate Science & Impacts Branch
202.343.9929
202.343.2202 (fax)
Jantarasami.Lesley@epa.gov

Carol Holmes Thanks Rona -- I totally agree with the... 11/04/2009 04:19:53 PM

From: Carol Holmes/DC/USEPA/US
To: Rona Birnbaum/DC/USEPA/US@EPA
Cc: Ben DeAngelo/DC/USEPA/US@EPA, Dina Kruger/DC/USEPA/US@EPA, John Hannon/DC/USEPA/US@EPA, Lesley Jantarasami/DC/USEPA/US@EPA, Patricia Embrey/DC/USEPA/US@EPA
Date: 11/04/2009 04:19 PM
Subject: Re: Meeting to ensure that all significant comments are being addressed in the RTC

Thanks Rona -- I totally agree with the approach of [redacted] (b) 5 deliberative [redacted]

[redacted]

Also, I had a couple thoughts on 1 or 2 of your lead office highlights as noted in the attached. [attachment "Lead Authors Volumes 10_11_12 (2) CSH.doc" deleted by Lesley Jantarasami/DC/USEPA/US] One thing I would like to discuss sooner rather than later is what we want to do with issues in Volume 12. See Section 5 of my attached comment summary (new volume 12) to see the types of comments I've been summarizing. [redacted] (b)(5) Deliberative [redacted] Comment summary (section 5 is new volume 12):
[attachment "Carol's sections of legal RTC 10 21 09.doc" deleted by Lesley Jantarasami/DC/USEPA/US]

Also, I really would like to make sure somebody in OAR looks at the comment excerpts from which I summarized old Section 5 also -- [redacted] (b)(5) Deliberative [redacted]. Comments excerpts reviewed for summary (old, old section 7) -- starts page 250:
[attachment "Categories_Carol Holmes-rv.doc" deleted by Lesley Jantarasami/DC/USEPA/US]

THANKS

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Fax (202) 564-5603

Rona Birnbaum Carol, a meeting next week is a good i... 11/04/2009 03:52:29 PM

From: Rona Birnbaum/DC/USEPA/US
To: Carol Holmes/DC/USEPA/US@EPA
Cc: Ben DeAngelo/DC/USEPA/US@EPA, Dina Kruger/DC/USEPA/US@EPA, John Hannon/DC/USEPA/US@EPA, Lesley Jantarasami/DC/USEPA/US@EPA, Patricia Embrey/DC/USEPA/US@EPA
Date: 11/04/2009 03:52 PM
Subject: Re: Meeting to ensure that all significant comments are being addressed in the RTC

Carol, a meeting next week is a good idea. We can probably use our weekly endangerment meeting to focus on just the RTC. [redacted] (b)(5) Deliberative

(b)(5) Deliberative

(b)(5) Deliberative

(b)(5) Deliberative

thanks, Rona

[attachment "Lead Authors Volumes 10_11_12 (2).doc" deleted by Carol Holmes/DC/USEPA/US]

Carol Holmes Hi Gang -- I would like us to set up a m... 11/03/2009 12:43:21 PM

From: Carol Holmes/DC/USEPA/US
To: Rona Birnbaum/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, Lesley Jantarasami/DC/USEPA/US, Dina Kruger/DC/USEPA/US@EPA
Cc: John Hannon/DC/USEPA/US@EPA, Patricia Embrey/DC/USEPA/US
Date: 11/03/2009 12:43 PM
Subject: Meeting to ensure that all significant comments are being addressed in the RTC

Hi Gang -- I would like us to set up a meeting once the preamble goes to OMB (assuming we don't have time before) to make sure that all significant comments have been responded to in the preamble and/or the RTCs (b)(5) Deliberative

Thanks!

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EPA-1581

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Vol 12 ANPR Comments_orig.doc

(b)(5) Deliberative - Vol 12 ANPR Comments_orig.doc

EPA-1582

Jason Samenow/DC/USEPA/US
11/10/2009 07:07 PM

To: Lesley Jantarasami, Ben DeAngelo, David Chalmers, Jeremy Martinich, Marcus Sarofim, Michael Kolian, Rona Birnbaum, William Perkins
cc:
bcc:
Subject: Fw: Major comment sets (b)(5) Deliberative

FYI-- I printed Idso...all 1200+ pages. Let me know if you want/need to borrow it at any point.

Jason

----- Forwarded by Jason Samenow/DC/USEPA/US on 11/10/2009 07:07 PM -----

From: Jason Samenow/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, David Chalmers/DC/USEPA/US@EPA, Jeremy Martinich/DC/USEPA/US@EPA, Marcus Sarofim/DC/USEPA/US@EPA, Michael Kolian/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA, William Perkins/DC/USEPA/US@EPA
Date: 11/10/2009 04:29 PM
Subject: Fw: Major comment sets (b)(5) Deliberative

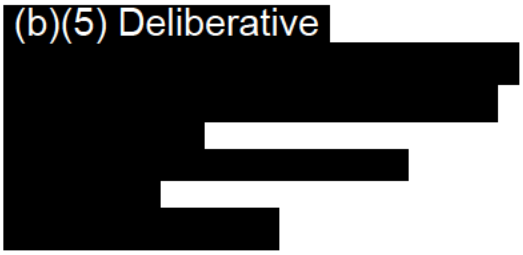
minor note-- (b)(5) Deliberative

----- Forwarded by Jason Samenow/DC/USEPA/US on 11/10/2009 04:28 PM -----

From: Jason Samenow/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, David Chalmers/DC/USEPA/US@EPA, Jeremy Martinich/DC/USEPA/US@EPA, Marcus Sarofim/DC/USEPA/US@EPA, Michael Kolian/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA, William Perkins/DC/USEPA/US@EPA
Date: 11/10/2009 04:02 PM
Subject: Major comment sets (b)(5) Deliberative

Here were my thoughts:

(b)(5) Deliberative


(b)(5) Deliberative

EPA-1583

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Vol 12 ANPR Comments.doc

(b)(5) Deliberative - Vol 12 ANPR Comments.doc

EPA-1584

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\CAA Is Not the Appropriate Framework to Regulate GHG.doc

(b)(5) Deliberative [redacted] - CAA Is Not the Appropriate Framework to Regulate GHG.doc

EPA-1585

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\7_1_General Comments on Impacts of the Findings.doc

(b)(5) Deliberative [redacted] - 7_1_General Comments on Impacts of the Findings.doc

EPA-1586

Lesley Jantarasami
04/01/2010 03:42 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\01_Full Doc\02_Rona Review\RTC draft Volume 1 General TSD Approach 110609.RB comments.doc

(b)(5) Deliberative - RTC draft Volume 1 General TSD Approach 110609.RB comments.doc

EPA-1587

Carol Holmes/DC/USEPA/US
11/12/2009 09:34 AM

To Lesley Jantarasami
cc
bcc
Subject 10 am mtg

Hi Lesley -- obviously I won't be coming to 1310 L street b/c I am working from home (fewer distractions overall). But hopefully we can still walk through comments together. Here is the latest set of my summaries -- the ones highlighted in blue are in the preamble in some version already. It hasn't changed much in recent weeks other than adding blue highlights. There are a few additional comments folks are working on separately, but let's focus on these first.

I suggest that while we'll want to make sure we flesh the responses in the preamble as necessary in the RTC, we start focusing on the comment summaries without any response now. At the mtg we can discuss how to get these into the master RTCs (to the extent they aren't already) and then work from those. THANKS

(b)(5) Deliberative ACP AWP

Carol's sections of legal RTC 11 12 09.doc

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EPA-1588

Lesley Jantarasami/DC/USEPA/US
11/12/2009 09:43 AM

To William Perkins, Michael Kolian, Jeremy Martinich, David Chalmers, Marcus Sarofim, Rona Birnbaum, Jason Samenow
cc
bcc
Subject Fw: 10 am mtg

Hi everyone,

See below from Carol regarding the meeting today. We'll probably walk through her attachment together, so it would be helpful to bring a copy to the meeting.

Also, Rona will be late, so Jason and I are facilitating.

Thanks!

Lesley

----- Forwarded by Lesley Jantarasami/DC/USEPA/US on 11/12/2009 09:39 AM -----

From: Carol Holmes/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US
Date: 11/12/2009 09:34 AM
Subject: 10 am mtg

Hi Lesley -- obviously I won't be coming to 1310 L street b/c I am working from home (fewer distractions overall). But hopefully we can still walk through comments together. Here is the latest set of my summaries -- the ones highlighted in blue are in the preamble in some version already. It hasn't changed much in recent weeks other than adding blue highlights. There are a few additional comments folks are working on separately, but let's focus on these first.

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(b)(5) Delibera ive ACP AWP

Carol's sections of legal RTC 11 12 09.doc

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EPA-1589

Lesley Jantarasami/DC/USEPA/US
11/12/2009 09:57 AM

To Carol Holmes
cc
bcc
Subject Re: 10 am mtg

The only one that has changed much since you saw them last is Volume 11, but here are all three in case you need them.

(b)(5) Deliberative
RTC draft Volume 10 Endangerment 110609.doc

(b)(5) Deliberative
RTC draft Volume 11 Cause or Contribute 110609.doc

(b)(5) Deliberative
RTC draft Volume 12 Implications 110609.doc

Carol Holmes PS -- I can't access quickr from home.,... 11/12/2009 09:46:04 AM

From: Carol Holmes/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US
Date: 11/12/2009 09:46 AM
Subject: Re: 10 am mtg

PS -- I can't access quickr from home., so if there is a version of any of volumes 10-12 you want me to look at as we talk please email them.

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Lesley Jantarasami Hi Carol, That sounds good - will yo... 11/12/2009 09:44:37 AM

From: Lesley Jantarasami/DC/USEPA/US
To: Carol Holmes/DC/USEPA/US@EPA
Date: 11/12/2009 09:44 AM
Subject: Re: 10 am mtg

Hi Carol,

That sounds good - will you and John be calling in to the conference line, or should we give you a call at home?

Lesley

Carol Holmes Hi Lesley -- obviously I won't be coming... 11/12/2009 09:34:58 AM

From:	Carol Holmes/DC/USEPA/US
To:	Lesley Jantarasami/DC/USEPA/US
Date:	11/12/2009 09:34 AM
Subject:	10 am mtg

Hi Lesley -- obviously I won't be coming to 1310 L street b/c I am working from home (fewer distractions overall). But hopefully we can still walk through comments together. Here is the latest set of my summaries -- the ones highlighted in blue are in the preamble in some version already. It hasn't changed much in recent weeks other than adding blue highlights. There are a few additional comments folks are working on separately, but let's focus on these first.

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[attachment "Carol's sections of legal RTC 11 12 09.doc" deleted by Lesley Jantarasami/DC/USEPA/US]

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Fax (202) 564-5603

EPA-1590

Lesley Jantarasami/DC/USEPA/US
11/12/2009 10:00 AM

To Carol Holmes
cc
bcc
Subject Re: 10 am mtg

Also, [redacted] (b)(5) Deliberative

(b)(5) Deliberative [redacted]
Prelim Comment Summaries_Vol12.doc

Carol Holmes PS -- I can't access quickr from home.,... 11/12/2009 09:46:04 AM

From: Carol Holmes/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US
Date: 11/12/2009 09:46 AM
Subject: Re: 10 am mtg

PS -- I can't access quickr from home., so if there is a version of any of volumes 10-12 you want me to look at as we talk please email them.

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Washington, DC 20460
Phone (202) 564-8709
Fax (202) 564-5603

Lesley Jantarasami Hi Carol, That sounds good - will yo... 11/12/2009 09:44:37 AM

From: Lesley Jantarasami/DC/USEPA/US
To: Carol Holmes/DC/USEPA/US@EPA
Date: 11/12/2009 09:44 AM
Subject: Re: 10 am mtg

Hi Carol,

That sounds good - will you and John be calling in to the conference line, or should we give you a call at home?

Lesley

Carol Holmes Hi Lesley -- obviously I won't be coming... 11/12/2009 09:34:58 AM

From: Carol Holmes/DC/USEPA/US

To: Lesley Jantarasami/DC/USEPA/US
Date: 11/12/2009 09:34 AM
Subject: 10 am mtg

Hi Lesley -- obviously I won't be coming to 1310 L street b/c I am working from home (fewer distractions overall). But hopefully we can still walk through comments together. Here is the latest set of my summaries -- the ones highlighted in blue are in the preamble in some version already. It hasn't changed much in recent weeks other than adding blue highlights. There are a few additional comments folks are working on separately, but let's focus on these first.

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[attachment "Carol's sections of legal RTC 11 12 09.doc" deleted by Lesley Jantarasami/DC/USEPA/US]

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Washington, DC 20460
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Fax (202) 564-5603

EPA-1591

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Prelim Comment Summaries_Vol12.doc

(b)(5) Deliberative [redacted] - Prelim Comment Summaries_Vol12.doc

EPA-1592

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Supportive Comments.doc

(b)(5) Deliberative [redacted] - Supportive Comments.doc

EPA-1593

Jeremy Martinich
04/01/2010 01:30 PM

To
cc
bcc
Subject UPLOAD G:\CCD\CSIB\Martinich\Endangerment\Endangerment\Comment Sections\Final versions\Volumes\Old versions\RTC draft Volume 7- Water, Coastal, Eco 11-06-09.doc

(b)(5) Deliberative [redacted] - RTC draft Volume 7- Water, Coastal, Eco 11-06-09.doc

EPA-1594

William Perkins/DC/USEPA/US
11/12/2009 11:06 AM

To Michael Kolian
cc
bcc
Subject Fw: Journal List with DCNs

Bill Perkins
Climate Change Adaptation Analyst
Climate Science and Impacts Branch
Climate Change Division
U.S. Environmental Protection Agency
perkins.william@epa.gov
(O) 202.343.9460
(F) 202.343.2202
(C) (b)(6)

----- Forwarded by William Perkins/DC/USEPA/US on 11/12/2009 11:06 AM -----

From: "Mae Thomas" <Mae.Thomas@erg.com>
To: William Perkins/DC/USEPA/US@EPA
Cc: "Mae Thomas" <Mae.Thomas@erg.com>
Date: 10/16/2009 09:04 PM
Subject: Journal List with DCNs

Bill, attached is the list of all the reference numbers and each DCN that cited the reference.

Thanks
Mae

(b)(5) Del berative

All Journals with DCNs.xls

EPA-1595

Jeremy Martinich
04/01/2010 01:30 PM

To
cc
bcc
Subject UPLOAD G:\CCD\CSIB\Martinich\Endangerment\Endangerment\Comment Sections\Final versions\Volumes\Old versions\RTC draft Volume 7 Water, Coastal, Eco 11-12-09.doc

(b)(5) Deliberative [redacted] - RTC draft Volume 7 Water, Coastal, Eco 11-12-09.doc

EPA-1596

Lesley Jantarasami/DC/USEPA/US
11/12/2009 02:02 PM

To Marcus Sarofim
cc
bcc
Subject Re: no need to send to Rona by 2pm

Yeah, I was thinking the same thing, that at least today's effort will not go to waste!

Marcus Sarofim Aw, shucks, and I was just about done... 11/12/2009 01:54:49 PM

From: Marcus Sarofim/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US@EPA
Date: 11/12/2009 01:54 PM
Subject: Re: no need to send to Rona by 2pm

Aw, shucks, and I was just about done with the merging and reorganzing and cross-walking against the Finding.

The deadline was good incentive to be productive, though - I can spend the next 24 hours polishing and making it better.

-Marcus

Marcus C. Sarofim, PhD
phone: 202-343-9993
fax: 202-343-2202
1310 L Street 256C
AAAS Science & Technology Policy Fellow
with the EPA Climate Division

Lesley Jantarasami Hi guys, Rona decided (b)(5) Deliberative 11/12/2009 01:52:07 PM

From: Lesley Jantarasami/DC/USEPA/US
To: Marcus Sarofim/DC/USEPA/US@EPA, Jason Samenow/DC/USEPA/US@EPA
Date: 11/12/2009 01:52 PM
Subject: no need to send to Rona by 2pm

Hi guys,

Rona decided [redacted] (b) 5 deliberative [redacted] I think Rona/Dina will want to see something by COB tomorrow, though.

Lesley

EPA-1597

Jeremy Martinich/DC/USEPA/US
11/12/2009 02:07 PM

To David Chalmers
cc
bcc
Subject V1 deletion?

Rona suggested that we [redacted] (b)(5) Deliberative . I'm ok with it, are you?

Comment:

[redacted] (b)(5) Deliberative

Response:

[redacted] (b)(5) Deliberative

(b)(5) Deliberative

(b)(5) Deliberative

[redacted]

****

Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

EPA-1598

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\04_Schedule\Old\Review Table_Endangerment 110609.xls

(b)(5) Deliberative [redacted] - Review Table_Endangerment 110609.xls

EPA-1599

Lesley Jantarasami/DC/USEPA/US
11/12/2009 02:34 PM

To William Perkins, Jason Samenow, Jeremy Martinich, Marcus Sarofim, David Chalmers, Michael Kolian, Ben DeAngelo, Rona Birnbaum, Carol Holmes, John Hannon
cc
bcc
Subject updated RTC outline

Hello everyone,

Based on the meeting today, I updated the outline for the 12 volumes of the RTC and incorporated the colors from the other outline denoting lead authors for vols 10-12. Green is OAR lead and blue is OGC lead. Please let me know if there are any corrections.

(b)(5) Deliberative

RTC Outline 111209.doc

Thanks,

Lesley

EPA-1600

Lesley Jantarasami
04/01/2010 03:43 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\01_Full Doc\05_Outline\Lead Authors designation.doc

(b)(5) Deliberative - Lead Authors designation.doc

EPA-1601

Jeremy Martinich/DC/USEPA/US
11/12/2009 02:47 PM

To David Chalmers
cc
bcc
Subject Re: V1 deletion?

Ok, I'll have Stephanie look at it.

****
Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

David Chalmers One other thing on that section: (b)(5) Deliberative 11/12/2009 02:31:24 PM

From: David Chalmers/DC/USEPA/US
To: Jeremy Martinich/DC/USEPA/US@EPA
Date: 11/12/2009 02:31 PM
Subject: Re: V1 deletion?

One other thing on that section: (b)(5) Deliberative

David Chalmers
ORISE Fellow
U.S. EPA, Climate Change Division
202.343.9814

David Chalmers Yes, (b)(5) Deliberative Davi... 11/12/2009 02:28:10 PM

From: David Chalmers/DC/USEPA/US
To: Jeremy Martinich/DC/USEPA/US@EPA
Date: 11/12/2009 02:28 PM
Subject: Re: V1 deletion?

Yes, (b)(5) Deliberative

David Chalmers
ORISE Fellow
U.S. EPA, Climate Change Division
202.343.9814

Jeremy Martinich Rona suggested that we (b)(5) Deliberative 11/12/2009 02:07:00 PM

From: Jeremy Martinich/DC/USEPA/US
To: David Chalmers/DC/USEPA/US@EPA
Date: 11/12/2009 02:07 PM
Subject: V1 deletion?

Rona suggested that we (b)(5) Deliberative I'm ok with it, are you?

Comment:

(b)(5) Deliberative

Response:

(b)(5) Deliberative

(b)(5) Deliberative

(b)(5) Deliberative

[redacted]

****

Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

EPA-1602

Carol Holmes/DC/USEPA/US
11/12/2009 02:48 PM

To William Perkins
cc John Hannon, Lesley Jantarasami
bcc
Subject Re: Fw: Incoming: Additional comments via category-specific emails

Hi Bill -- [redacted] (b)(5) Deliberative ACP [redacted]

Also, [redacted] (b)(5) Deliberative ACP [redacted]

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William Perkins Carol and John, Forgot to CC you on th... 11/12/2009 02:39:32 PM

From: William Perkins/DC/USEPA/US
To: Carol Holmes/DC/USEPA/US@EPA, John Hannon/DC/USEPA/US@EPA
Cc: Lesley Jantarasami/DC/USEPA/US@EPA
Date: 11/12/2009 02:39 PM
Subject: Fw: Incoming: Additional comments via category-specific emails

Carol and John,

Forgot to CC you on this, as you have a couple of new comment excerpts that I will be sending shortly for your sections.

Cheers,

Bill

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(O) 202.343.9460
(F) 202.343.2202
(C) [redacted] (b)(6)

----- Forwarded by William Perkins/DC/USEPA/US on 11/12/2009 02:38 PM -----

From: William Perkins/DC/USEPA/US

To:	Jason Samenow/DC/USEPA/US@EPA, Ben DeAngelo/DC/USEPA/US@EPA, Lesley Jantarasami/DC/USEPA/US@EPA, Michael Kolian/DC/USEPA/US@EPA, David Chalmers/DC/USEPA/US@EPA, Jeremy Martinich/DC/USEPA/US@EPA, Marcus Sarofim/DC/USEPA/US@EPA
Cc:	Rona Birnbaum/DC/USEPA/US@EPA
Date:	11/12/2009 02:35 PM
Subject:	Incoming: Additional comments via category-specific emails

Endangerment team,

As discussed this morning, there are some new comments (which may or may not say anything new, it did not look like anything groundbreaking was in these from the ones I looked at) that need to be wrapped in.

I am going to email them in Word documents, by category, TO the original category author and CCed to the volume lead. If I send you something that you are not the correct person for, please let me know so that we can fix it. If you have any questions, please let me know. Thank you.

Cheers,

Bill

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EPA-1603

Jeremy Martinich/DC/USEPA/US
11/12/2009 02:49 PM

To David Chalmers
cc
bcc
Subject Re: adaptation comment

[redacted] (b)(5) Deliberative

****
Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

David Chalmers I'll check with the original comment aft... 11/12/2009 02:47:34 PM

From: David Chalmers/DC/USEPA/US
To: Jeremy Martinich/DC/USEPA/US@EPA
Date: 11/12/2009 02:47 PM
Subject: Re: adaptation comment

I'll check with the original comment after this call, but it should be. I'm pretty sure (b)(5) Del berative [redacted]

David Chalmers
ORISE Fellow
U.S. EPA, Climate Change Division
202.343.9814

Jeremy Martinich Ok. (b)(5) Deliberative 11/12/2009 02:42:54 PM

From: Jeremy Martinich/DC/USEPA/US
To: David Chalmers/DC/USEPA/US@EPA
Date: 11/12/2009 02:42 PM
Subject: Re: adaptation comment

Ok. [redacted] (b)(5) Deliberative
Is that the right page #?

****
Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

David Chalmers Yeah, I think (b)(5) Deliberative 11/12/2009 02:25:19 PM

From: David Chalmers/DC/USEPA/US
To: Jeremy Martinich/DC/USEPA/US@EPA
Date: 11/12/2009 02:25 PM
Subject: Re: adaptation comment

Yeah, I think (b)(5) Deliberative

David Chalmers
ORISE Fellow
U.S. EPA, Climate Change Division
202.343.9814

Jeremy Martinich Hey dude, Rona re-reviewed V1 and... 11/12/2009 01:59:51 PM

From: Jeremy Martinich/DC/USEPA/US
To: David Chalmers/DC/USEPA/US@EPA
Date: 11/12/2009 01:59 PM
Subject: adaptation comment

Hey dude, Rona re-reviewed V1 and had this comment in the adaptation section. (b)(5) Deliberative Let me know what your thoughts are.

Comment:

(b)(5) Deliberative

Response:

(b)(5) Deliberative

****

Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

EPA-1604

Marcus Sarofim
04/01/2010 08:01 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\msarofim\My Documents\WorkFolder\Tsd_Anpr\ResponseToComments\Volumes\RTC draft Volume 11 Cause or Contribute 111209.doc

(b)(5) Deliberative [redacted] - RTC draft Volume 11 Cause or Contribute 111209.doc

EPA-1605

Lesley Jantarasami
04/01/2010 03:43 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\01_Full Doc\05_Outline\RTC Outline 111209.doc

(b)(5) Delibera ive - RTC Outline 111209.doc

EPA-1606

Jeremy Martinich/DC/USEPA/US
11/12/2009 04:15 PM

To Lesley Jantarasami
cc
bcc
Subject Re: 10 am mtg

(b)(5) Deliberative

Text for V9.doc
****

Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

----- Forwarded by Jeremy Martinich/DC/USEPA/US on 11/12/2009 04:11 PM -----

From: Lesley Jantarasami/DC/USEPA/US
To: William Perkins/DC/USEPA/US@EPA, Michael Kolian/DC/USEPA/US@EPA, Jeremy Martinich/DC/USEPA/US@EPA, David Chalmers/DC/USEPA/US@EPA, Marcus Sarofim/DC/USEPA/US@EPA, Rona Birnbaum/DC/USEPA/US@EPA, Jason Samenow/DC/USEPA/US@EPA
Date: 11/12/2009 09:43 AM
Subject: Fw: 10 am mtg

Hi everyone,

See below from Carol regarding the meeting today. We'll probably walk through her attachment together, so it would be helpful to bring a copy to the meeting.

Also, Rona will be late, so Jason and I are facilitating.

Thanks!

Lesley

----- Forwarded by Lesley Jantarasami/DC/USEPA/US on 11/12/2009 09:39 AM -----

From: Carol Holmes/DC/USEPA/US
To: Lesley Jantarasami/DC/USEPA/US
Date: 11/12/2009 09:34 AM
Subject: 10 am mtg

Hi Lesley -- obviously I won't be coming to 1310 L street b/c I am working from home (fewer distractions overall). But hopefully we can still walk through comments together. Here is the latest set of my summaries -- the ones highlighted in blue are in the preamble in some version already. It hasn't changed much in recent weeks other than adding blue highlights. There are a few additional comments folks are working on separately, but let's focus on these first.

I suggest that while we'll want to make sure we flesh the responses in the preamble as necessary in the RTC, we start focusing on the comment summaries without any response now. At the mtg we can discuss how to get these into the master RTCs (to the extent they aren't already) and then work from those. THANKS
[attachment "Carol's sections of legal RTC 11 12 09.doc" deleted by Jeremy Martinich/DC/USEPA/US]

Confidential communication for internal deliberations only; Attorney-client, attorney work product and/or enforcement privilege; Do not distribute outside EPA or DOJ

Carol S. Holmes
Office of General Counsel
U.S. Environmental Protection Agency
1200 Pennsylvania Ave, NW (MC 2344A)
Washington, DC 20460
Phone (202) 564-8709
Fax (202) 564-5603

EPA-1607

William Perkins/DC/USEPA/US
11/12/2009 04:35 PM

To Michael Kolian
cc
bcc
Subject New 9.7.9

(b)(5) Deliberative

9_7_9_Air Quality Effects.doc

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EPA-1608

William Perkins/DC/USEPA/US
11/12/2009 04:35 PM

To David Chalmers
cc Jeremy Martinich
bcc
Subject New 10.1 EJ

(b)(5) Deliberative

10_1_Environmental Justice Considerations.doc

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EPA-1609

William Perkins/DC/USEPA/US
11/12/2009 04:36 PM

To Jason Samenow
cc Jeremy Martinich
bcc
Subject New 4.3 level of certainty

(b)(5) Deliberative

4_3_Level of Proof or Uncertainty.doc

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EPA-1610

William Perkins/DC/USEPA/US
11/12/2009 04:38 PM

To Marcus Sarofim
cc David Chalmers
bcc
Subject New comments on pollutants 5.2.2.6, 5.2.2, 5.2.3.1, 5.2.3.3

(b)(5) Deliberative 5_2_3_3_Other Substances.doc

(b)(5) Deliberative 5_2_2_6_Sulfur Hexafluoride.doc

(b)(5) Deliberative 5_2_2_Contribution of Proposed Pollutants.doc

(b)(5) Deliberative 5_2_3_1_Black Carbon.doc

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EPA-1611

William Perkins/DC/USEPA/US
11/12/2009 04:38 PM

To Marcus Sarofim
cc Lesley Jantarasami
bcc
Subject New comments 6.1 general c+c

(b)(5) Deliberative

6_1_General Comments on the Cause or Contribute Finding.doc

Bill Perkins
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(C) (b)(6)

EPA-1612

William Perkins/DC/USEPA/US
11/12/2009 04:39 PM

To Lesley Jantarasami
cc
bcc
Subject New comments 7.1 general comments on implications

(b)(5) Deliberative

7_1_General Comments on Impacts of the Findings.doc

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(C) (b)(6)

EPA-1613

William Perkins/DC/USEPA/US
11/12/2009 04:39 PM

To David Chalmers
cc Lesley Jantarasami
bcc
Subject New comments 8 other options for regulation of GHGs

(b)(5) Deliberative

8_Other Options for Regulating GG.doc

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EPA-1614

William Perkins/DC/USEPA/US
11/12/2009 04:40 PM

To Jeremy Martinich
cc
bcc
Subject New comments 9.2.1, 9.3 non-EPA assessments + DQA

(b)(5) Deliberative

9_3_Adherence to the Data Quality Act.doc

(b)(5) Deliberative

9_2_1_Use of non-EPA assessments.doc

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(C) (b)(6)

EPA-1615

William Perkins/DC/USEPA/US
11/12/2009 04:40 PM

To Marcus Sarofim
cc Jason Samenow
bcc
Subject New comments 9.5.1 GHG emissions/concentrations

(b)(5) Deliberative

9_5_1_Greenhouse gas emissions and concentrations.doc

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(F) 202.343.2202
(C) (b)(6)

EPA-1616

William Perkins/DC/USEPA/US
11/12/2009 04:41 PM

To Jason Samenow
cc
bcc
Subject New comments 9.5.2 obs temp, 9.5.4 obs EWE

(b)(5) Deliberative
9_5_4_Extreme Weather Events.doc

(b)(5) Deliberative
9_5_2_Temperature.doc

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EPA-1617

William Perkins/DC/USEPA/US
11/12/2009 04:44 PM

To Jeremy Martinich
cc Jason Samenow
bcc
Subject New comments 9.5.5 obs SLR

(b)(5) Delibera ive

9_5_5_Sea Level_Oceans.doc

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(C) (b)(6)

EPA-1618

William Perkins/DC/USEPA/US
11/12/2009 04:44 PM

To Jason Samenow
cc
bcc
Subject New comments 9.5.6 obs cryosphere

(b)(5) Deliberative

9_5_6_Cryosphere.doc

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(C) (b)(6)

EPA-1619

William Perkins/DC/USEPA/US
11/12/2009 04:45 PM

To Jeremy Martinich
cc Jason Samenow
bcc
Subject New comments 9.5.7 ecological effects

(b)(5) Deliberative

9_5_7_Ecological Effects.doc

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EPA-1620

William Perkins/DC/USEPA/US
11/12/2009 04:47 PM

To David Chalmers, Marcus Sarofim
cc
bcc
Subject New comments 9.6.x TSD conclusions on anthropogenic, etc. (six categories)

Hey guys,

(b)(5) Deliberative
Here they are. Thanks.

Cheers,

Bill

(b)(5) Deliberative
9_6_2_5_CO2 not the cause of past global warming episodes.doc

(b)(5) Deliberative
9_6_1_Agree_Disagree with TSD Conclusion.doc

(b)(5) Deliberative
9_6_2_1_Other Substances with Radiative Forcing Effects.doc

(b)(5) Deliberative
9_6_2_2_Solar Irradiance.doc

(b)(5) Deliberative
9_6_2_3_Greenhouse Gas Effect Does Not Exist.doc

(b)(5) Deliberative
9_6_2_4_Natural variability is a sufficient explanation.doc

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EPA-1621

William Perkins/DC/USEPA/US
11/12/2009 04:47 PM

To Michael Kolian
cc
bcc
Subject New comments 9.7.10,9.7.11 Ag and Forestry

(b)(5) Deliberative 9_7_11_Forestry.doc

(b)(5) Deliberative 9_7_10_Agricultural Impacts.doc

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(C) (b)(6)

EPA-1622

William Perkins/DC/USEPA/US
11/12/2009 04:48 PM

To Jeremy Martinich
cc
bcc
Subject New comments 9.7.12,9.7.13 water and coastal

(b)(5) Deliberative 9_7_13_Coastal Areas.doc (b)(5) Deliberative 9_7_12_Water Resources.doc

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(C) (b)(6)

EPA-1623

William Perkins/DC/USEPA/US
11/12/2009 04:49 PM

To Marcus Sarofim
cc David Chalmers
bcc
Subject New comments models

(b)(5) Deliberative

9_7_1_Models.doc

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(C) (b)(6)

EPA-1624

William Perkins/DC/USEPA/US
11/12/2009 04:50 PM

To Michael Kolian
cc David Chalmers
bcc
Subject New comments projected temperature 9.7.3

(b)(5) Deliberative

9_7_3_Temperature.doc

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(C) (b)(6)

EPA-1625

William Perkins/DC/USEPA/US
11/12/2009 04:53 PM

To Lesley Jantarasami
cc
bcc
Subject **Legal additional comments x 2 categories**

Lesley,

(b)(5) Deliberative But here they are as per our discussion!
Thank you.

Cheers,

Bill

(b)(5) Deliberative
4_5_1_Cost-Benefits Considerations.doc

(b)(5) Deliberative
3_1_General Comments on the Legal Basis of the Proposed Findings.doc

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EPA-1626

David Chalmers/DC/USEPA/US
11/12/2009 04:54 PM

To Jeremy Martinich
cc
bcc
Subject Re: Children addition

(b)(5) Deliberative Here's a revised response:

Response:

(b)(5) Deliberative

Jeremy Martinich Comment: (b)(5) Deliberative 11/12/2009 03:31:32 PM

From: Jeremy Martinich/DC/USEPA/US
To: David Chalmers/DC/USEPA/US@EPA
Date: 11/12/2009 03:31 PM
Subject: Children addition

Comment:

(b)(5) Deliberative

Response:

(b)(5) Deliberative

****

Jeremy Martinich
USEPA, Climate Change Division
202-343-9871

EPA-1627

Dina Kruger/DC/USEPA/US
Sent by: Anne Hargrove

11/12/2009 05:18 PM

To Ben DeAngelo, Carol Holmes, Heidi_R._King, Jason Samenow, John Hannon, Rona Birnbaum, Suzanne Kocchi

cc

bcc

Subject Information Update - Subject has changed: Dina, Rona, Ben, Jason, SuzieK, Carol Holmes, John Hannon, Heidi King w/OMB/Interagency Reviewers / Endangerment Briefing / RM 809 / Call: (b)(6) : Code: (b)(6)

EPA-1628

Jeremy Martinich
04/01/2010 01:29 PM

To
cc
bcc
Subject UPLOAD G:\CCD\CSIB\Martinich\Endangerment\Endangerment\Comment Sections\Final versions\Volumes\Old versions\RTC draft Volume 1 General TSD Approach 11-12-09.doc

(b)(5) Deliberative [redacted] - RTC draft Volume 1 General TSD Approach 11-12-09.doc

EPA-1629

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Permitting Costs.doc

(b)(5) Deliberative - Permitting Costs.doc

EPA-1630

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Redist Comments_Vol12.doc

(b)(5) Deliberative [redacted] - Redist Comments_Vol12.doc

EPA-1631

Lesley Jantarasami/DC/USEPA/US
11/12/2009 06:19 PM

To Carol Holmes
cc
bcc
Subject reorganized Vol 9

Hi Carol,

Here is the reorganized volume 9 with your summaries brought in from the doc you sent this morning, as well as (b)(5) Deliberative I have also pasted in a few comment excerpts for your review to ensure that they have been captured somewhere in vol 9 (or you can let me know if they belong somewhere else). I went through parts of the final findings and found comment summaries for (b)(5) Deliberative, but you will want to also go through the final findings and add language as appropriate where I missed it.

This will also be posted on Quickr. Please let me know if you have any questions!

(b)(5) Deliberative
RTC draft Volume 9 Legal 111209.doc

Thanks,

Lesley

EPA-1632

Lesley Jantarasami
04/01/2010 03:44 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\01_Full Doc\Quickr drop 110609\RTC draft Volume 9 Legal 110609.doc

(b)(5) Deliberative - RTC draft Volume 9 Legal 110609.doc

EPA-1633

Lesley Jantarasami
04/01/2010 03:44 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\01_Full Doc\Quickr drop 110609\RTC draft Volume 9 Legal 111209.doc

(b)(5) Deliberative - RTC draft Volume 9 Legal 111209.doc

EPA-1634

Lesley Jantarasami
04/01/2010 03:52 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\ljantara\My Documents\Endangerment\02_Comments and Responses\Volume 12\Carol's sections of legal RTC 11 12 09.doc

(b)(5) Deliberative - Carol's sections of legal RTC 11 12 09.doc

EPA-1635

Rona Birnbaum/DC/USEPA/US
11/12/2009 07:11 PM

To Ben DeAngelo, David Chalmers, Jason Samenow, Jeremy Martinich, Lesley Jantarasami, Marcus Sarofim, Michael Kolian, William Perkins
cc Suzanne Kocchi
bcc
Subject endangerment team meeting

Meeting

Date 11/16/2009
Time 09:30:00 AM to 10:30:00 AM
Chair Rona Birnbaum
Invitees
Required Ben DeAngelo; David Chalmers; Jason Samenow; Jeremy Martinich; Lesley Jantarasami; Marcus Sarofim; Michael Kolian; William Perkins
Optional Suzanne Kocchi
FYI
Location

status, schedule, and other related issues

EPA-1636

Dina Kruger/DC/USEPA/US
11/13/2009 08:13 AM

To suzanne kocchi
cc
bcc
Subject Omb

Spoke to Gina. She said [redacted] (b)(5) Deliberative [redacted] Gina said she told [redacted] (b)(5) Deliberative [redacted]

Let me know if you hear anything from Heidi. I'm going to let Gina know that we [redacted] (b)(5) Deliberative [redacted]

[redacted] (b)(5) Deliberative [redacted]

Sent by EPA Wireless E-Mail Services

EPA-1637

Jason Samenow/DC/USEPA/US
11/13/2009 12:24 PM

To Rona Birnbaum
cc Lesley Jantarasami
bcc
Subject Re: half of Vol 2 reviewed

Rona-- won't be able to get to this until later in the weekend. [redacted] (b)(5) Deliberative

jason

Rona Birnbaum still working on 2nd half 11/13/2009 11:42:06 AM

From: Rona Birnbaum/DC/USEPA/US
To: Jason Samenow/DC/USEPA/US@EPA
Cc: Lesley Jantarasami/DC/USEPA/US@EPA
Date: 11/13/2009 11:42 AM
Subject: half of Vol 2 reviewed

still working on 2nd half

[attachment "RTC draft Volume 2 Validity of Data.RB comments.110609.doc" deleted by Jason Samenow/DC/USEPA/US]

EPA-1638

Jason Samenow/DC/USEPA/US
11/13/2009 12:25 PM

To Marcus Sarofim
cc
bcc
Subject Fw: half of Vol 2 reviewed

marcus-- can you please address rona's edits to your comments and responses in tracked changes, and then send back to me?

thanks,
jason

----- Forwarded by Jason Samenow/DC/USEPA/US on 11/13/2009 12:24 PM -----

From: Rona Birnbaum/DC/USEPA/US
To: Jason Samenow/DC/USEPA/US@EPA
Cc: Lesley Jantarasami/DC/USEPA/US@EPA
Date: 11/13/2009 11:42 AM
Subject: half of Vol 2 reviewed

---

still working on 2nd half

(b)(5) Deliberative [redacted]

RTC draft Volume 2 Validity of Data.RB comments.110609.doc

EPA-1639

Ben DeAngelo
04/06/2010 04:56 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\owner\My Documents\Endangerment\Response to Public Comments\Redist Comments_Vol11.doc

(b)(5) Deliberative - Redist Comments_Vol11.doc

EPA-1640

Ben DeAngelo
04/06/2010 04:56 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\owner\My Documents\Endangerment\Response to Public Comments\Redist Comments_Vol10.doc

(b)(5) Deliberative - Redist Comments_Vol10.doc

EPA-1641

Ben DeAngelo
04/06/2010 04:57 PM

To
cc
bcc
Subject UPLOAD C:\Documents and Settings\owner\My Documents\Endangerment\Response to Public Comments\RTC_draft_Volume_1_110609 + DINA.doc

(b)(5) Deliberative [redacted] - RTC_draft_Volume_1_110609 + DINA.doc

EPA-1642

Lesley Jantarasami
04/01/2010 03:42 PM

To
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