Met Office

Mr James Snowdome

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31 July 2008

Our ref: 15-07-2008-122601-002

Dear Mr Snowdome

Re: **Freedom of Information Request**

Your e-mail dated 10 July 2008 has been considered to be a request for information in accordance with the Freedom of Information Act 2000.

You asked for the following information:

1. How much money was spent on the Global Warming Facts and Myths section of your website?

   The approximate internal and external costs were £1240.00.

2. Could you also please let me know how much research the Met Office did into the Cosmic Ray myth before declaring it a myth? Furthermore I would like to know what measure of solar activity the Met Office is using with respect to their "bunking" of this myth? Is it Total Solar Irradience or Sun Spot number or some other measurement?

The research done to support the statements in the "Climate Myths" pages are based predominantly on expert assessment of the scientific peer reviewed literature. This opinion is reflected in the latest Intergovernmental Panel on Climate Change report (IPCC 2007 - chapter 2). The Met Office Hadley Centre also commissioned an independent report into solar influences of climate which fed into our assessments (Gray 2005).

There is no evidence that recent warming has been significantly contributed to by either solar irradiance changes or by other indirect solar activity changes such as cosmic ray activity. Examining a number of different measures of solar activity, such as solar irradiance, sunspot number, sunspot cycle length, geomagnetic indices or cosmic rays, shows that there have been little underlying change over the last 30-50 years, whilst global temperatures have increased.

In fact a recent study (Lockwood 2007) showed that trends in solar activity over the last 20 years were in the opposite sense to explain the recent changes in surface temperatures.

Research at the Met Office of how solar activity may effect climate change is mainly focused on the better understood influence of changes in solar irradiance or brightness. Our research has suggested a significant influence of the Sun on early 20th century climate change (IPCC 2007 - chapter 9).

References
IPCC "Climate Change 2007: Working Group 1: The Physical Science Basis.
Lockwood, M. and Frohlich, C., 2007, Recent oppositely directed trends in solar climate forcings and the global mean surface air temperature, Proc. Roy. Soc. A.
Gray, L.J., Haigh, J.D., Harrison, R.G., The influence of solar changes on the Earth's climate, Met Office Hadley Centre technical note 62, 2005

3. You also state in the Myths section that the CO2 increase is measurable and its effect is well quantified. Can you please direct me to the papers which calculate the quantity of effect an increase of CO2 has on temperature (I have never seen a paper that actually shows me the "well quantified" effect, only a broad range of effects taken from computer modelling which, as we all know, is open to abuse by the pre-conceived ideas of the modellers)?

The warming effect of CO2 is well quantified as has been demonstrated in experiments over the last 100 or so years. The gas is a so called greenhouse gas, that is it absorbs long wave radiation. References to the earliest studies into this can be found in a variety of accessible sources (IPCC 2007 - chapter 1, Hanson 2006, RealClimate)

References
IPCC "Climate Change 2007: Working Group 1: The Physical Science Basis.
Hanson, R., The rough guide to climate change, 2006 RealClimate,
www.realclimate.org

4. In your Fact 1 pdf you state that temperatures have risen by 0.7 degrees over the last 100 years. Can you please let me know a) how much the background rise has been, on average, since the end of the last ice age and b) which model of the last 100 years you have used. Has this model been peer reviewed and ALL data, methods, and computer code been open to external reviewers on request?

a). As direct scientific observations of climate were obviously not made in pre-history, paleoclimate scientists have to use so called proxies to estimate the climatic history. Proxies such as tree ring data, chemical measurements of ice and ocean floor cores, can give estimates of the local mean climate changes that were happening over thousands of years. It is estimated that during the so called Last Glacial Maximum, or the greatest extent of ice sheets and glaciers during the last ice

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age, (about 21 thousand years ago), that temperatures could have been up to 5C cooler in the tropics, and cooler further in higher latitudes (IPCC 2007- chapter 6).

b). The models used in the figure in "Fact 1" are Met Office Hadley Centre models HadCM3, currently in the web based page (Met Office 2007), and HadGEM1, in the document version (Met Office 2008). Descriptions and methodologies for the models can be found in a number of sources the main ones being Pope et al, 2000 and Gordon et al, 2000 for HadCM3 and Martin et al, 2006 and Johns et al, 2006 for HadGEM1. Thus the model design and physics has been peer-reviewed in the scientific literature. The code is shared with collaborators under license.

The models used in both figures were also used in the IPCC multimodel assessments (IPCC 2007 - chapter 8,9) where there are also descriptions/references of the evaluation of the models. Data produced by the models (and from other institutions models) can be found on the CMIP3 multi model data set archive at PCMDI.

References :

Gordon, C, et al, 2000. The simulation of SST, sea-ice extents and ocean heat transports in a version of the Hadley Centre coupled model without flux adjustments. Clim. Dyn., 16, 147-168.

http://www.metoffice.gov.uk/corporate/pressoffice/myths/
Met Office, 2008,

http://www.metoffice.gov.uk/corporate/pressoffice/myths/bigpicture.pdf
PCMDI - http://www-pcmdi.llnl.gov/ipcc/about_ipcc.php

IPCC "Climate Change 2007: Working Group 1: The physical science basis.
PCMDI - http://www-pcmdi.llnl.gov/ipcc/about_ipcc.php

T.C. Johns, C.F. Durman, H.T. Banks, M.J. Roberts, A.J. McLaren, J.K. Ridley, C.A. Senior, K.D. Williams, A. Jones, G.J. Rickard, S. Cusack, W.J. Ingram, M. Crucifix, D.M.H. Sexon, M.M. Joshi, B-W. Dong, H. Spencer, R.S.R. Hill, J.M. Gregory, A.B. Keen, A.K. Pardaens, J.A. Lowe, A. Bodas-Salcedo, S. Stark, and Y. Searl, 2006. The new Hadley Centre climate model HadGEM1: Evaluation of coupled simulations. Journal of Climate, 19, 1327-1353.

Martin, GM et al, 2006. The physical properties of the atmosphere in the new Hadley Centre Global Environmental Model, HadGEM1. Part I: Model description and global climatology. J. Climate. 19, 1274-1301.

Pope VD, et al, 2000. The impact of new physical parameterizations in the Hadley Centre climate model: HadAM3. Clim. Dyn. 16, 123-146

5. With respect to your Fact 2 you state that it has warmed by 0.1 degree in the past decade. Now that we have accurate satellite measurements I assume that this number has come from these rather than a model which, again, can reflect the pre-conceived ideas of the modellers. Can you please confirm that this

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measurement comes from the accurate satellite measurements and, if not, why not?

The information presented in "Fact 2" is from observations of near surface temperatures, taken from thermometer readings at land based meteorological stations and ocean buoys and ship observations. No climate or meteorological model simulation is used here. Satellite measurements, whilst having the advantage of almost total area coverage, are not necessarily more accurate than surface observations and do not measure the same thing. Satellites have only been taking observations since the late 1970s, whilst surface observations go back over 100 years. Satellites are also indirectly measuring the temperature of the lower atmosphere, and due to changes in satellites, their orbits and in the methods of reconstructing the temperatures, there are some quantifiable and unquantifiable uncertainties on the obtained temperatures (IPCC 2007 - chapter 3). This is reflected in the several different reconstructions of atmospheric temperatures from satellite data made by different institutions (IPCC 2007 - chapter 3).

There are of course uncertainties on surface observations, as demonstrated by the error bars in figure 1 in "Fact 2". More information and references to the observed temperatures can be found on www.hadobs.org.

References

IPCC "Climate Change 2007: Working Group 1: The Physical Science Basis.

6. In Fact 3 you state that CO2 and temperature are linked. Can you please let me know how much a rise in temperature lags behind CO2 increase?

This is also addressed in the IPCC publication “Climate Change 2007: The Physical science Basis” section 6.4

7. In Fact 5 you state that global temperature will rise by 2-3 degrees this century according to one of the IPCC's mid-range models. Regardless of the fact that the IPCC is a heavily politicised organisation with reports written by a core of "scientists" who refuse to disclose methods and data and are well known for their bias towards proving that mankind is the sole factor behind climate change; can you please tell me which model output we are currently tracking according to satellite temperature measurements.

Please refer to the answer in point 4 above.

8. In Fact 6 you state that climate models predict the main features of future climate. Can you please let me know if the data entering these models is available to ALL external reviewers, along with the code and methodology? If not then please let me know why not? Can you also please let me know how well the temperature increase in the atmosphere, as predicted by these models, compares to that observed by satellite measurements?

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Information that is fed into the model is taken from a variety of sources which have been published in peer reviewed scientific journals. Data produced by the models (and from other institutions models) can be found on the CMIP3 multi model data set archive at PCMDI. For other model references please see answer to Question 4b.

Recent studies, which scientists from the Met Office contributed to, have examined the trends in atmosphere temperatures over the last several decades and have concluded that observations from radiosondes (balloon based thermometer readings) and that reconstructed from satellite measurements are generally consistent with climate model simulations (CCSP 2006) but that there are still issues with inconsistencies between different reconstructions of atmospheric temperatures from satellites (Santer 2005, Thorne 2007).

References

Climate Change Science Program report, Temperature Trends in the Lower Atmosphere: Steps for Understanding and Reconciling Differences, 2006

Santer, B.D. et. al., Amplification of Surface Temperature Trends and Variability in the Tropical Atmosphere, Science 2005

Thorne, P.W. et. al., Tropical vertical temperature trends: A real discrepancy? Geophysical Research Letters 2007

I hope that this answers your query.

If you are unhappy with this response or you wish to complain about any aspect of the handling of your request, then you should contact me in the first instance. If informal resolution is not possible and you are still dissatisfied then you may apply for an independent internal review by contacting the Director of Information Exploitation, 6th Floor, MOD Main Building, Whitehall, SW1A 2HB (e-mail info-XD@mod.uk). Please note that any request for an internal review must be made within 40 working days of the date on which the attempt to reach informal resolution has come to an end.

If you are still unhappy following an internal review, you may take your complaint to the Information Commissioner under the provisions of Section 50 of the Freedom of Information Act. Please note that the Information Commissioner will not investigate your case until the MOD internal review process has been completed. Further details

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of the role and powers of the Information Commissioner can be found on the Commissioner's website, http://www.informationcommissioner.gov.uk.

Yours sincerely

Penny

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