Atmos. Chem. Phys. Discuss., 12, C10686–C10687, 2012
www.atmos-chem-phys-discuss.net/12/C10686/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "An empirical model of global climate – Part 1: Reduced impact of volcanoes upon consideration of ocean circulation" *by* T. Canty et al.

A. Robock

robock@envsci.rutgers.edu

Received and published: 18 December 2012

Review of Canty et al.

I think this paper has fundamental errors, and the conclusion is wrong.

1. What the authors call the AMO is actually the climate response. So they are just double counting the response. No wonder they get less of a response to volcanoes. And it is not correct to argue that using only the land record eliminates this problem. Land and ocean temperature time series are highly correlated and are connected by the atmospheric circulation. There may be a long-term oscillation of the Atlantic Ocean, but if the period is 70 years you would need 500-700 years of

observations to prove it from observations. What they did is just to use SST and label it an oscillation. There is no proof that there is a physical mechanism with a 50-70 year period, because the data record is not long enough. Occam's Razor tells me they are simply counting climate change twice, and have the term on both sides of equation (2). This was also addressed by Mann and Emanuel (2006), ftp://texmex.mit.edu/pub/emanuel/PAPERS/EOS_mann_emanuel_2006.pdf

2. Equation (2) is wrong. Lambda needs to be multiplied by (1+ gamma) for the aerosols, too. The sensitivity of the climate system is an expression of how it responds to radiative forcing, no matter what the source. They are assuming no feedbacks in the climate system for aerosols, and this is clearly wrong.

3. Douglass and Knox (2005) got it terribly wrong. This was shown by Wigley et al. (2005b), which is referenced, and by Robock (2005), which is not. There are multiple time scale responses to volcanic eruptions, so a simple linear regression like done in this paper does not do a good job of simulating the climate response.

Robock, Alan, 2005: Comment on "Climate forcing by the volcanic eruption of Mount Pinatubo" by David H. Douglass and Robert S. Knox. Geophys. Res. Lett., 32, L20711, doi:10.1029/2005GL023287.

4. The volcanic lag is wrong. The forcing develops faster than 6 months.

5. The uncertainty in indirect aerosol forcing is huge. How does this affect the results?

Minor issues:

6. the correct spelling is "Krakatau" and not "Krakatoa."

7. the word "data" is plural, but in many (but not all) places in the paper you treat it as singular.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 23829, 2012.