



DRI ENVIRONMENTAL SEMINAR

Monday April 4th, noon – 1 pm

Why Hasn't Earth Warmed as Much as Expected?

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The observed increase in global mean surface temperature (GMST) over the industrial era is less than 40% of that expected from observed increases in long-lived greenhouse gases together with the best-estimate equilibrium climate sensitivity given by the 2007 Assessment Report of the Intergovernmental Panel on Climate Change. Possible reasons for this warming discrepancy are systematically examined. The warming discrepancy is shown to be due mainly to some combination of two factors: the IPCC best estimate of climate sensitivity being too high and/or the greenhouse gas forcing being partially offset by forcing by increased concentrations of atmospheric aerosols; the increase in global heat content due to thermal disequilibrium accounts for less than 25% of the discrepancy, and cooling by natural temperature variation can account for only about 15%. Current uncertainty in climate sensitivity precludes determining the amount of future fossil fuel CO₂ emissions that would be compatible with any chosen maximum allowable increase in GMST; even the sign of such allowable future emissions is unconstrained at present. Resolving this situation requires substantial reduction in the uncertainty of radiative forcing by atmospheric aerosols.

Reference: Why Hasn't Earth Warmed as Much as Expected? Schwartz S. E., Charlson R. J., Kahn R. A., Ogren, J. A., and Rodhe H., J. Climate 23, 2453-2464 (2010); doi: 10.1175/2009JCLI3461.1.