Identifying Human Influences on Atmospheric Temperature

PCMDI Program for Climate Model Diagnosis and Intercomparison

Objective

- Performs the first multi-model fingerprint study with CMIP-5 simulation output and satellite measurements of stratospheric and tropospheric temperature change

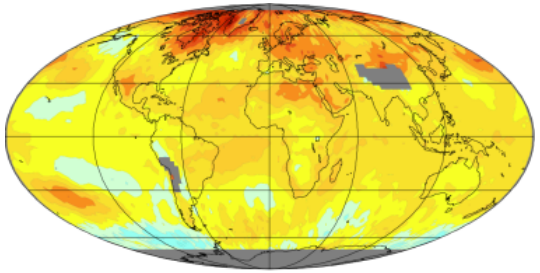
Main scientific points

- Clearest evidence to date of a human influence on atmospheric temperature
- Satellite data and CMIP-5 simulations of historical climate change show similar geographical patterns of tropospheric warming and lower stratospheric cooling
- Sustained, global-scale tropospheric warming and stratospheric cooling cannot be explained by natural internal climate variability

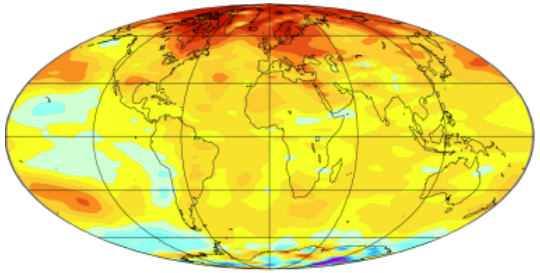
Impact

- Shows that the identification of a human-caused signal in atmospheric temperature is robust to uncertainties in models and data
- Maintains DOE's leadership in fingerprint research

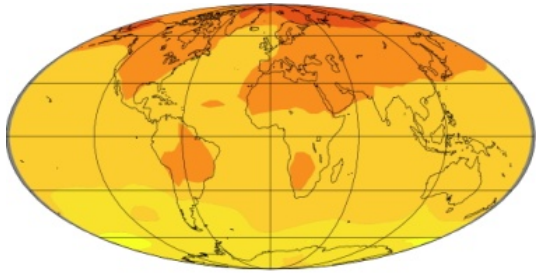
Observations (Remote Sensing Systems)

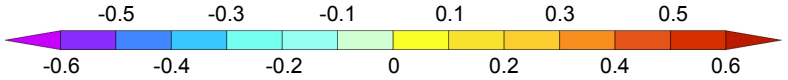


Observations (University of Alabama)



Multi-model average (CMIP-5)





Trend (°C/decade)

Trends in lower tropospheric temperature over January 1979 to December 2011 in satellite observations (top 2 panels) and in CMIP-5 models. For further details, refer to Fig. 4 in Santer *et al.* (2013a)

B.D. Santer, J.F. Painter, C.A. Mears, **C. Doutriaux, P. Caldwell,** J.M. Arblaster, **P.J. Cameron-Smith,** N.P. Gillett, **P.J. Gleckler,** J. Lanzante, J. Perlwitz, S. Solomon, P.A. Stott, **K.E. Taylor,** L. Terray, P.W. Thorne, M.F. Wehner, F.J. Wentz, T.M.L. Wigley, L.J. Wilcox, and C.-Z. Zhou: Identifying human influences on atmospheric temperature. *Proceedings of the U.S. National Academy of Sciences*, **110**, 26-33 (2013a).