

U.S. Climate Change Science Program (CCSP)

Temperature Trends in the Lower Atmosphere – Steps for Understanding and Reconciling Differences.

Karl, T.R., Hassol S.J., Miller, C.D., and Murray, W. L., editors, 2005. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research, Washington, DC. In draft.

Presented by Dr. Thomas R. Karl
NOAA – Director, National Climatic Data Center
Chief Editor, CCSP Synthesis and Assessment Product 1.1



1

Climate Science in Support of Decision Makers
CCSP Workshop Nov 14-16, 2005 Arlington, VA



CCSP 1.1 - Temperature Trends in the Lower Atmosphere *Outline*

- ***Overview of CCSP Product 1.1***
- ***Milestones 2002 – Current***
- ***Report Organization: Key Questions Addressed***
- ***What's new since NRC 2000 & IPCC 2001 Assessments***
- ***Selected Issues***



Temperature Trends in the Lower Atmosphere

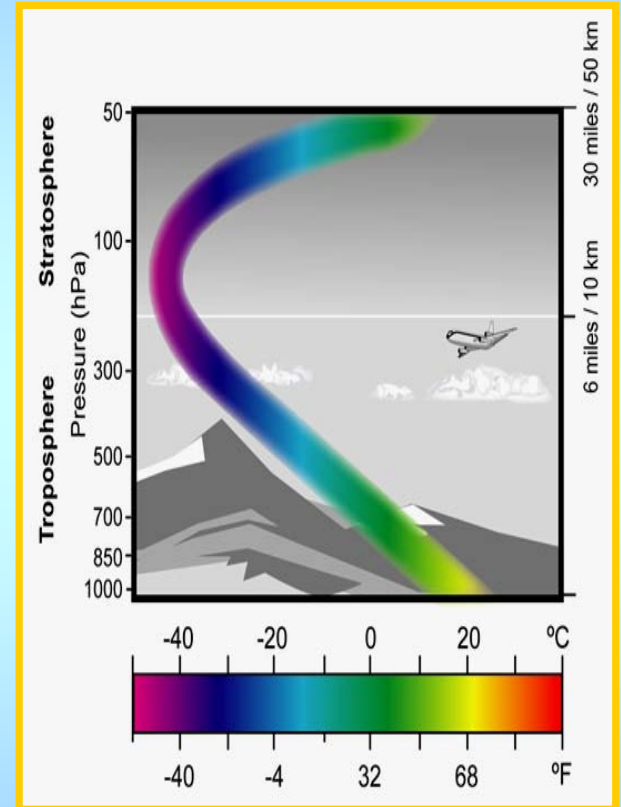
Overview of CCSP Product 1.1

Objective - An understanding of:

- Temperature changes in the atmosphere
- Differences in these changes at various levels in the atmosphere
- The causes of these changes & differences

Available Products & Methods:

- New surface, satellite, radiosonde data
- New model simulations of the 20th century climate
- Comparisons of models & observed data



Layers of the Atmosphere of Primary Interest in CCSP 1.1



Temperature Trends in the Lower Atmosphere

Milestones 2002 – 2004

Milestones

2002/2003

- **CCSP Meeting** **Dec 2002**
 - White paper on Product 1.1 formally discussed by panel of experts
 - Addressed many areas including NRC (2000) & IPCC (2001) reports
 - Apparent disparity between surface & troposphere temperature trends
- **CCSP Strategic Plan developed** **Jul 2003**
- **NOAA Workshop – Asheville, NC** **Oct 2003**
 - Reviewed science for troposphere temperature trends

Milestones

2004

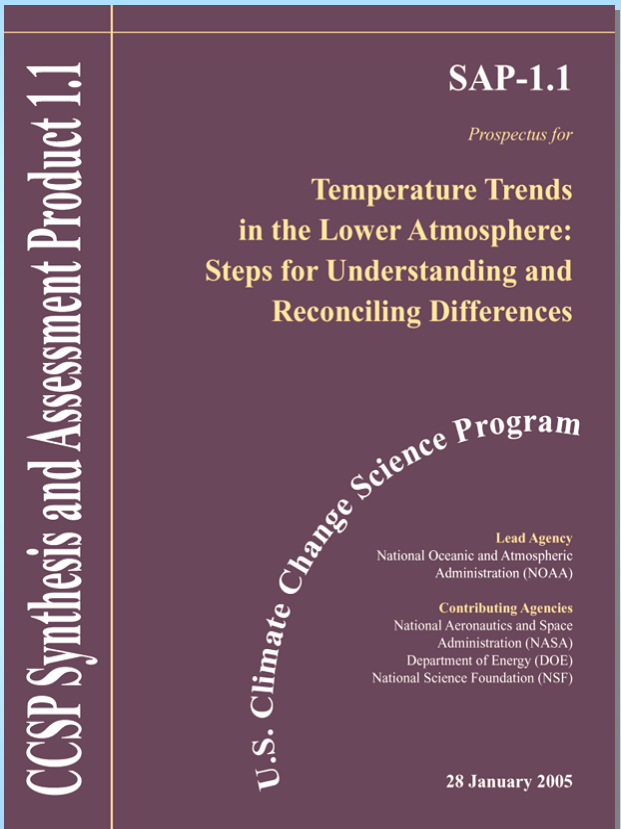
- **Draft Product 1.1 Prospectus posted on CCSP web-page** **Jul**
- **Public comment period on Prospectus closed** **Aug**
- **Convening Lead/Lead Author Meetings (Chicago)** **Aug, Oct, Dec**
- **Exeter, UK meeting** **Sep**
 - Designed to complement US CCSP Synthesis Product Development Effort



Temperature Trends in the Lower Atmosphere

Milestones 2005-2006

- Draft Synthesis Product submitted to NRC for scientific review – **Jan 2005**
- NRC comments received – **Apr 2005**
- 2nd draft released for public comment – **Nov 2005**
- Public comments received – **Dec 2005**
- Third draft submitted to CCSP principals for final review – **Feb 2006**
- Product accepted by CCSP principals and submitted to National Science and Technology Council (NSTC) for approval – **March 2006**
- Synthesis Product approved by NSTC and disseminated – **April 2006**



Temperature Trends in the Lower Atmosphere

Report Organization: Key Questions Addressed

Preface --- Editorial team

Executive Summary

CLA: T. Wigley

LAs: V. Ramaswamy, J. Christy, J. Lanzante, C. Mears, B. Santer,
and C. Folland

Chapter 1 --- *Why do temperatures vary vertically (from the surface to the stratosphere) and what do we understand about why they might vary and change over time?*

CLAs: V. Ramaswamy

LAs: J. Hurrell and J. Meehl

Chapter 2 --- *What kinds of atmospheric temperature variations can the current observing systems measure and what are their strengths and limitations, both spatially and temporally?*

CLA: J. Christy

LAs: D. Seidel, S. Sherwood



Temperature Trends in the Lower Atmosphere

Report Organization: Key Questions Addressed (cont.)

Chapter 3 --- What do observations indicate about the changes of temperature in the atmosphere and at the surface since the advent of measuring temperatures vertically?

CLA: J. Lanzante

LAs: T. Peterson, F. Wentz and K. Vinnikov

Chapter 4 --- What is our understanding of the contribution made by observational or methodological uncertainties to the previously reported vertical differences in temperature trends?

CLA: C. Mears

LAs: C. Forest, R. Spencer, R. Vose, and R. Reynolds

Chapter 5 --- How well can the observed vertical temperature changes be reconciled with our understanding of the causes of these changes?

CLA: B. Santer

LAs: J. Penner, and P. Thorne

Chapter 6 --- What measures can be taken to improve the understanding of observed changes?

CLA: C. Folland

LAs: D. Parker, R. Reynolds, S. Sherwood, and P. Thorne

Statistical Appendix

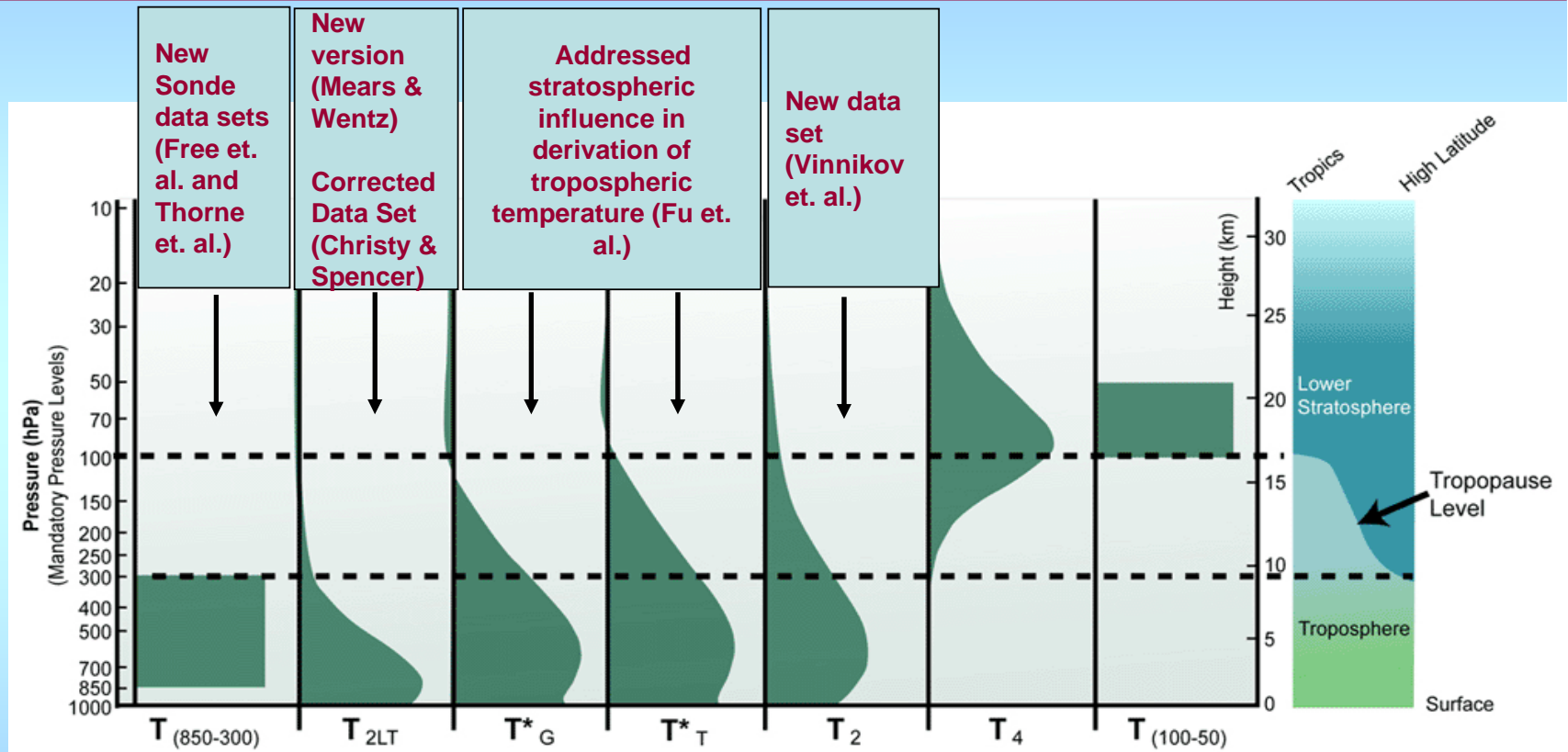
CLA: T. Wigley

Glossary/Acronyms



What's New since IPCC and NRC Assessments

(Data sets and Models)

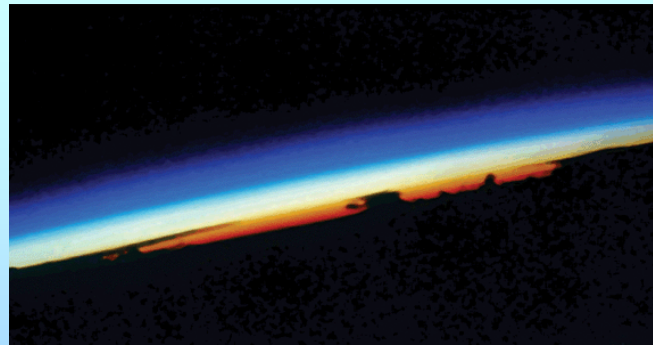


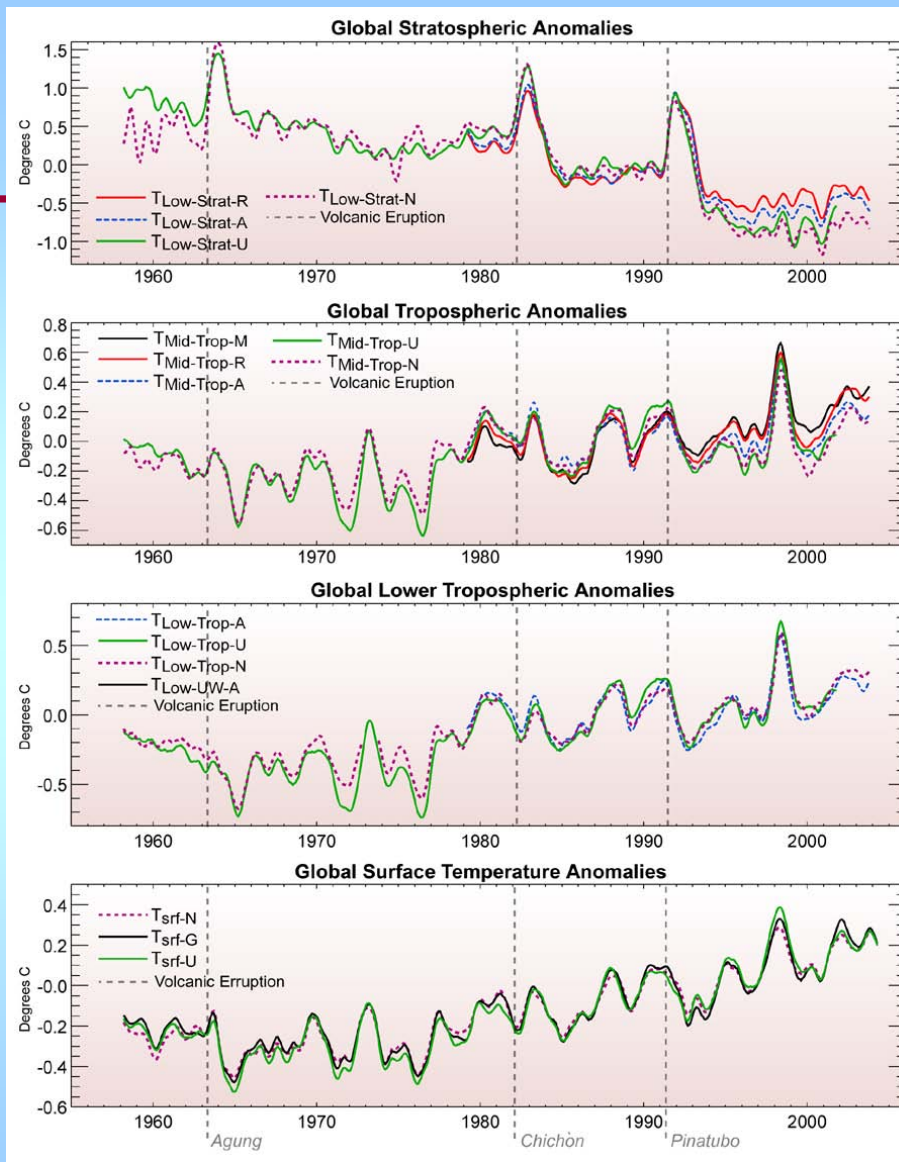
- 20 New model simulations with many ensemble numbers prepared for IPCC (2007)



Temperature Trends in the Lower Atmosphere

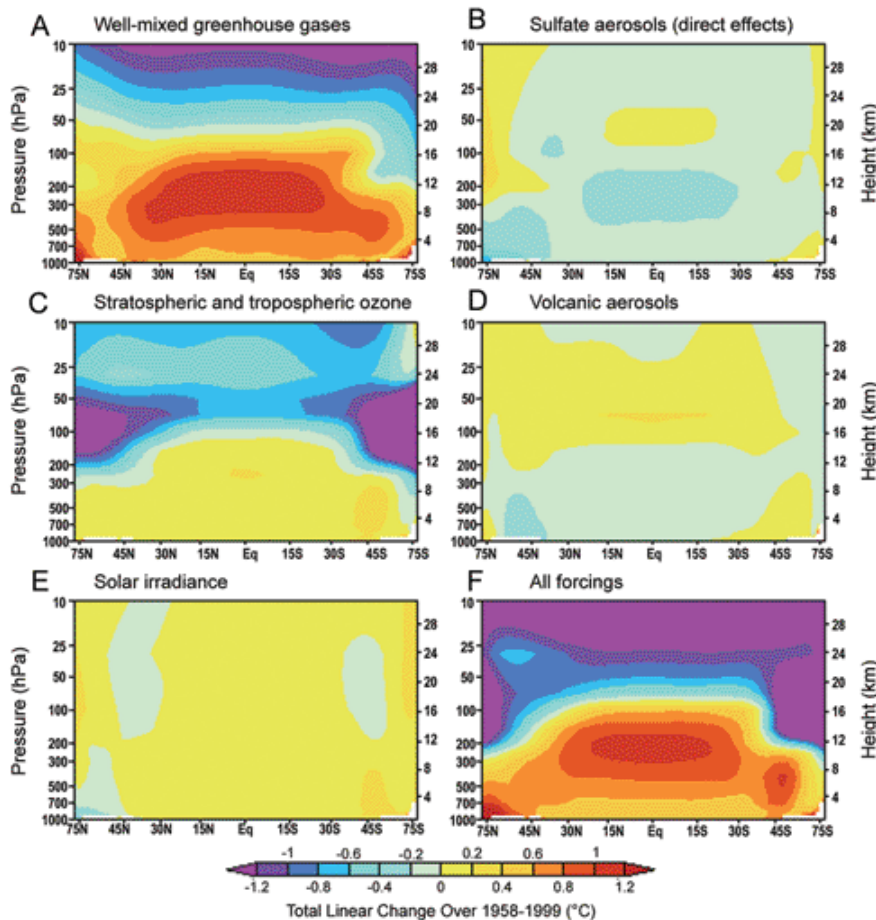
Selected Issues





Paralleled Climate Model Simulations of Zonal-Mean Atmospheric Temperature Change

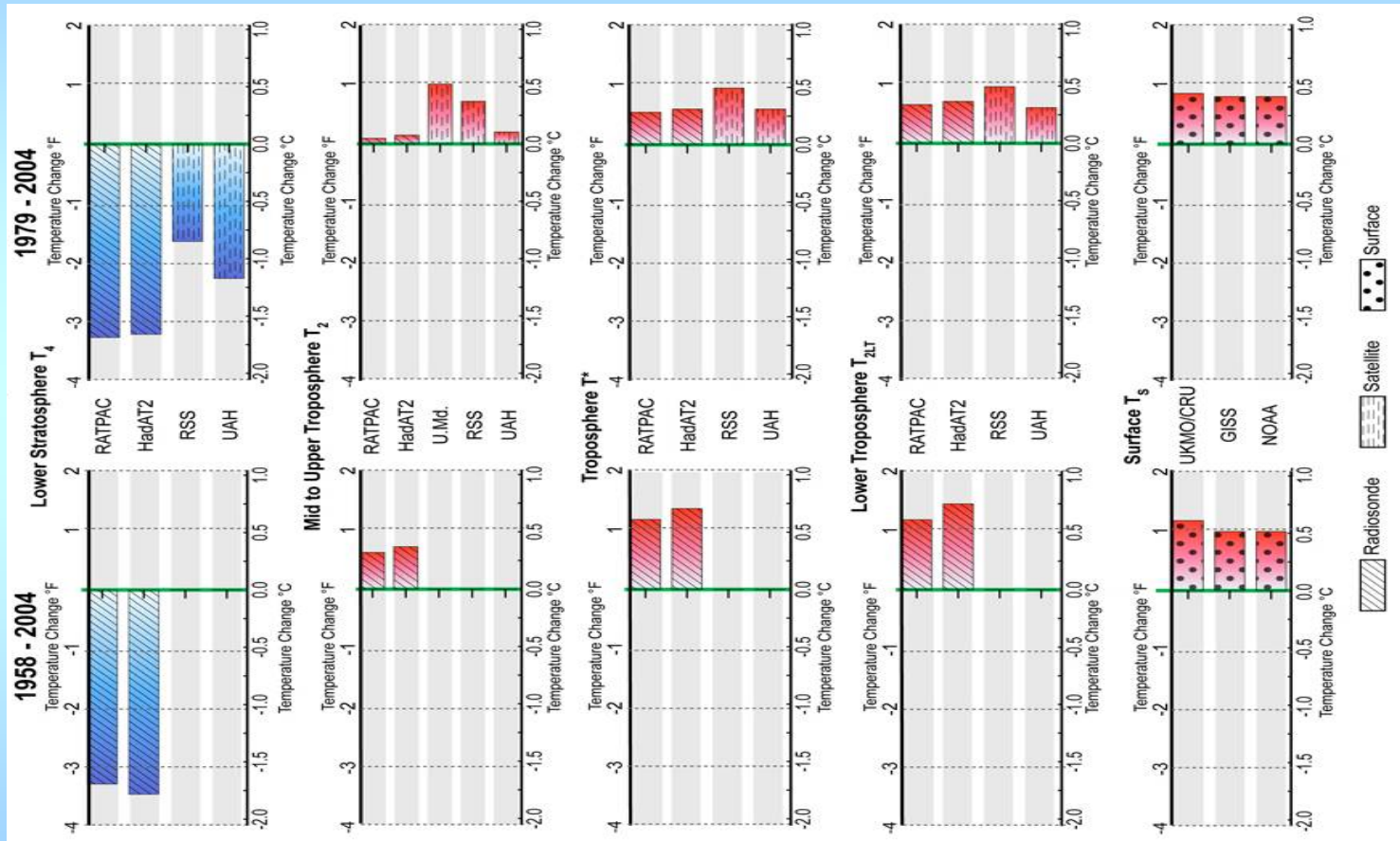
Total linear change computed over January 1958 to December 1999



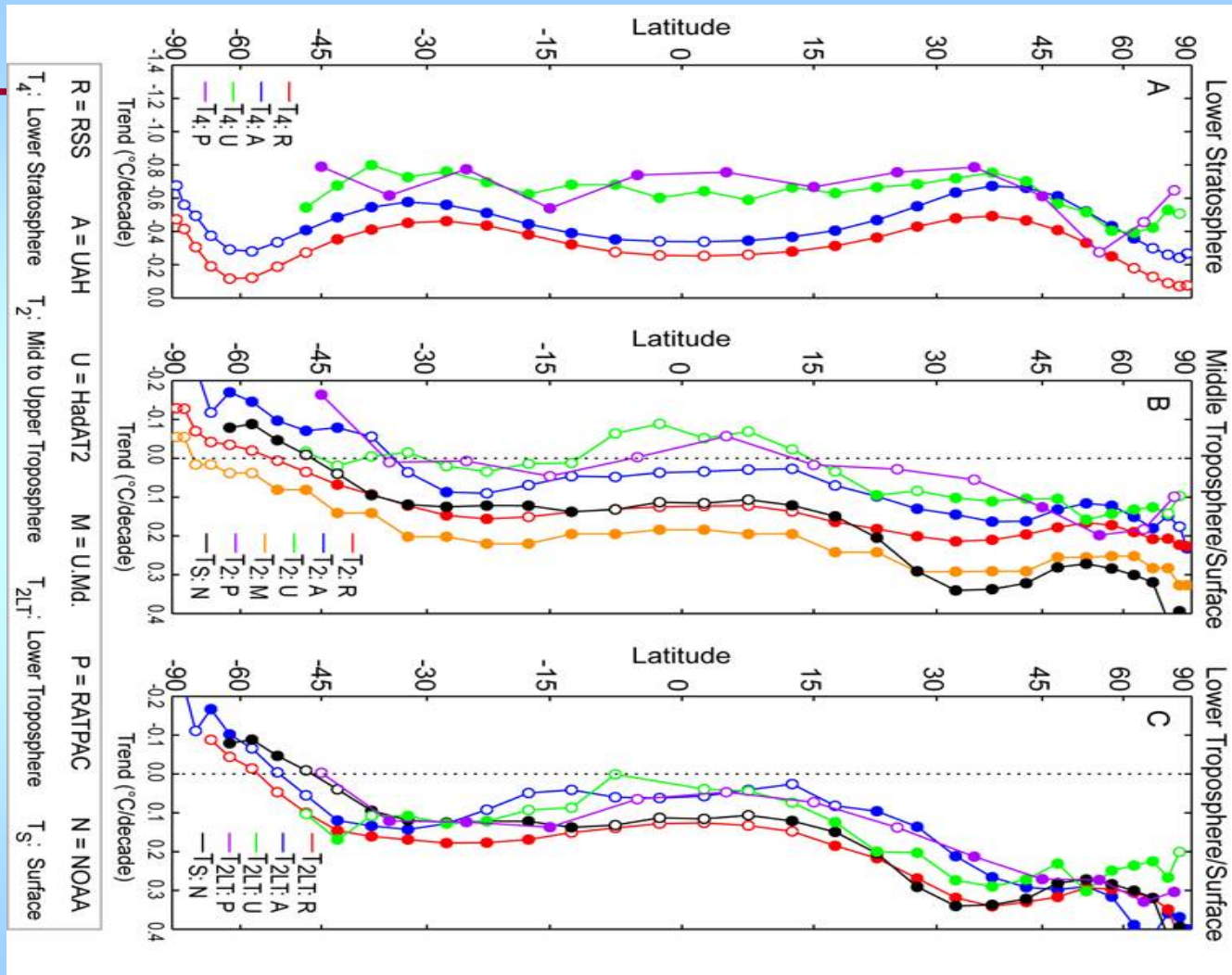
PCM simulations of the vertical profile of temperature change due to various forcings, and the effect due to all forcings taken together (after Santer et al., 2000).



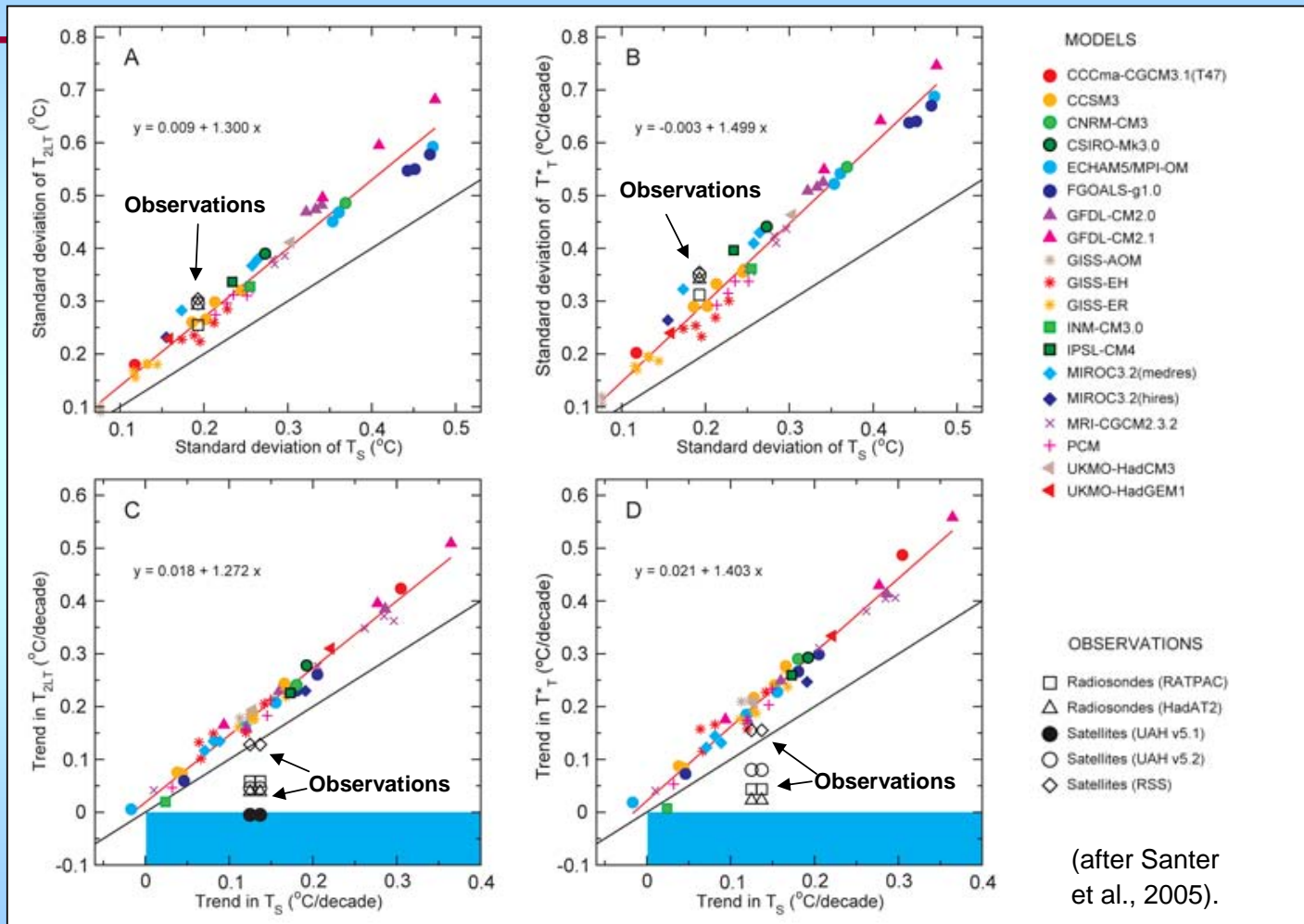
Total Global-Mean Temperature Changes



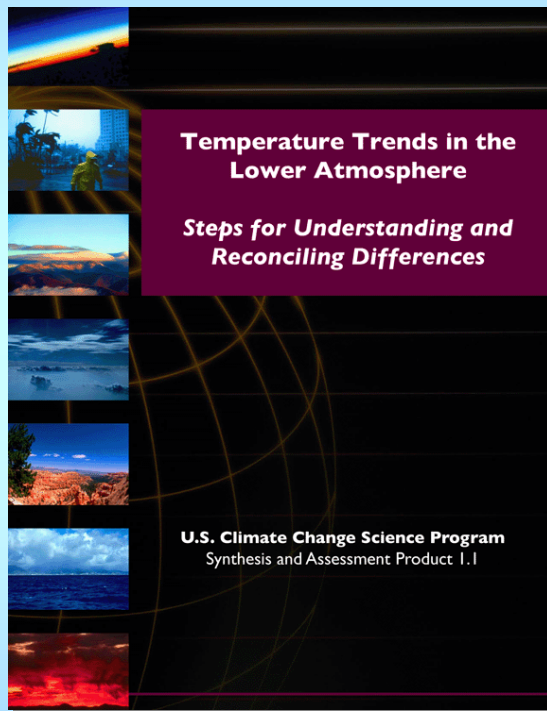
Temperature Trends for 1979-2004 (°C/decade) by Latitude



The Relationships Between Tropical Temperature Changes at Earth's Surface and in Two Different Layers of the Troposphere



Temperature Trends in the Lower Atmosphere



For further information on
**CCSP Synthesis and Assessment
Product 1.1**

<http://www.climatescience.gov/>

**Report available for
45 day comment period**

