



CDR DEVELOPMENT PROJECT

Inter-Calibrated Radiance FCDR and Upper-Air Temperature TCDR from MSU/AMSU/SSU

Cheng-Zhi Zou
NOAA/NESDIS/STAR
(301)683-3592

Cheng-Zhi.Zou@noaa.gov

Presented by Jian Li

Outline

- Project Description
- Production and QA Approach
- Applications
- Schedule & Issues

Project Description (2-1)

- Develop MSU/AMSU/SSU radiance FCDR to support consistent modeling reanalysis activities and consistent satellite retrievals

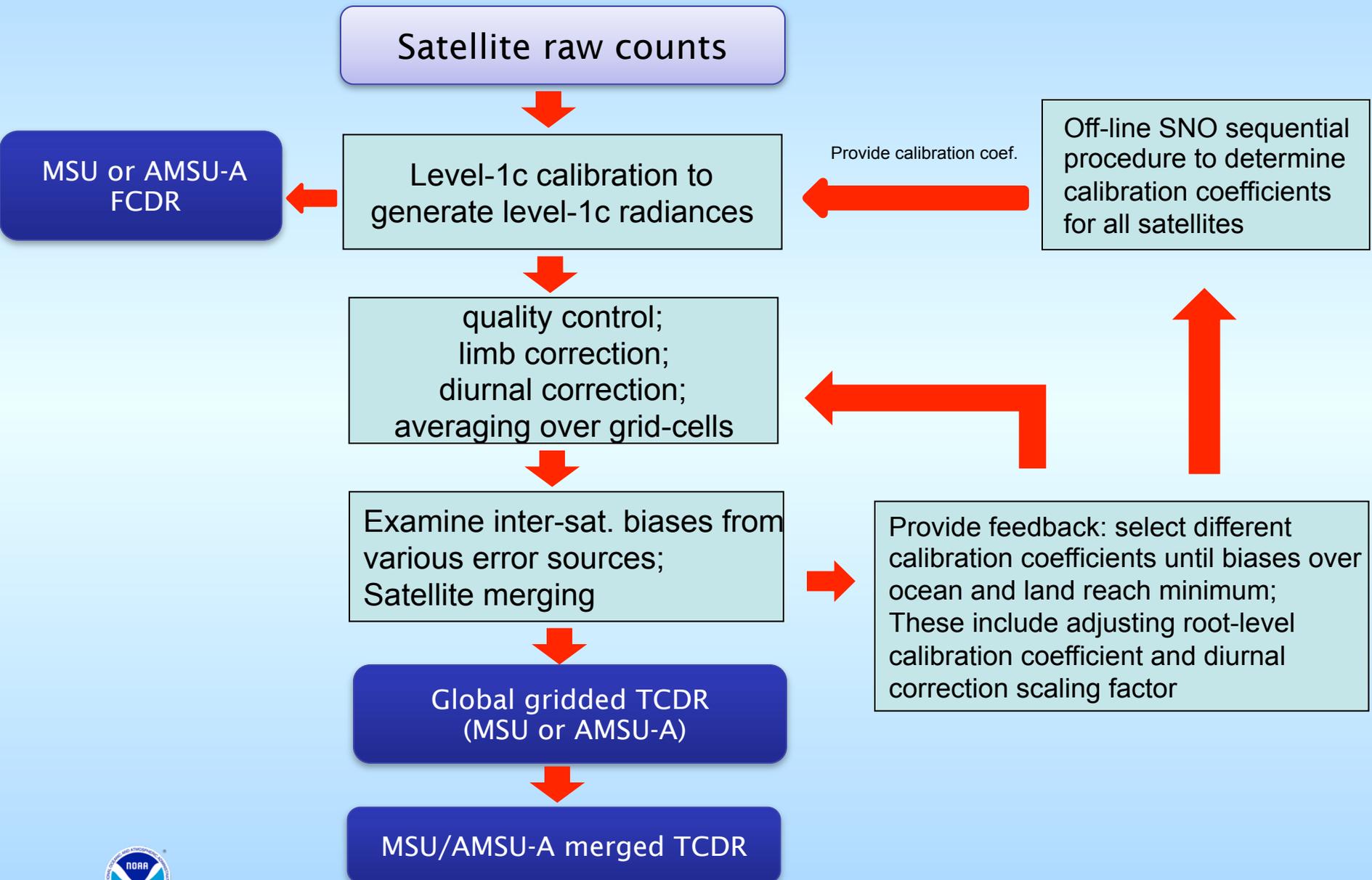
CDR(s) (Validated Outputs)	Period of Record	Spatial Resolution; Projection information	Time Step	Data format	Inputs	Uncertainty Estimates (in percent or error)	Collateral Products (unofficial and/or unvalidated)
MSU Radiance FCDRs (3 chs)	1979-20 06	110 km	25.6 sec (scan-line)	netCDF	Raw Counts SNO Cal. Coefficients	Abs. Bias: 0.5-1 K Rel. bias 0.05-0.1 K	Limb, diurnal, corrected L1C
AMSU-A Radiance FCDRs (11 chs)	1998- present	45 km	8 sec. (scan-line)	netCDF	Raw Counts SNO Cal. Coefficients	Abs. Bias: 0.5-1 K Rel. bias 0.05-0.1 K	Limb, diurnal, freq. corrected-L1C
SSU FCDRs (3 chs)	1979-20 06	147 km	32 sec. (scan-line)	netCDF	SSU L1B	~ 0.5 K	Limb, Dirunal, Atmo. CO ₂ corrected L1C

Project Description (2-2)

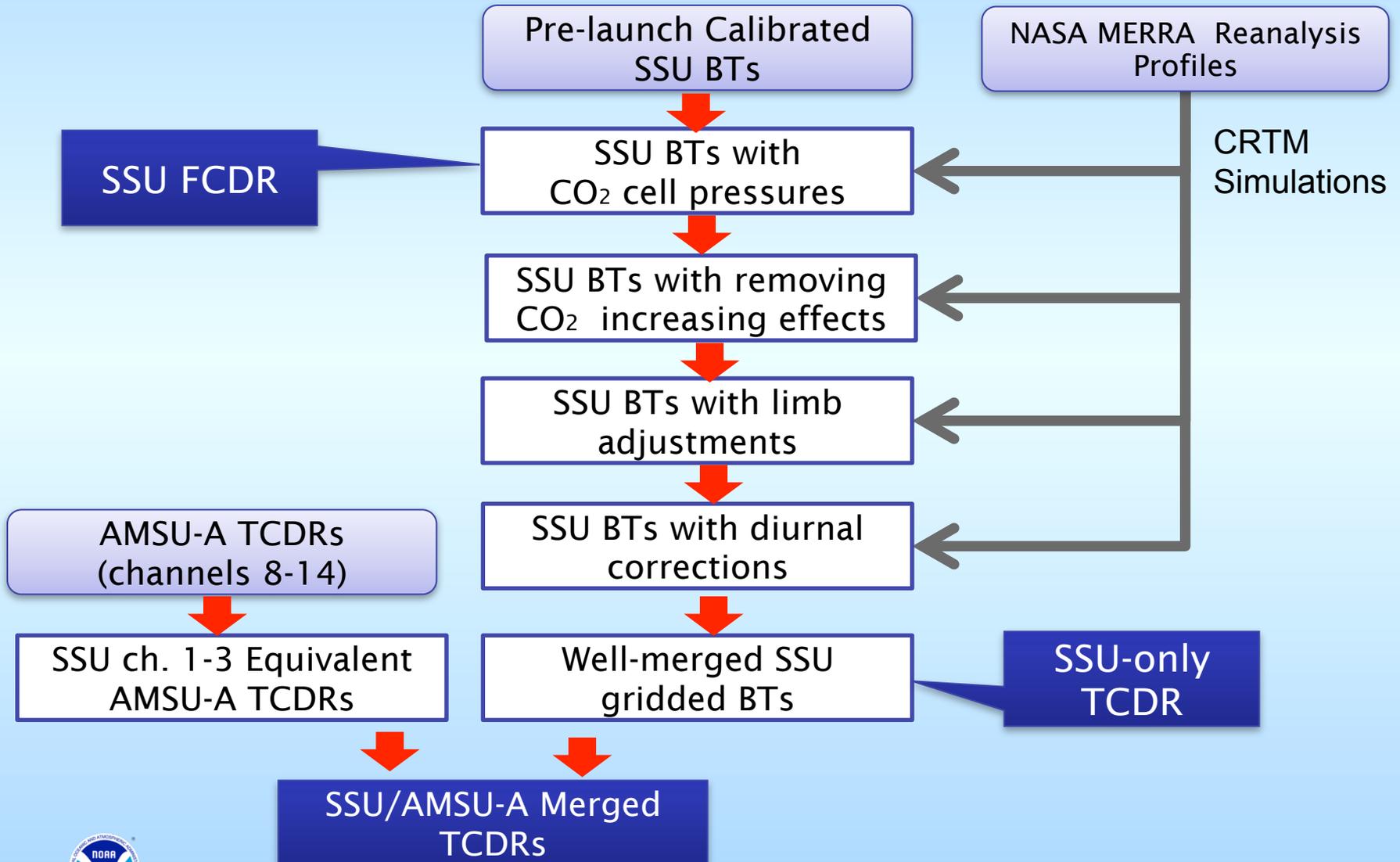
- Develop consistent atmospheric layer temperature TCDR for climate service support - climate change research, climate change monitoring, validating climate model simulation...

CDR(s) (Validated Outputs)	Period of Record	Spatial Resolution; Projection information	Time Step	Data format	Inputs	Uncertainty Estimates (in percent or error)	Collateral Products (unofficial and/or unvalidated)
MSU-only TCDRs (3 chs)	1979-200 6	2.5° x 2.5°	5-Day Monthly	netCDF ASCII	MSU radiance FCDRs	Inter-sat bias: 0.05-0.1 K Inter-sat σ : 0.03-0.05K	
SSU-only TCDRs (3 chs)	1979-200 6	2.5° x 2.5°	5-Day	netCDF ASCII	SSU FCDRs	0.5 K	
AMSU-A-only TCDRs (11 chs)	1998- present	2.5° x 2.5°	Monthly	netCDF ASCII	AMSU-A Radiance FCDRs	Inter-sat bias: 0.05-0.1 K Inter-Sat σ : 0.03-0.05K	
MSU/AMSU-A Merged TCDRs (3 chs)	1979- present	2.5° x 2.5°	Monthly	netCDF ASCII	MSU/ AMSU-A TCDRs	0.03 - 0.05 K	
SSU/AMSU-A Merged TCDRs (3 chs)	1979- present	2.5° x 2.5°	Monthly	netCDF ASCII	SSU TCDRs AMSU-A TCDRs	0.5 K	

Approaches: MSU/AMSU CDR

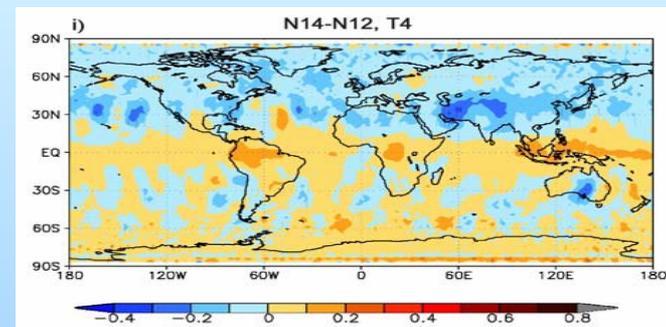
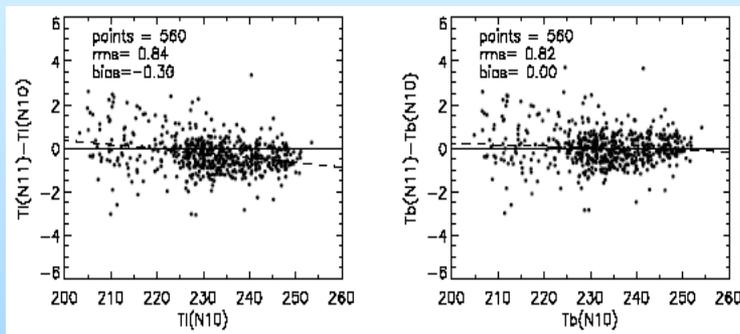
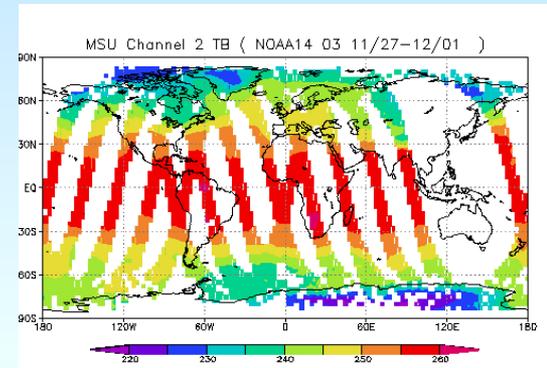


Approaches SSU CDR Development Flow Chart

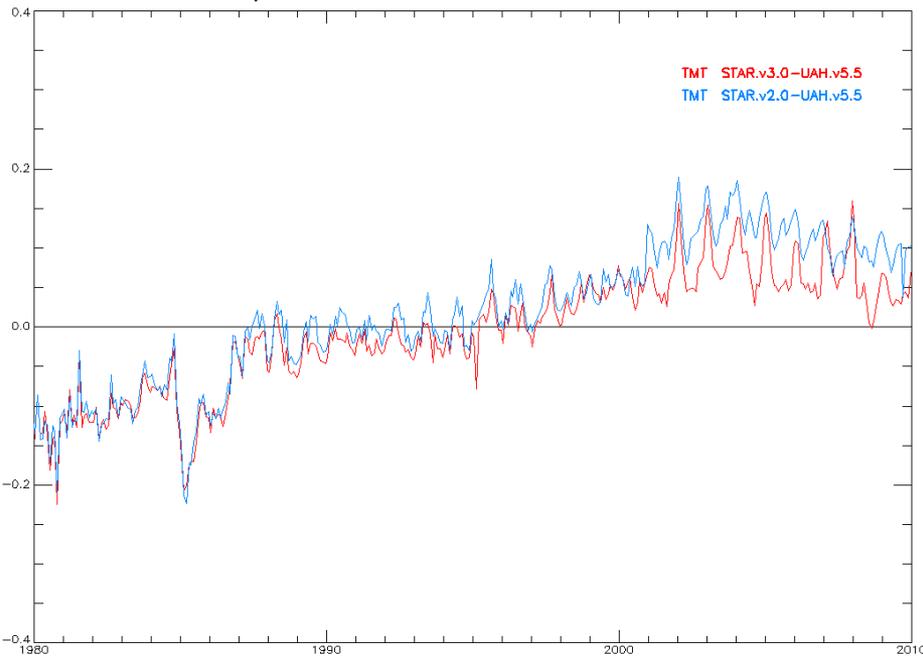


Quality Assurance Approach

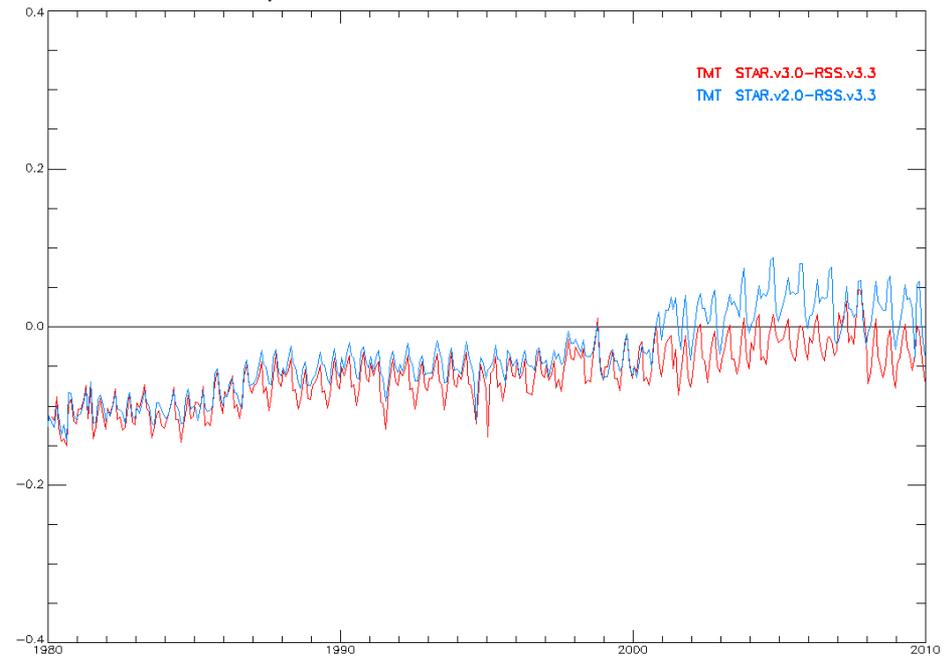
- FCDR (L1C): L1B QC flag + additional Tb/raw counts thresholds
- Manual/visual image evaluation:
- Statistical analysis:
 1. SNO calibration \rightarrow SNO bias/scene temperature-dependent biases close to zero
 2. Inter-satellite bias minimized everywhere, global mean inter-sat. diff time series stable, bias/stddev



MSU/AMSU Global TMT Anomalies Difference STAR & UAH



MSU/AMSU Global TMT Anomalies Difference STAR & RSS



- Comparison with similar dataset products
UAH - RSS - STAR
- Comparison with GPSRO, radiosonde, Lidar, reanalysis, climate model observations, and other climate variables
- Comparisons with observation of other variables
e.g. sea ice trend

Applications

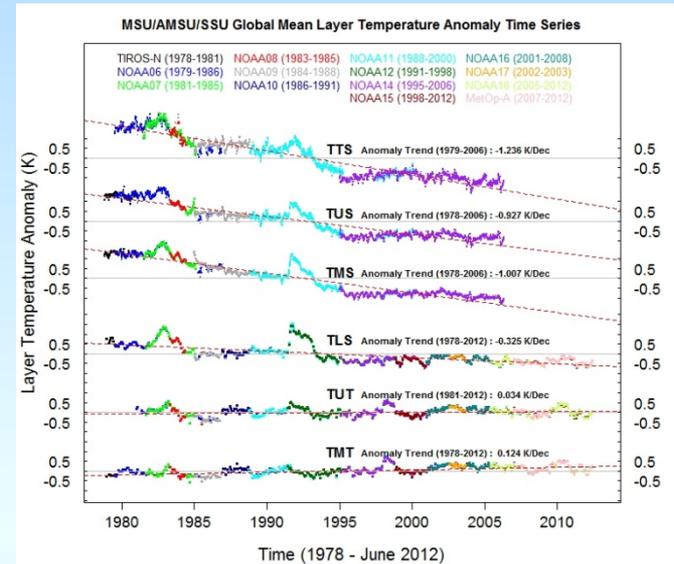
1. Operational monitoring climate change (Climate Service)

2. Policy Support:

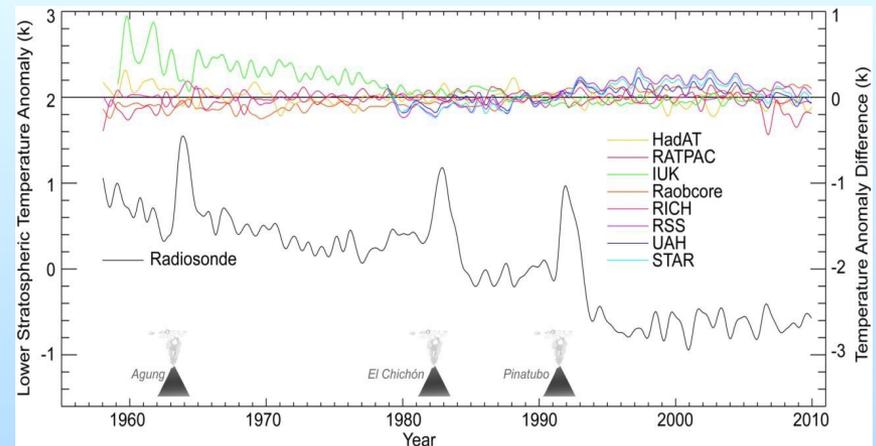
IPCC report

BAMS Climate Assessment Report: State of the Climate

NCDC climate report



<http://www.star.nesdis.noaa.gov/smcd/emb/mscat/index.php>



Applications

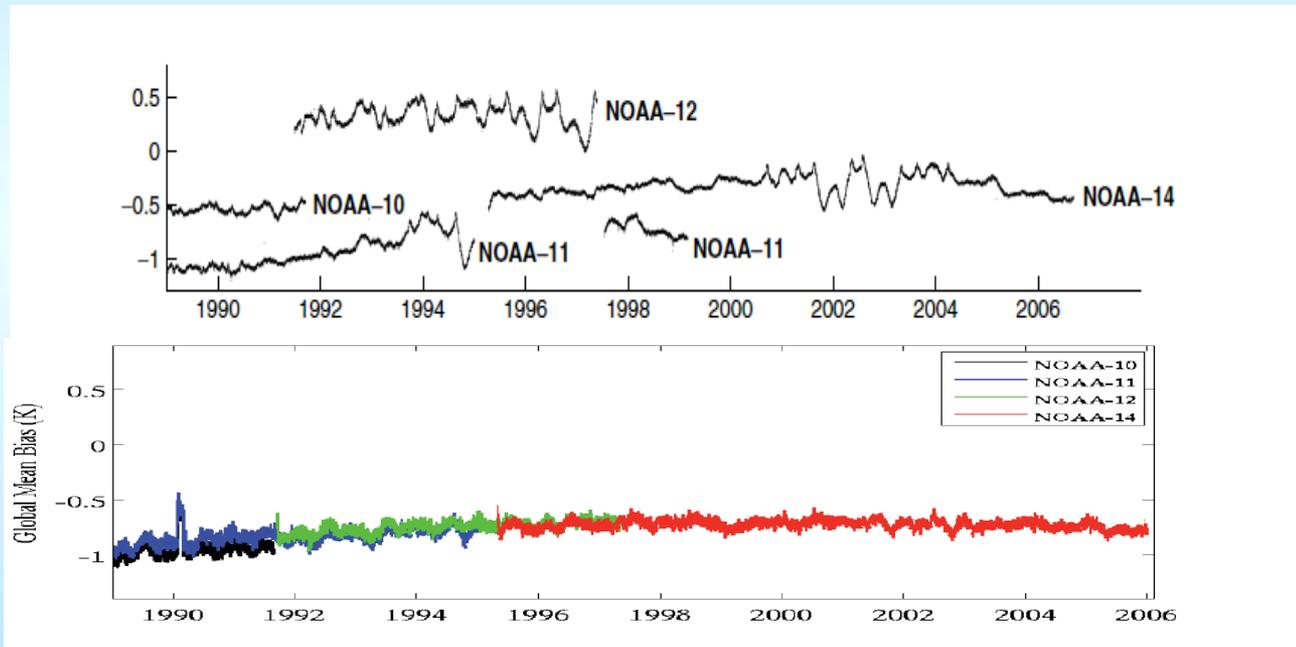
3. Support Climate Reanalysis Development

Saha et al., 2010: The NCEP climate forecast system reanalysis, BAMS

Rienecker, et. al. 2011: MERRA - NASA's Modern-Era Retrospective Analysis for Research and Applications, J. Climate

ERA-interim Bias
Correction Pattern

NASA MERRA Bias
Correction Pattern

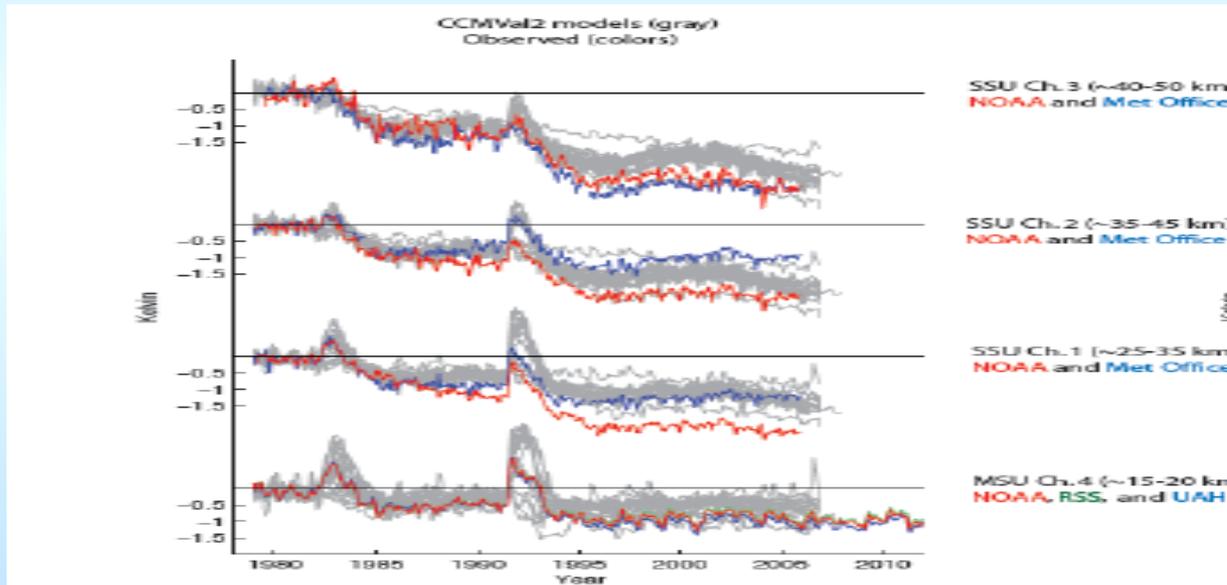


Key Findings: inter-calibrated MSU dataset may improve reanalysis trend analysis

Applications

4. Support trend assessment by climate community and validating climate modeling simulations

Key Findings: Previous stratospheric dataset and climate models may have significantly underestimated upper stratospheric temperature cooling trends



Plot from Thompson et al. 2012 in Nature

Applications

5. Support Agriculture

Support reanalysis → provide data input for crop modeling
→ crop simulation and forecasting

Schedule & Issues

- **Completed CDRs**
 - MSU, AMSU-A FCDRs → Operational transitioned to NCDC in FY12
 - MSU-1.2 → mature; need a plan for operational transitioning to NCDC

- **Ongoing CDRs**
 - **Merged MSU/AMSU-A version 3.0 TCDR**
 - Resolve inconsistency in 2001
 - More accurate adjustment schemes
 - **SSU FCDR and SSU TCDR version 2.0**
 - Recalibrating SSU FCDR to incorporate issues raised by community
 - Compare with UKMO data to understand differences

- **Issues:**
 - **Impact from sequestration: lost team members**
 - **Products will be cut: only develop, maintain, and deliver those affordable**

- **NCDC Support:**
 - **Provide further funding support**

Thank You

