Climate Working Group Discussion

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Aura Science Team Meeting, Sept. 29. 2010, Boulder
Goals

- Document current status of climate-related Aura products and studies
- Discuss planned data improvements and new products, particularly combined data products
- Stimulate discussion on how to improve model evaluation and interaction between satellite and modeling communities
- Coordinate write up for senior review proposal
- Promote Aura climate results, e.g., highlight 1-page slides + notes -> PAO, EPO, HQ, senior management
M. Prather’s analysis of IPCC AR5 scoping activities

- Very limited representation of atmospheric chemistry and composition community at the AR5 scoping
- Inclusion of future air quality as a bullet in both the WGI Near-Term Climate and WGII Human Health chapters.

Important chapters relevant to Aura

WGI
- CH 5. Information from Climate Archives
- CH 6. Carbon and Other Biogeochemical Cycles
- CH7. Clouds and Aerosols
- CH8. Anthropogenic and Natural Radiative Forcing
- CH11. Near-term Climate Change: Projections and Predictability
- CH12. Long-term Climate Change: Projections, Commitments and Responsibility

WGII
- CH11: Human Health

WGIII
- Chapter 6. Putting Mitigation Options and Pathways In Context

Important to get papers published by 2011(2012)
Discussed at last meeting

- The most effective way forward is for satellite data producers to continue working closely with one or more modeling group to publish papers, rather than hand off data products.
  - Development/availability of observation operators (averaging kernels, simulators) is important (e.g., aerosol AK, radiative kernels, cloud simulators -> COSP package used by modelers).
  - New diagnostics for modelers (e.g., simulation of trop. O3)
- Satellite data community needs better quantification of error bars including bias for data products.
- CCMVAL and IPCC model evaluations needs more representation of scientists from satellite observations community.
- Importance of simultaneous measurements of clouds, aerosols and atmospheric composition has been shown (e.g. Jiang et al. 2008); we note that current A-train capabilities may not be available in the future
New items

- Long-term archival and documentation of data sets, especially L1B – need to start documenting important “features” of our data sets and algorithms, ATBDs are out-dated for many products (include in senior review proposal?)
- Are there any specific validation or field campaign needs related to climate?
- Senior review
Aura Climate-related Products

- **Tropospheric Ozone and LS (TES, OMI/MLS)** Helen Worden, Jerry Ziemke
- **Isotopic water vapor (TES)** John Worden
- **Clouds (Aura cloud products: IWC profiles, HIRDLS CloudTopPressure, Extinction, OMI Cloud Optical Centroid Pressure, Cloud Radiative Fraction)** Jonathan Jiang, Steven Massie
- **Aerosol (HIRDLS ext., OMI UV/Vis Indices, OMI Aerosol Absorption/SSA, absorbing type, AOT over clouds, MLS CO as an aerosol proxy)** Steven Massie, Omar Torres, Pepijn Veefkind
- **Water vapor (MLS upper tropospheric, stratospheric profile, combined with HALOE, HIRLDS?)** Bill Read, Nathaniel Livesey
- **OMI surface reflectivity (wavelength dependence)**
- **Carbon greenhouse gases (carbon dioxide and methane) (TES)**, Susan Kulawik, Vivienne Payne
- **(Aerosol and tropospheric ozone precursors such as SO2, NO2, NH3, CO, HCHO) (OMI/TES/MLS)**, Nick Krotkov, Simon Carn, Karen Cady-Pereira, Ming Luo, Thomas Kurosu
Senior Review Proposal

- Continue funding to core science teams, mission ops, EPO for another 2 years (does not include ROSES)
- Call letter Nov., due Feb.-March 2011 (would like to have contributions by end of year, finished by end of January).
- Focus on what has been done in last two years (e.g., new products) and why we need to continue to collect more data
- Science sections organized around Aura science questions (strat. chem., AQ, climate)
What improvements/new data products were proposed?

- HIRDLS: Retrievals in presence of PSCs
- HIRDLS + MLS IWC
- MLS: noisy products
- OMI: footprint and collocation with other sensors, GOME2 processed with OMI algorithms
- OMI-TES: tropospheric ozone
- TES-MLS: CO
“What are the roles of upper tropospheric aerosols, cirrus, water vapor, and ozone (and other greenhouse gases) in climate change?”

- Clouds, H2O, HDO, and aerosols
- Chemistry and Climate
  - Strat-trop. transport/dynamics, influence on O3
  - Tropical composition - TTL, diagnosing changes in strat. dynamics with composition, tape recorders, PMC’s/PSC’s
  - UT radiative forcing (ozone)
  - Climate impact of volcanoes
Organize around more specific climate questions?

- How and where do aerosols impact clouds, precipitation, and transport of water vapor to stratosphere?
- What changes in SO2 are driving changes in stratospheric aerosol (volcanoes, changing emissions)?
- How & why are absorbing aerosols changing? What are their sources and distributions?
- How is cirrus formed in TTL? How do radiative effects of cirrus vary in space & time?
- How well do models simulate clouds, aerosol, radiative forcing, atmospheric composition (H2O and O3)?
- What are processes controlling relative humidity in GCMs? (HDO)
- How good are sources and sinks CO2 and CH4 (and other aerosol precursors) in models? Using data assimilation/inverse modeling to improve.
- Combining data sets through assimilation (level 4), increments tell use about model and data deficiencies
Other points to highlight

- New and improved products
  - TES CO2, CH4, NH3, IRKs
  - OMI aerosol AOD above cloud,
  - OMI improved AAOD: aerosol type from AIRS CO, aerosol height from CALIPSO

- Overlap with future missions (TropOMI, GOME2, IASI, Glory, OCO-2, GCOM-W,NPP/JPSS,EV-1,SAGEIII)

- Merging with past datasets to extend records
  - H2O: MLS+HALOE
  - OMI AI: with TOMS
  - Tropical trop. O3 with TOMS