Thermal IR satellite missions for air quality

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CEOS Atmospheric Composition Virtual Constellation AC-VC-16

Thermal IR satellite missions for air quality: Summary 1

CrIS:

- The operational CrIS sounders on S-NPP and JPSS, along with IASI, AIRS and other MW sensor data are being operationally processed by both the NOAA-Unique Combined Atmospheric Processing System (NUCAPS) and NASA Community Long-term Infrared Microwave Coupled Atmospheric Product System (CLIMCAPS) systems
- NUCAPS focuses on lowest possible latency and having model independent T(p), q(p), and trace gases
- CLIMCAPS focuses on most stable product, continuous across missions. Uses MERRA-2 reanalysis product as a-priori for T(p), q(p) and O3(p). Uses climatological a-priori for emissivity and other trace gases
- Applications include: GHG monitoring, TIR and SWIR together to enhance PBL sensitivity; Ozone ozone hole, intrusions, mid-trop O3, LS O3 trends; CO2 seasonal amplitude; CO trends and chemistry; CH4 sources; other trace gases supported with experimental retrievals (HNO3, N2O, SO2, NH3, Isoprene, Ethane, and Propylene ….)

AIRS:

- AIRS data records almost 18 years!
- Extend the mission while the Aqua satellite drifts, it's running out of fuel so do corrective maneuvers after 2022
- Plans to change from 1:30 equator crossing time to 5:00pm over a 5-year period
- New version V7 is to be released
- AIRS ammonia science product available on NASA GES DISC

Thermal IR satellite missions for air quality: Summary 2

IASI:

- IASI-B is now the reference instrument, IASI-C working fine and IASI-A has started to drift. They were moved from the tri-star to "trident" configuration
- Recent scientific results : record-high CO observations during the Australian fires in November 2019-January 2020, record low O3 observed in March 2020 over the Artic; new sources of NH3 found/discriminates thanks to oversampling methods, new VOCs maps ;
- 31 species now detected in the IASI spectra. New for 2020: *SF6, CCL4, HFC-134a, HCHO*
- OLR + SST trends since 2007 show high stability (IASI-FT project)
- Pollution drop associated with the lockdown for CO, O3 and NH3 (see Friday's presentation)

MOPITT:

- The Terra satellite celebrated 20 years in orbit last December
- New work analyses interannual variability and long-term trends with the longest satellite record of global CO observations
- Compares and contrast CO with the MODIS AOD record for different regions
- The decreasing CO trend slows across all regions for 2002-2018 relative to 2002-2010; correlation of lower CO with lower emissions for the global financial crisis starting in 2008
- Other trends depend on region: Eastern USA shows reductions in both AOD and CO over 2002-2018, reflecting the impact of strong air quality and climate related policies
- Initial 2002-2010 CO decline in China was not accompanied by an AOD decline as move to a centralized energy production improved combustion efficiency but not particulate pollution, but AOD started decreasing along with the continued decrease in CO after enactment of Clean Air Policies in 2010
- Clear reduction in CO loadings as a result of the COVID-19 shutdown