



OMPS LP aerosol extinction profile measurements in the stratosphere



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2012 2013 2014 2015 2016 2017



OMPS Limb sensor



Limb Profiler

Heritage: SOLSE / LORE, SAGE III, OSIRIS, SCIAMACHY, GOMOS

Wavelength: 280 –1000 nm

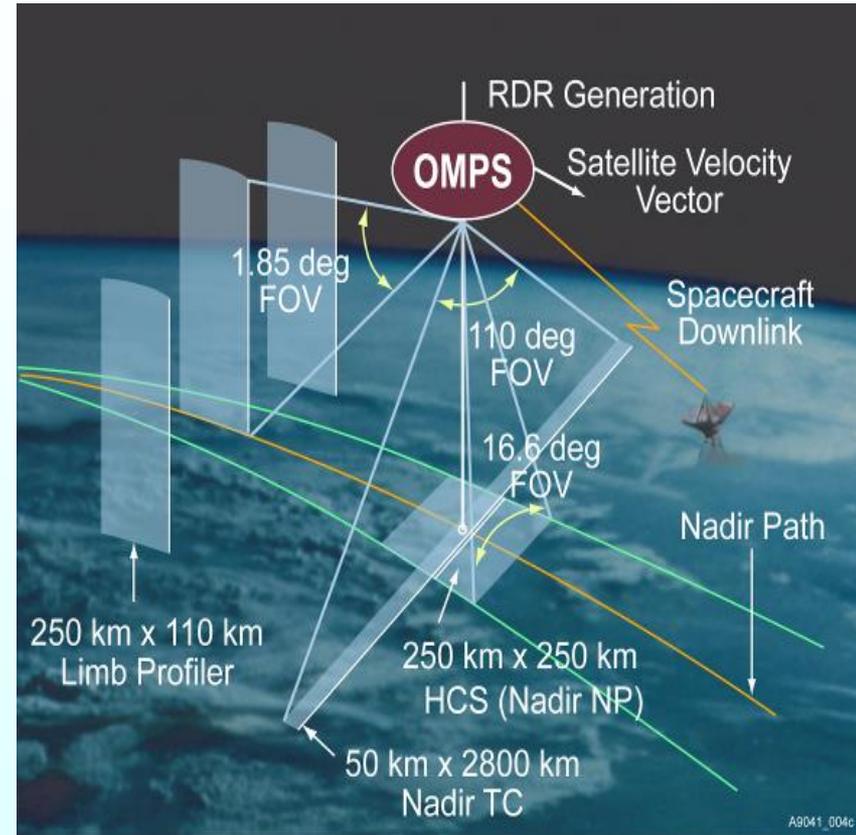
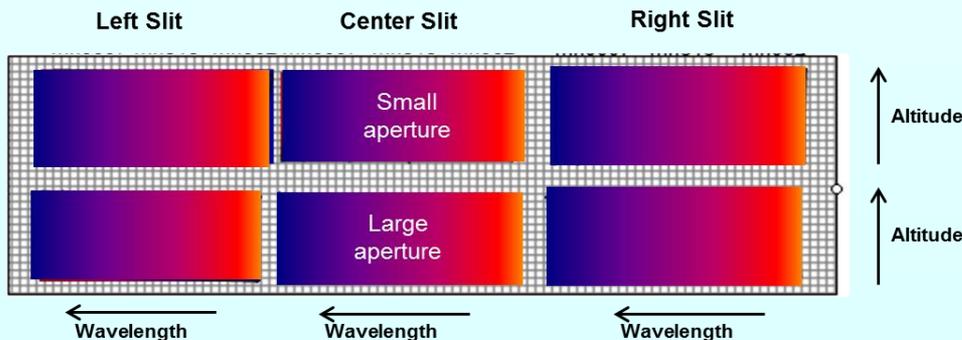
Vertical range: 105 km (5 - 80 km consistently)

Vertical Sampling: 1 km

Vertical resolution: ~1.8 km

Along-track sampling: 125 km

Detector: 0.25 megapixel CCD at -45 °C

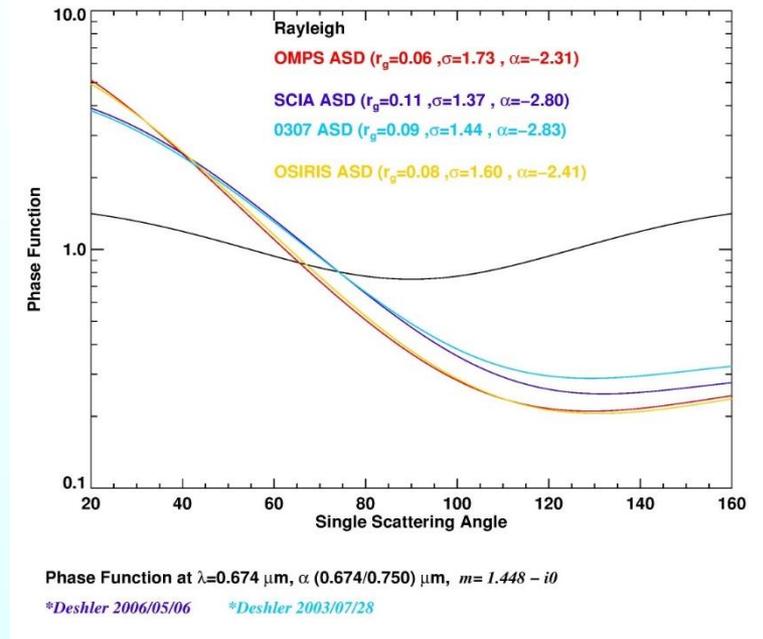




Aerosol retrieval algorithm

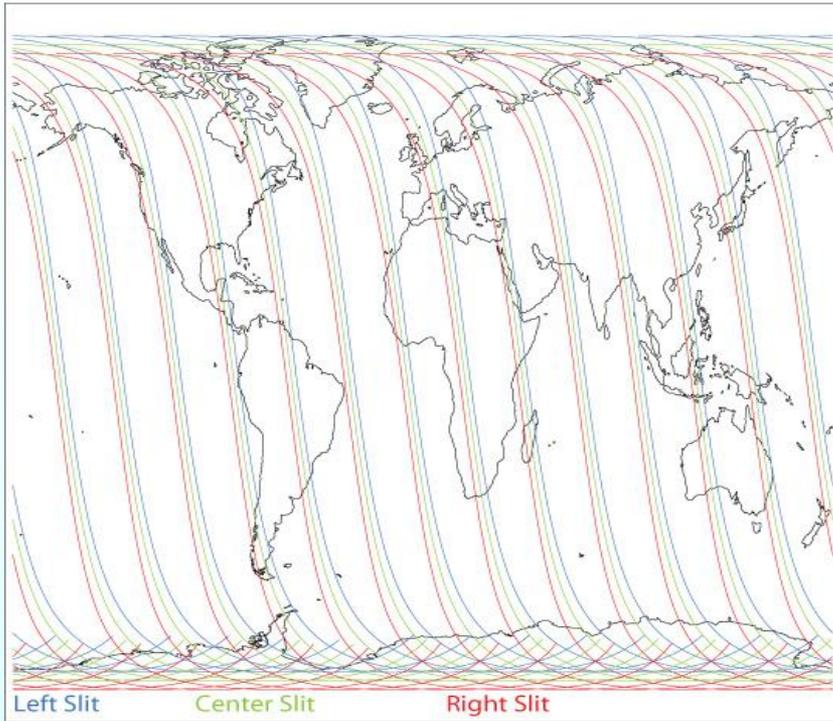


- **OMPS LP current aerosol retrieval algorithm uses Chahine's non-linear relaxation method**
- **Uses 675 nm Rayleigh-corrected radiances $(I-I_0)/I_0$**
 - I_0 is calculated using MERRA data assuming no aerosols and 45.5 km reflectivity
- **Aerosol phase function determined by aerosol size distribution, refractive index and shape**
 - Use a constant aerosol size distribution (ASD), single-mode log-normal, with no altitude variation: $(r_0, \sigma) = (0.06 \mu\text{m}, 1.73)$
 - Current data Version 0.5
- **Data are screened for clouds using Chen et al. [2016]**

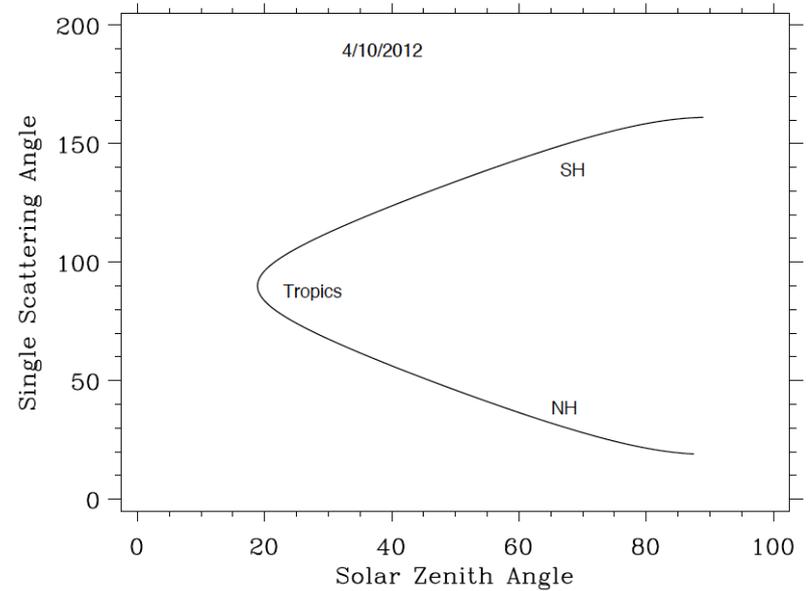




OMPS LP daily coverage



Variation of OMPS LP SSA



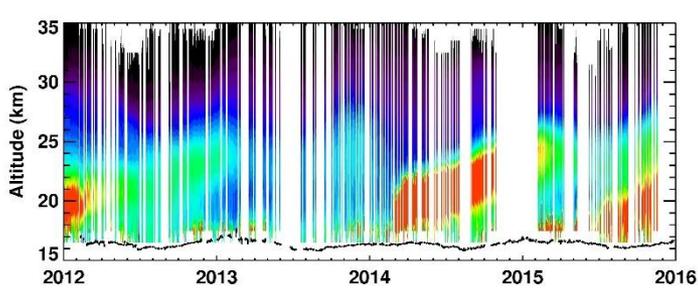
3 slits, 14-15 orbits each day, 160 events, ~7200 measurement daily



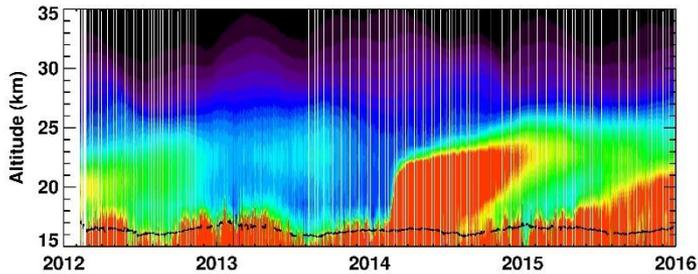
OMPS & OSIRIS daily zonal mean comparison Latitude 10S - 0



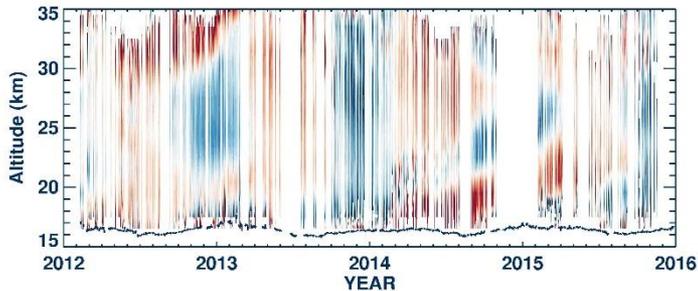
-10 < Lat > 0



OSIRIS Aerosol Ext Coeff x1e4

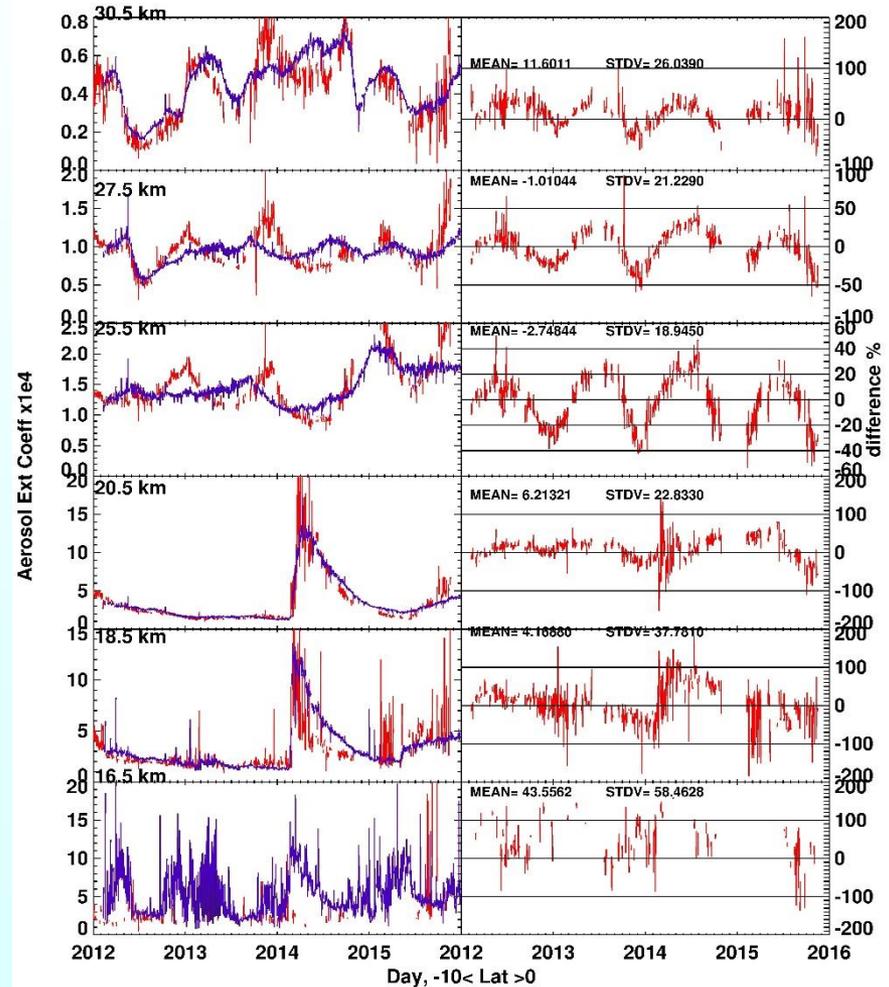


OMPS Aerosol Ext Coeff x1e4



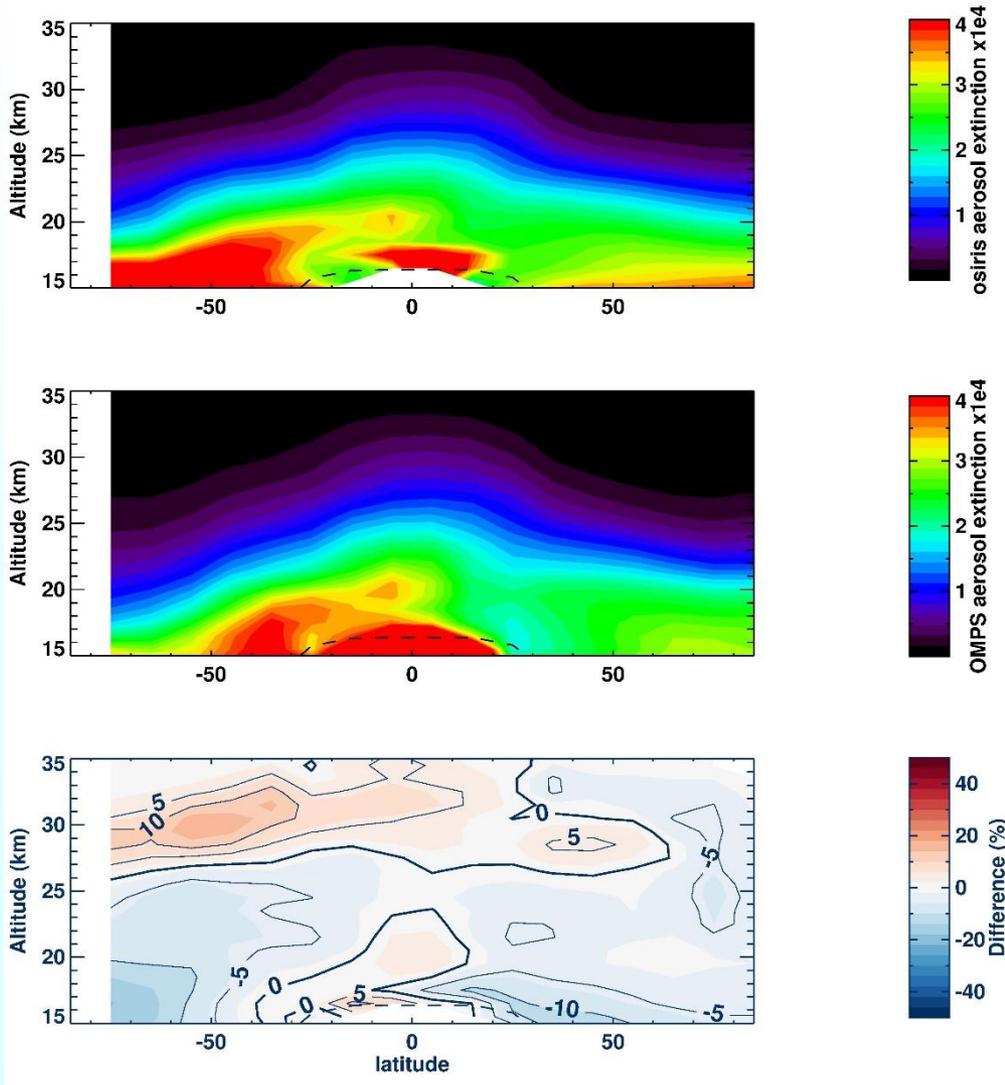
Difference (%)

OMPS - OSIRIS %





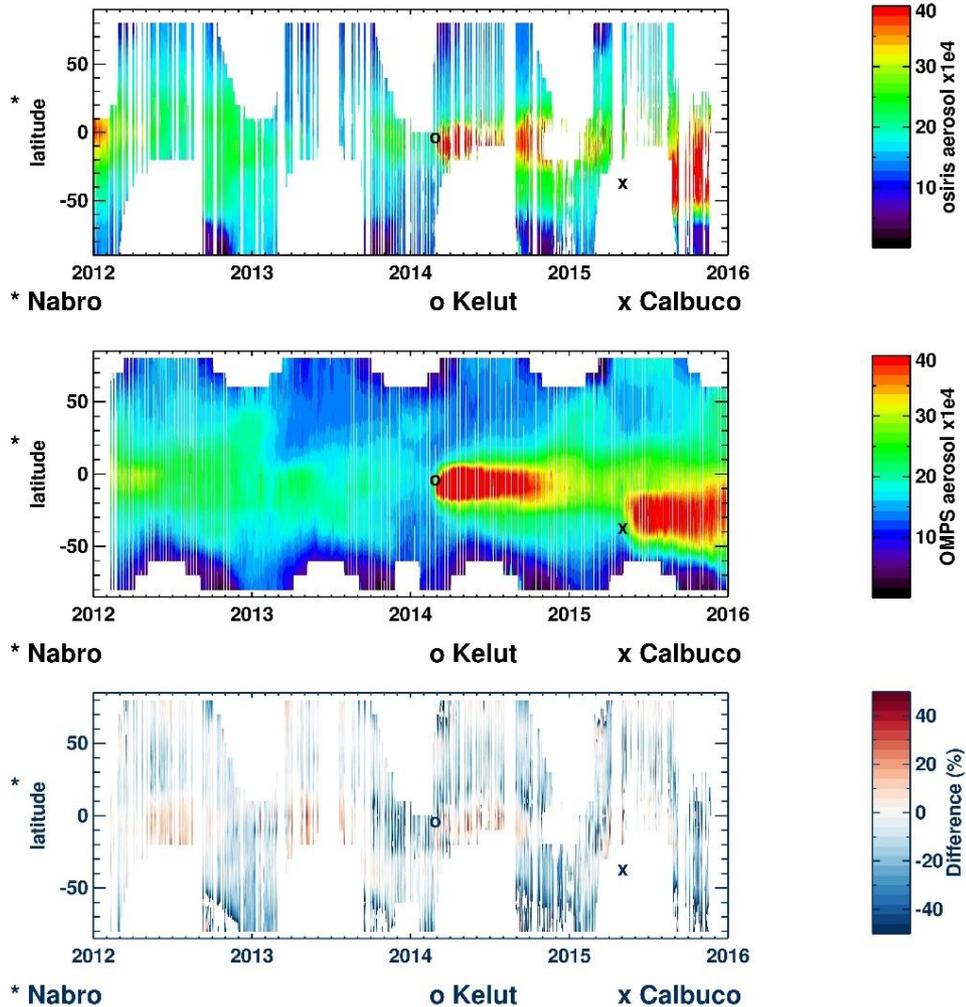
OMPS vs. OSIRIS global zonal mean comparison





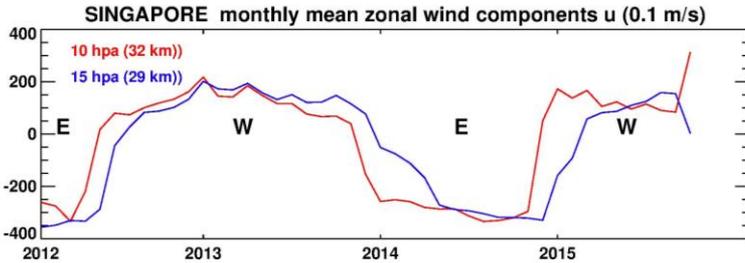
OMPS vs. OSIRIS stratospheric column

Stratospheric aerosol column (17.5 km to 35.5 km)





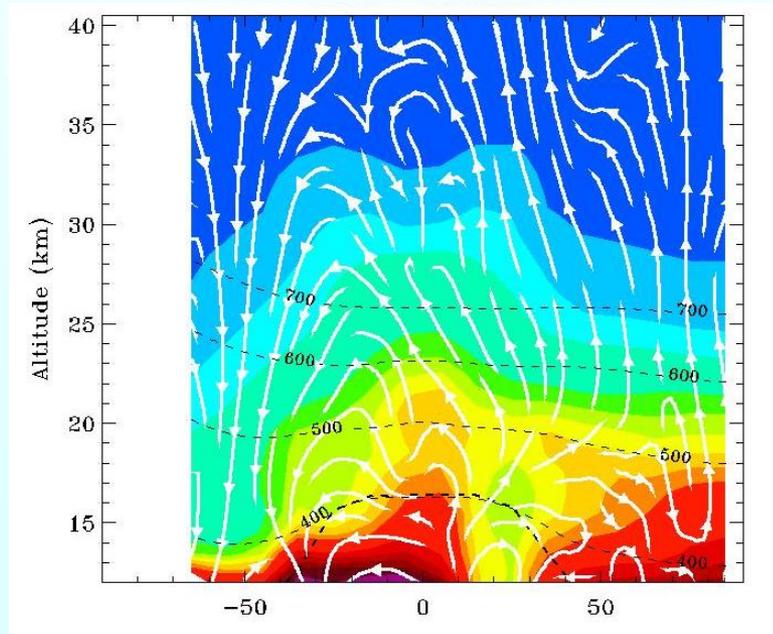
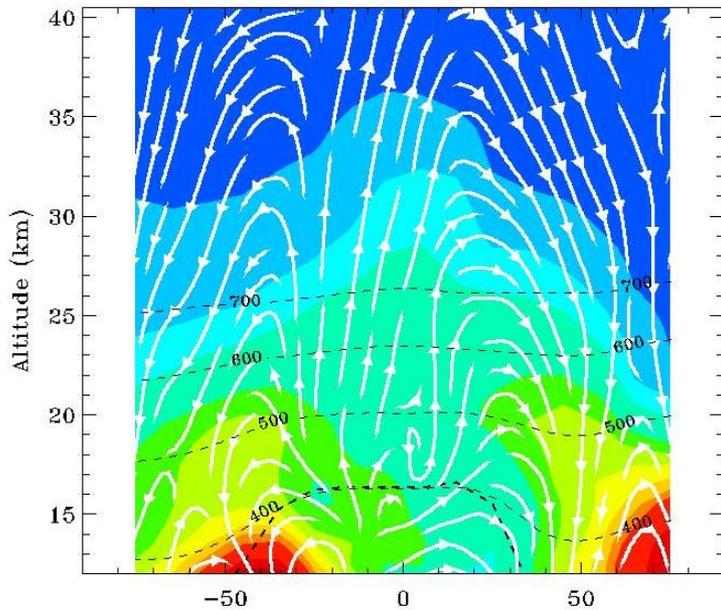
Quasi-Biennial Oscillation (QBO) signature



February 2012 (Easterly phase)

Enhanced tropical aerosol extinction values during easterlies (upward lofting) and drop in aerosol values during westerlies (downward descent).

May 2012 (Westerly phase)

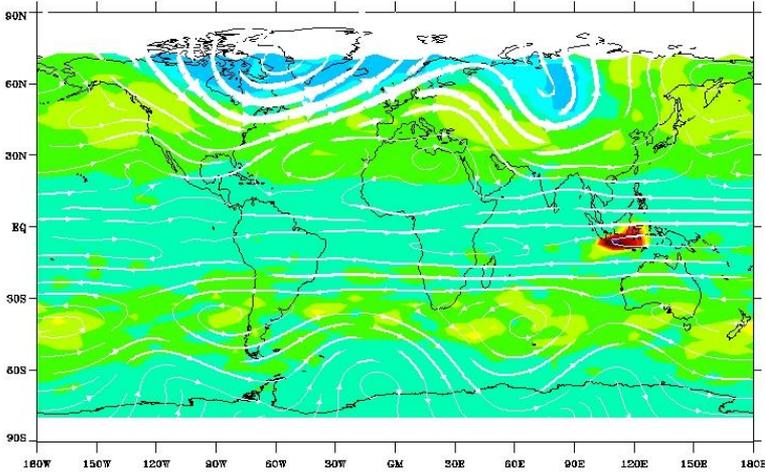




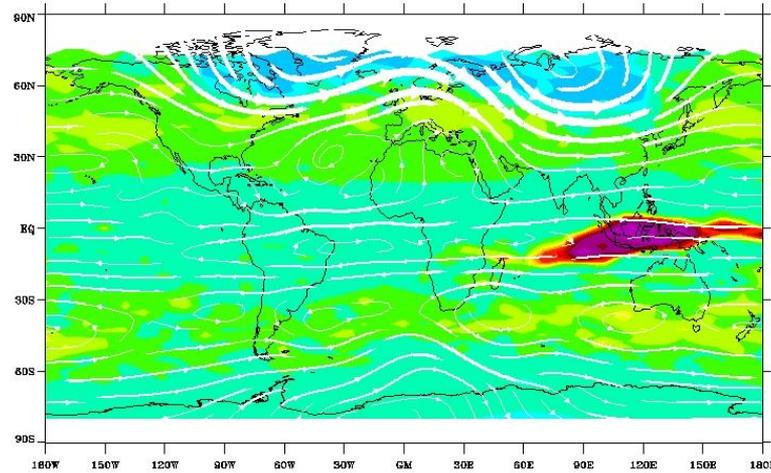
Tracking Kelut volcanic eruption –first month



Date = 20140209 to 20140216



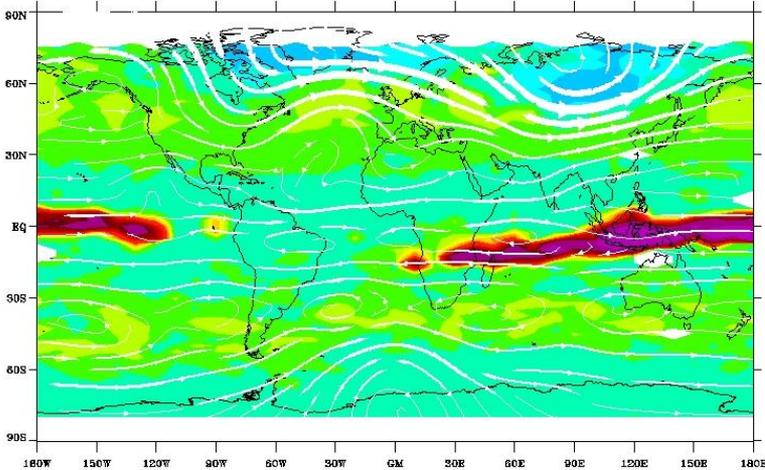
Date = 20140217 to 20140223



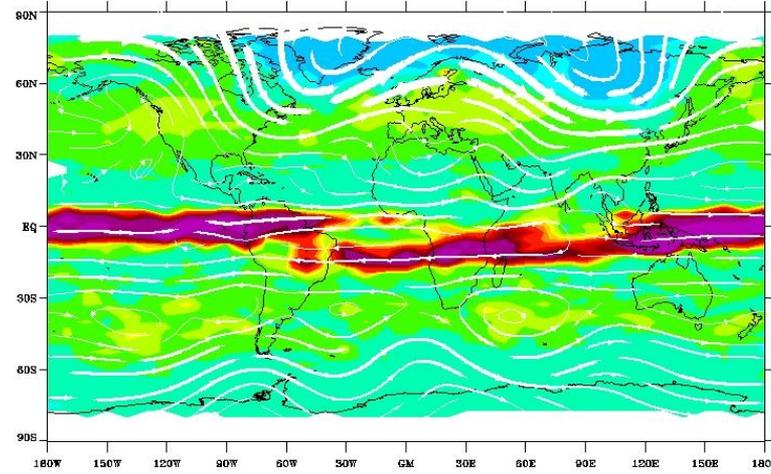
-Weekly maps at 20.5 km

-Superimposed MERRA zonal winds

Date = 20140224 to 20140302



Date = 20140303 to 20140310



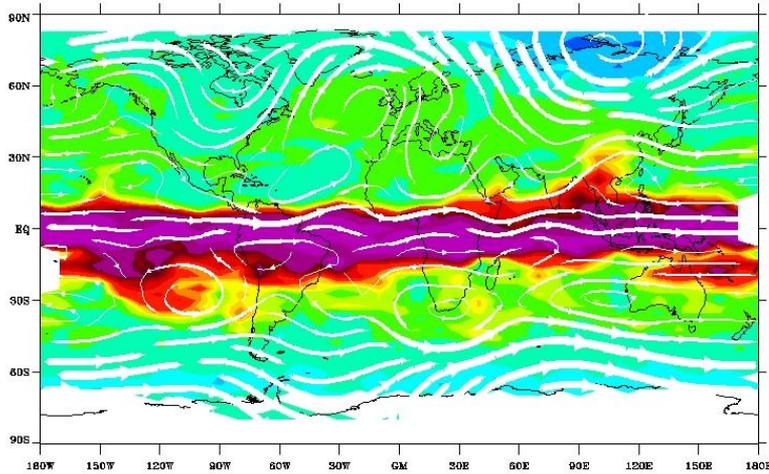
$\times 10^4 \text{ km}^{-1}$



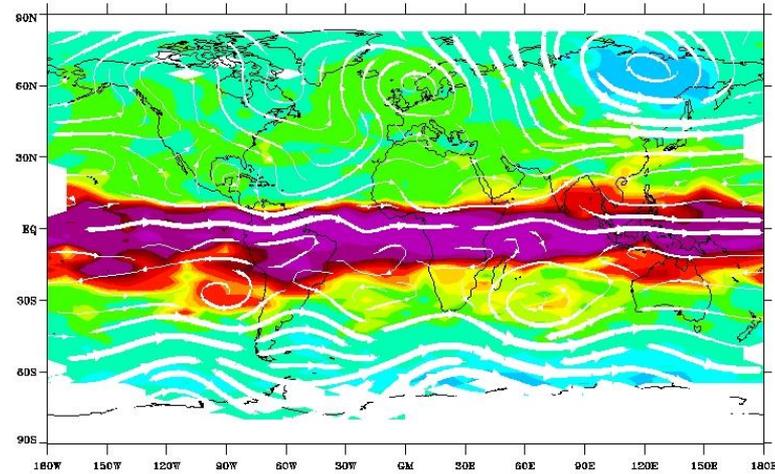
Tracking Kelut volcanic aerosol



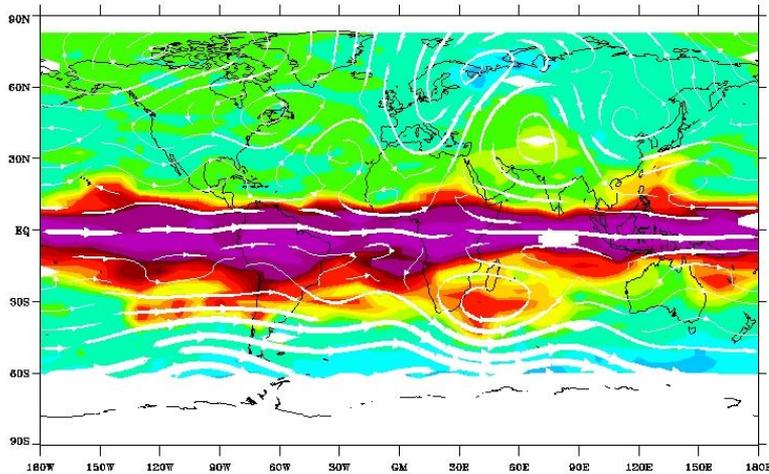
Date = 20140410 to 20140416



Date = 20140417 to 20140423



Date = 20140502 to 20140508



- Aerosol transport poleward in synoptic scale tongue of air
- Aerosol transport via anticyclone poleward and trapped inside for weeks.



Injection of Calbuco aerosol in the polar vortex



Date = 201504

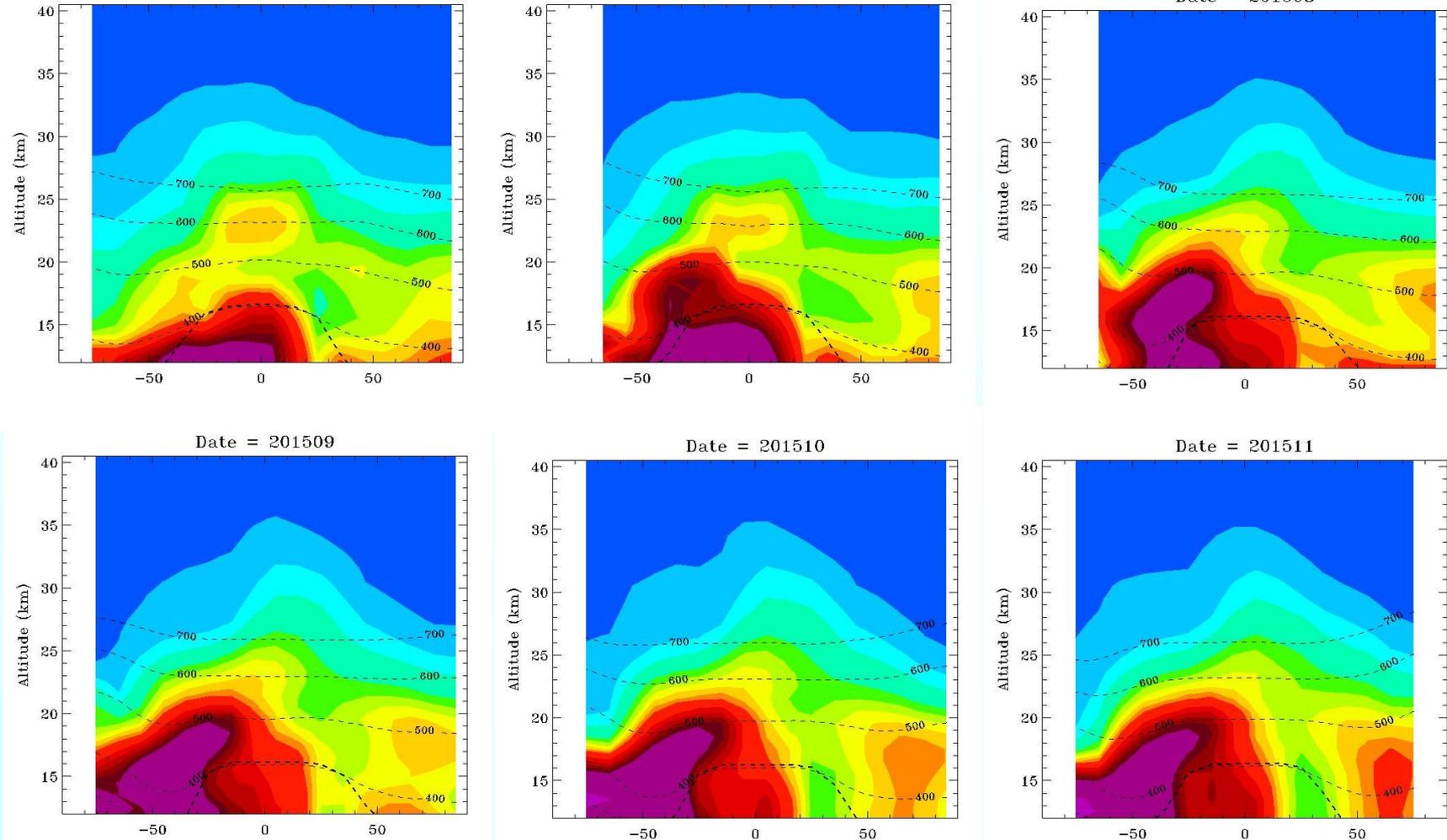
Date = 201505

Date = 201508

Date = 201509

Date = 201510

Date = 201511



$\times 10^4 \text{ km}^{-1}$



Future plans



- **New V1.0 aerosol data in Sept 2016**
 - Improved straylight correction results in better agreement between 3 slits, and improved retrieval in polar region
 - New bimodal lognormal size distribution model with coarse mode fraction of 0.003. Only minor change in aerosol extinction
 - Provides residuals at 8 wavelengths for diagnostics and future improvements.
- **Validate OPMS LP V1.0 with OSIRIS, CALIPSO and Models**
- **Use CALIPSO and CATS polarization measurements to validate and improve the cloud detection algorithm**
- **Investigate the use of longer wavelength (867 nm) to improve the retrieval at lower altitudes.**
- **Validate OMPS LP with SAGE III solar and limb measurements (after launch) and utilize SAGE III multi-wavelength and aerosol size information**