

Aircraft and satellite based studies of stratospheric aerosol – composition, sources and climate forcing



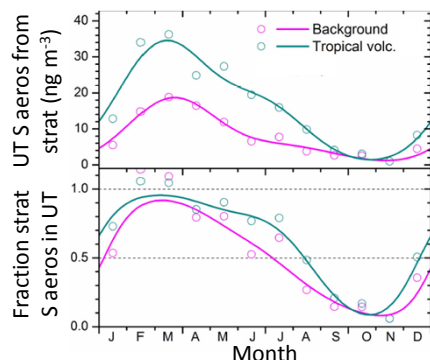
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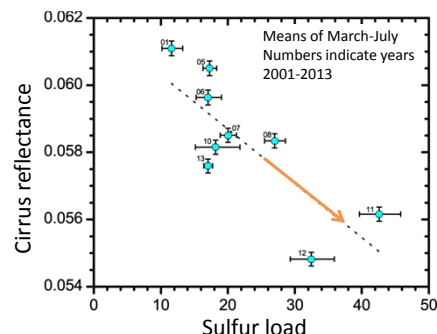
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The stratosphere impacts the UT aerosol

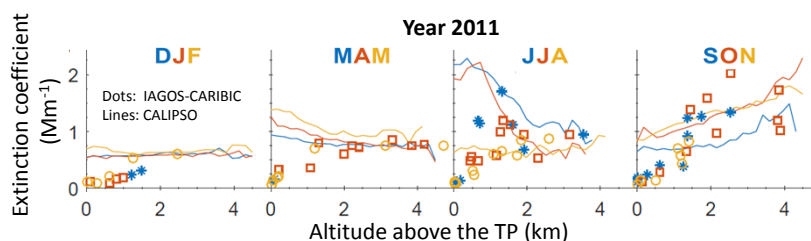


Stratospheric sulfate impact on cirrus?

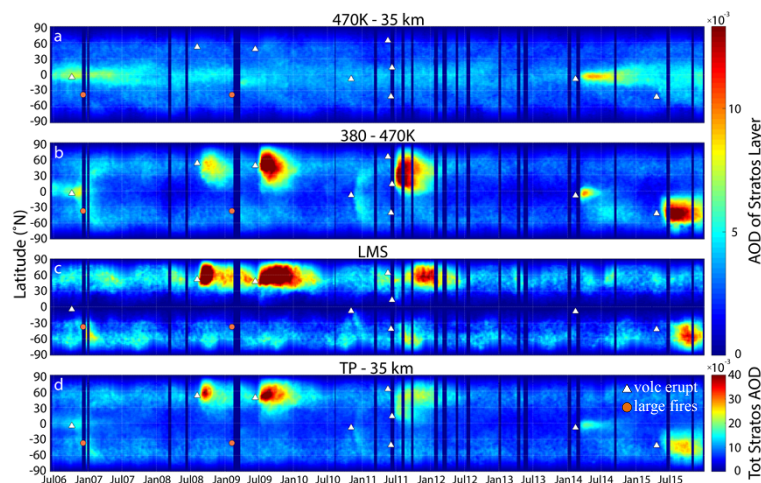


Aircraft and satellite agree above 2 km into the stratosphere

Deviations below caused by dust (and hygroscopic growth?)

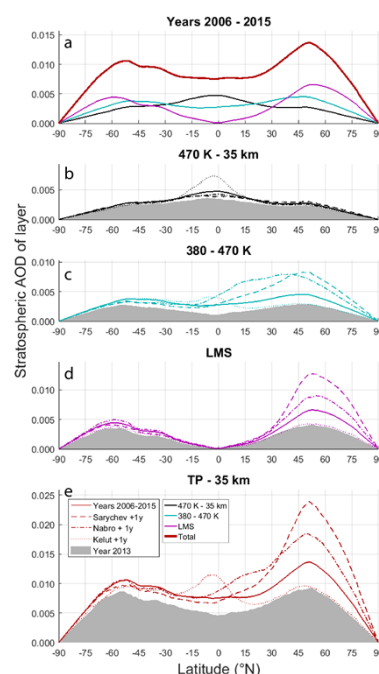


AOD of three stratospheric layers



- **Extratropical eruptions**
 - Some confined within **LMS**
 - Aerosol >380 K spread to the tropics
 - Up to one year impact
- **Tropical eruptions reaching < 20 km (470 K)**
 - Transported in shallow Brewer-Dobson branch
 - Up to one year impact
- **Tropical eruptions reaching > 20 km**
 - Ascended in the deep Brewer-Dobson branch
 - Several years impact

Largest volc imp in NH midlat



Global means of AOD and RF

Period	AOD	RF (Wm ⁻²)
Years 2006 - 2015	0.0082	-0.21
The year 2013	0.0059	-0.15
Sarychev +1year	0.0102	-0.26
Nabro +1year	0.0099	-0.25
Kelut +1year	0.0073	-0.18

Observations and Methodology

- CALIOP light scattering observations
 - Level 1b V4-10 data
 - Corrected for attenuation of particle and molecular extinction
 - Ice clouds removed by depolarization ratio
 - Polar stratospheric clouds removed by temp threshold
- AOD computed by lidar ratio of 50 sr
- RF = -25×AOD
- IAGOS-CARIBIC aerosol composition analysis
 - Aerosol sampling at 9-13 km alt
 - Up to 20 elements detected by Ion Beam Analysis
- MODIS
 - Aboard Terra
 - Cirrus reflectance data from level 3 monthly means
 - Averaged over 30-60°N