

The causes of upper tropospheric and stratospheric aerosol variations during the Post-Pinatubo period

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Aerosols are key components of the climate system through their direct radiative impacts and their roles as nuclei for cloud formation. While it's well known that major volcanic eruptions can enhanced stratospheric aerosol loadings for years with subsequent effects on climate, the extend to which minor eruptions as well as other sources affect aerosol levels of the upper troposphere and lower stratosphere still have to be understood. Over the past 15 years, the absence of major eruptions represented a unique opportunity to monitor background UTLS aerosol levels. Hofmann et al. (2009) found, using ground-based lidars at Mauna Loa and Boulder, that aerosol backscatter between 20-30 km have increased over the period 2000-2009 at a similar rate than SO₂ emissions in Asia (India, China). During this presentation, we will show that relatively small volcanic eruptions (Volcanic Explosivity Index=3-4) were the main sources of stratospheric aerosol variability over this period. In addition, we will also show that the strong annual cycle in stratospheric aerosol found with ground-based lidars was affected by a problem of calibration. Finally, the last part of this talk will focus on an intriguing aerosol feature observed every summer in the upper troposphere during the Summer Asia Monsoon since the beginning of the 2000's. Such maximum of aerosol could be the first evidence that upper tropospheric aerosol levels have been affected by the strong increase of Asian Pollution over the last two decades.