



Characterizing the Aerosols over the Tibetan Plateau

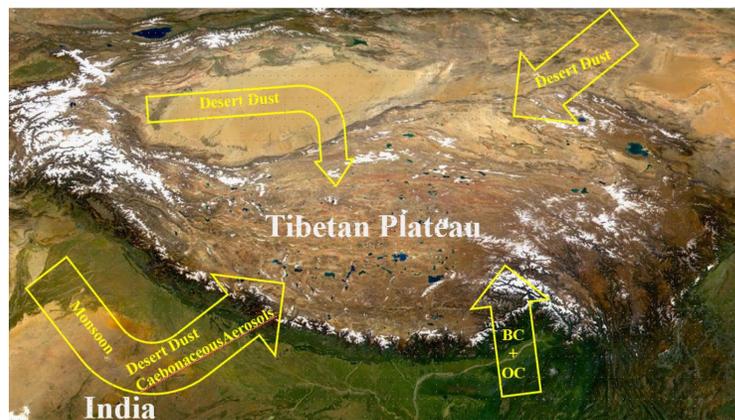


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Background Information

- The Tibet Plateau (TP) is at the juncture of several important natural and anthropogenic aerosols sources, including several deserts and areas in south Asia where biomass is burned extensively.



- My research includes a literature review of past studies, and analysis of MODIS and CALIPSO satellite data.

References

Cong, Z., et al.(2015). Carbonaceous aerosols on the south edge of the Tibetan Plateau: concentrations, seasonality and sources. *Atmos. Chem. Phys.*, 15, 1573–1584.

Huang, J., et al. (2007). Summer dust aerosols detected from CALYPSO over the Tibetan Plateau. *Geophysical Research Letters*, Volume 34, L18805.

Liu, Y., et al. (2015). Modeling study on the transport of summer dust and anthropogenic aerosols over the Tibetan Plateau. *Atmospheric Chemistry and Physics*, Volume 15, Issue 21, Pages 12581-12594.

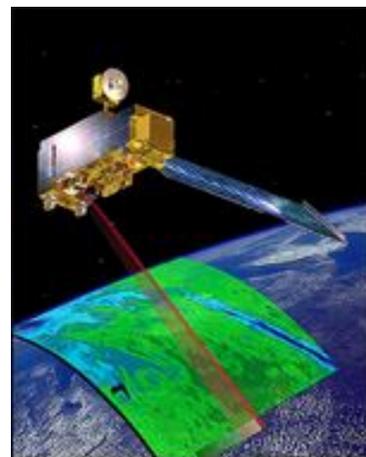
Liu, Z., et al. (2008). Airborne dust distributions over the Tibetan Plateau and surrounding areas derived from the first year of CALIPSO lidar observations. *Atmospheric Chemistry and Physics*, 8, 5045–5060.

Yoram, J., et al. (2002). A satellite view of aerosols in the climate system. *Nature*, volume419, pages215–223.

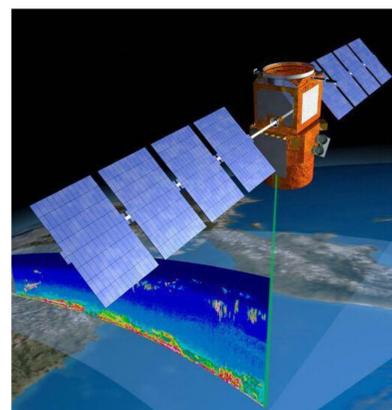
Zhang, X., et al. (2017). The online measured black carbon aerosol and source orientations in the Nam Co region, Tibet. *Enviro Sci Pollut Res Int*, 24(32): 25021-25033.

Literature Review

- Dust is mostly distributed on the north slope, and dust occurs more often during Spring and Summer than Fall and Winter. Summer dust is originated from the surrounding deserts, mainly from Taklimakan desert. Dust transports to the TP by an anticyclonic pathway, which is driven by westerly current and topographic blocking. (Huang et al., 2007; Liu et al., 2015; Liu et al., 2008)
- Carbonaceous particles, mainly BC and OC on the south slope of TP are transported from long-distance polluted areas of South Asia, including India, Pakistan, Nepal, Bangladesh by large-scale atmospheric circulation like summer monsoon and local mountain wind systems. BC and OC concentrations both have a clear seasonal variations, reaching maximum in the pre-monsoon period and minimum in the monsoon season. This pattern is closely related to meteorological conditions like precipitation and wind speed. (Zhang et al., 2017; Cong et al., 2015)



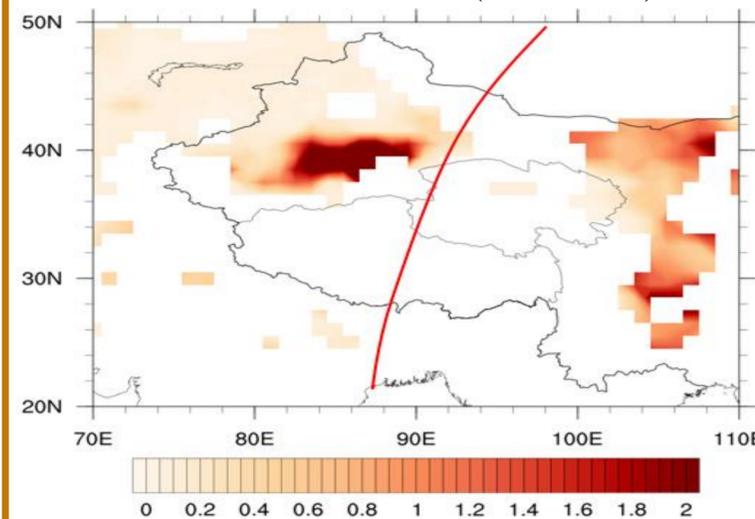
MODIS/Terra



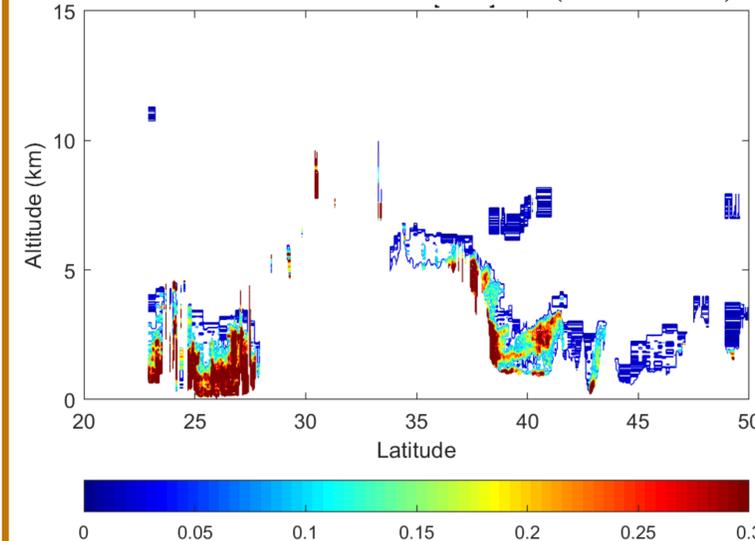
CALIPSO

Next Steps

MODIS/Terra AOD (08/22/2007)



CALIPSO Extinction Coefficient (08/22/2007)



- CALIPSO provides information on the altitude of aerosol layers in the atmosphere, which are missed by other observational satellites, like MODIS.
- By using CALIPSO, we can identify aerosols confined to the lowest part of the atmosphere that are likely to be removed quickly by rain and those that are transported to higher altitudes that are much more likely to travel long distances and affect air quality in distant areas.

Next steps-Examine an extreme event

1. Examine CALIPSO data on high PM days to estimate how much of the column is near the surface.
2. Understand the meteorological conditions in which these extreme dust/aerosol events occur.
3. Write up results for the Master Thesis.