

Pronounced Changes in Water Vapor, Ozone and Meteorological Parameters Associated with Dust Storms Using Multi Sensor

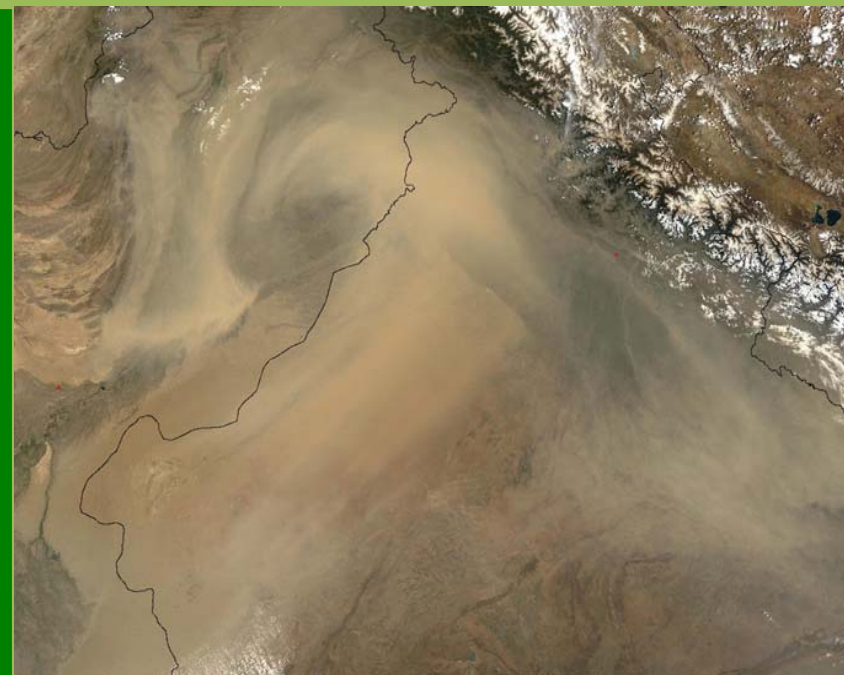
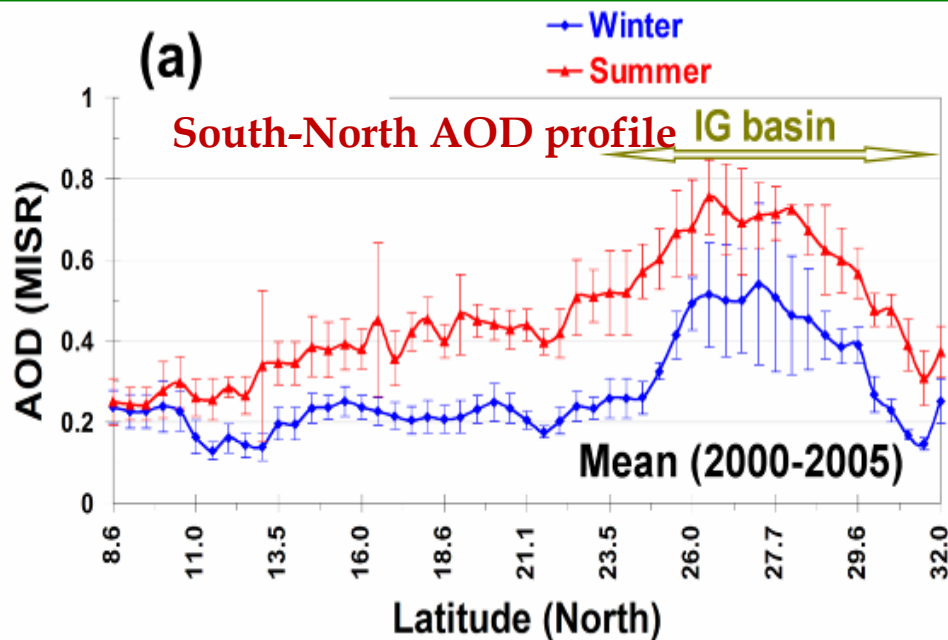
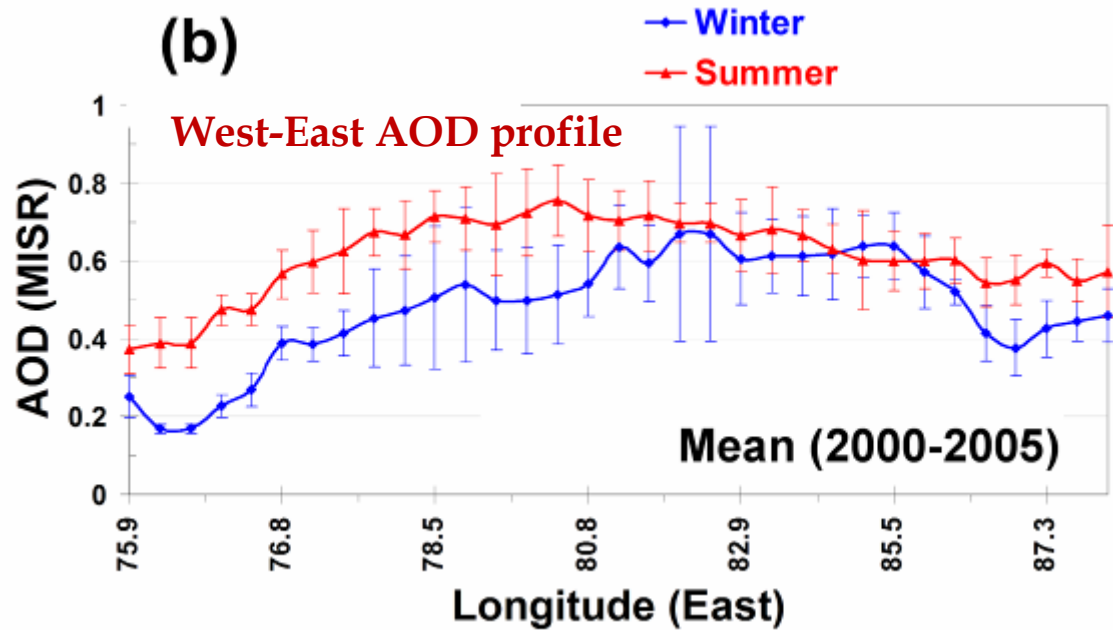
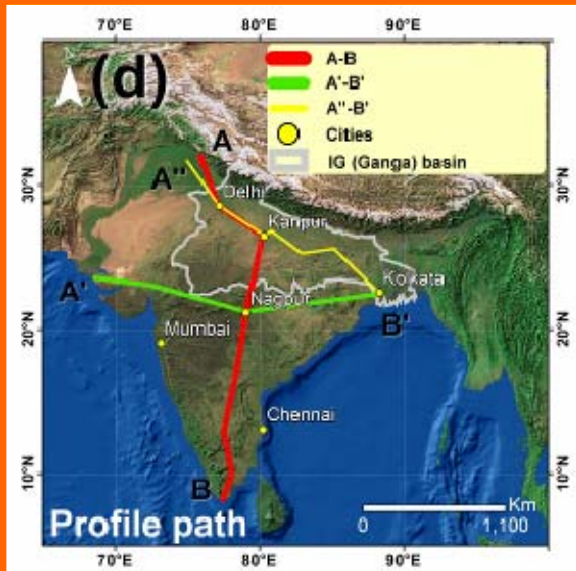
Ramesh P. Singh, A.K. Prasad, Ritesh Gautam and Menas Kafatos

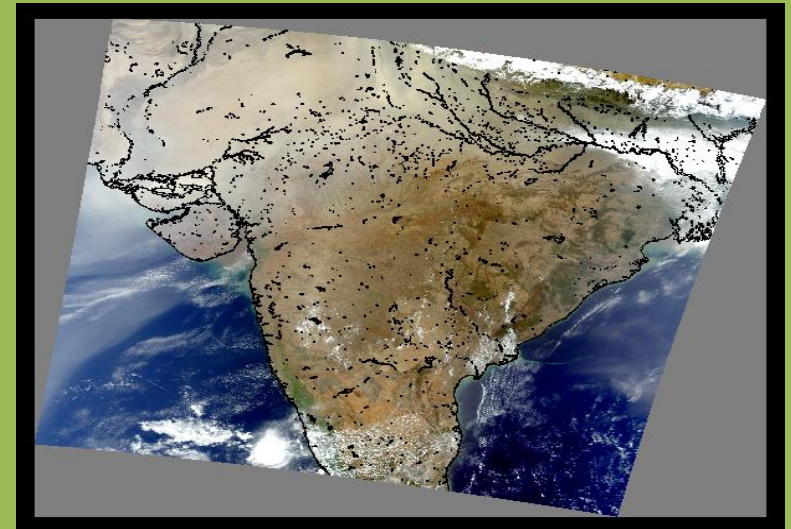
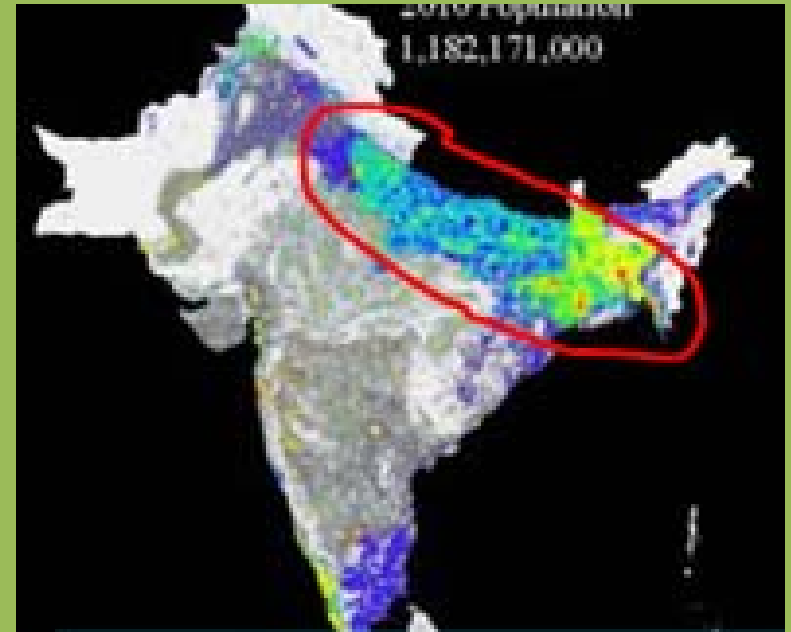
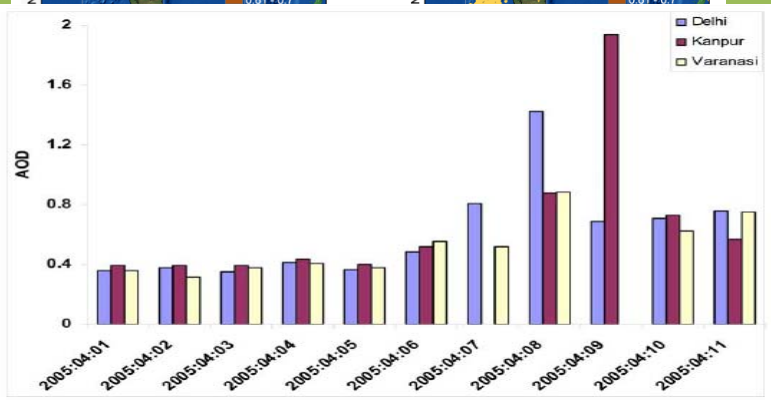
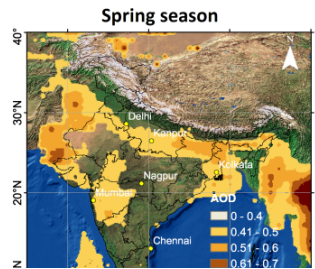
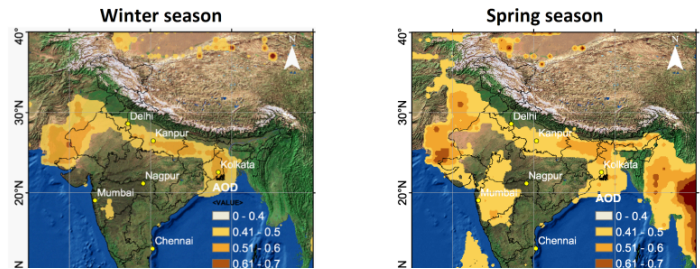
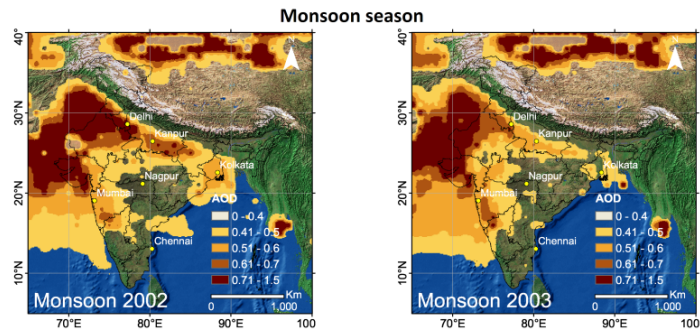
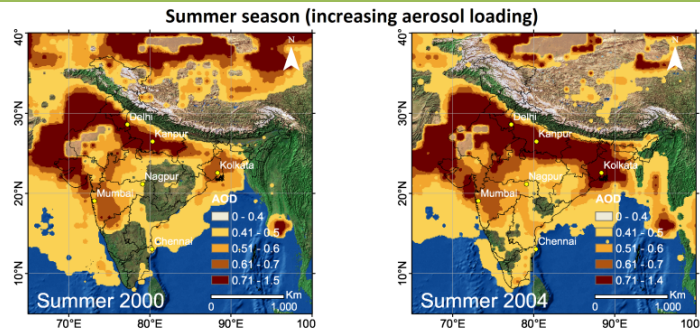
Center for Earth Observing and Space Research

George Mason University

Fairfax, VA, USA

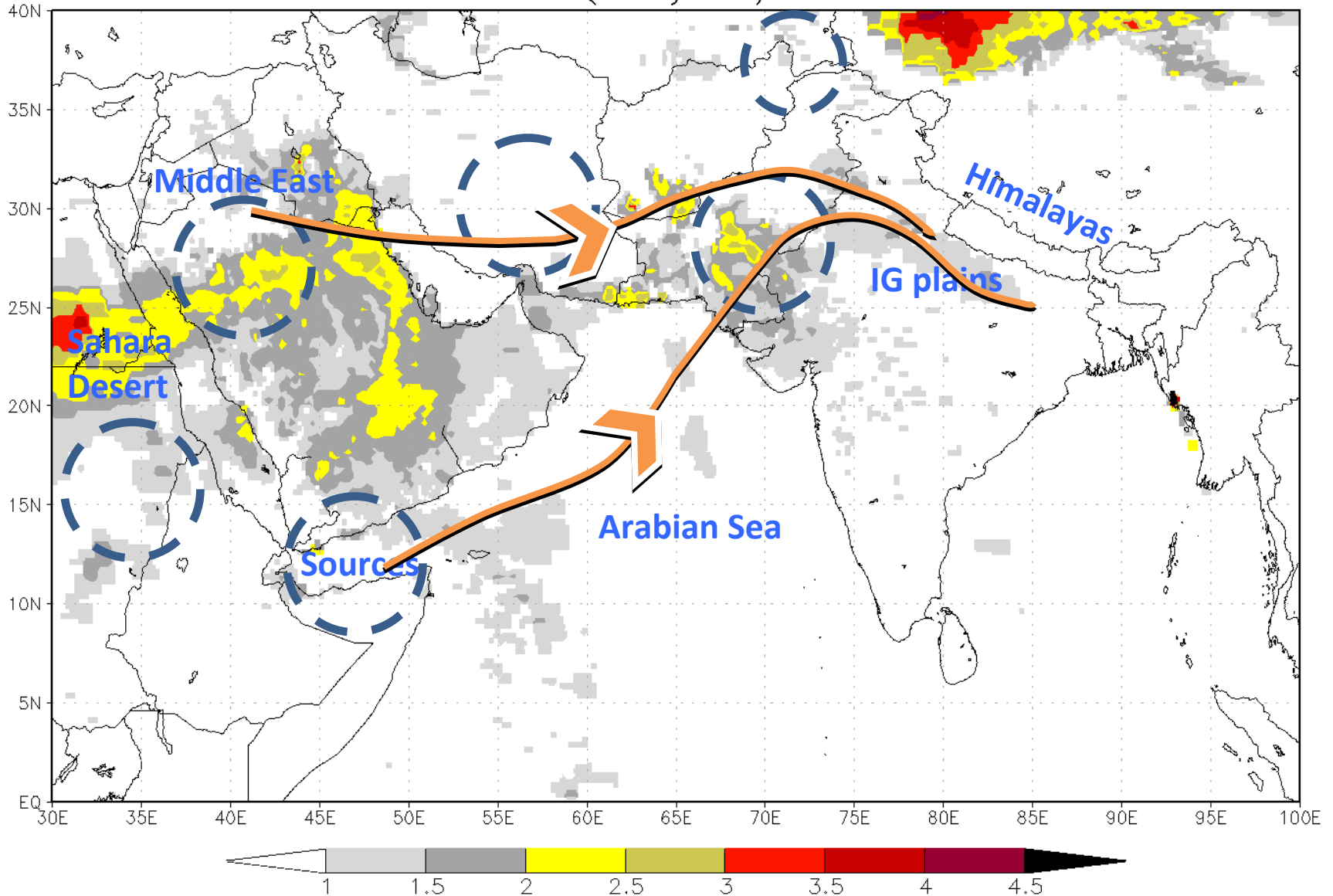
rsingh3@gmu.edu





Dust storms (May 7-8-9, 2005)

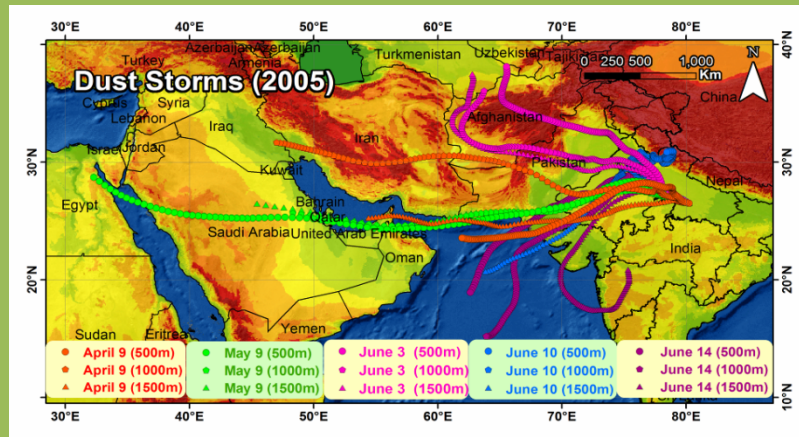
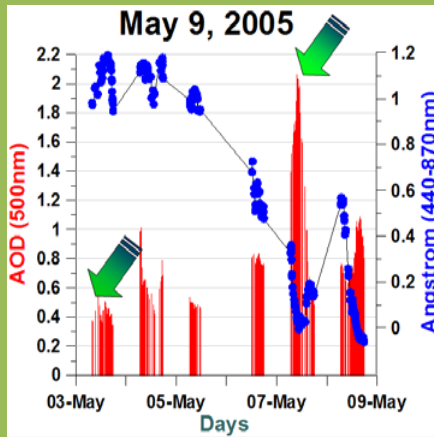
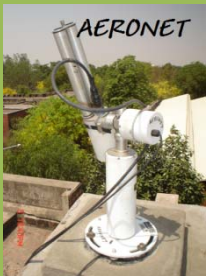
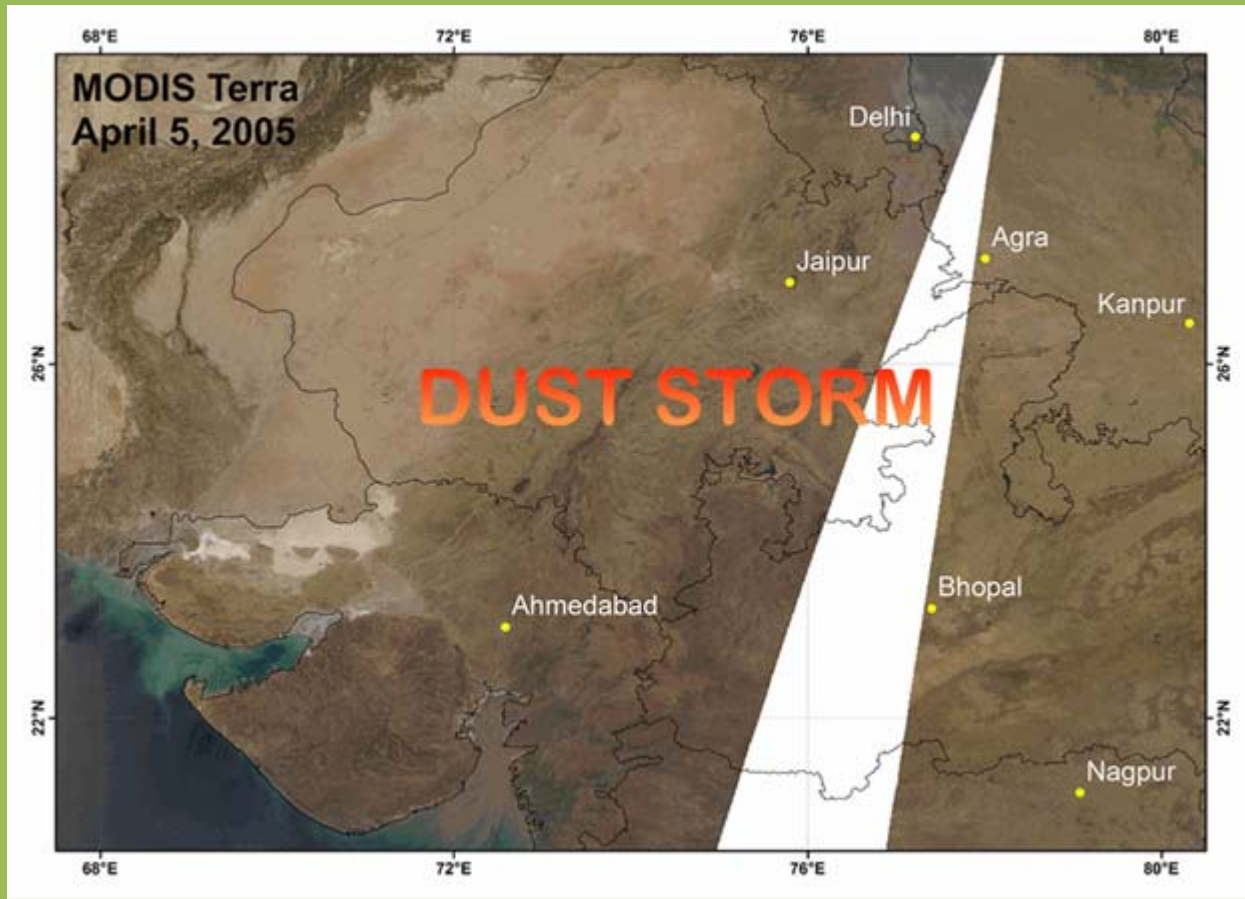
OMT03E.002 UV Aerosol Index [unitless]
(01May2005)



Dust Storms

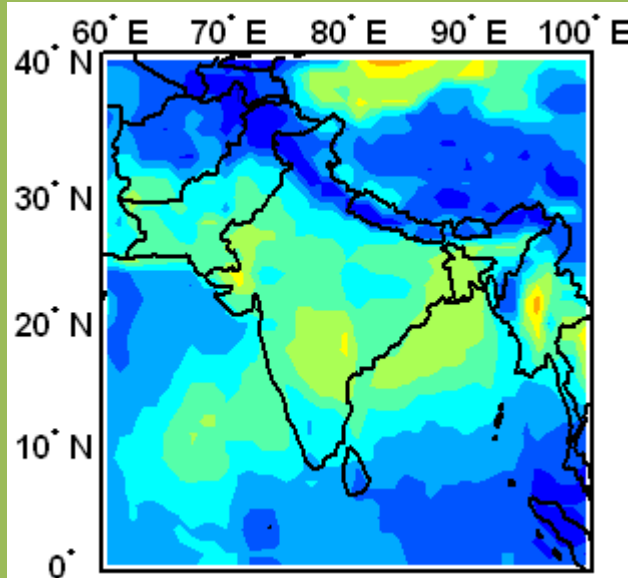
Satellite (daily
MODIS Terra
and Aqua)

Ground based
CIMEL
Sun-photometer

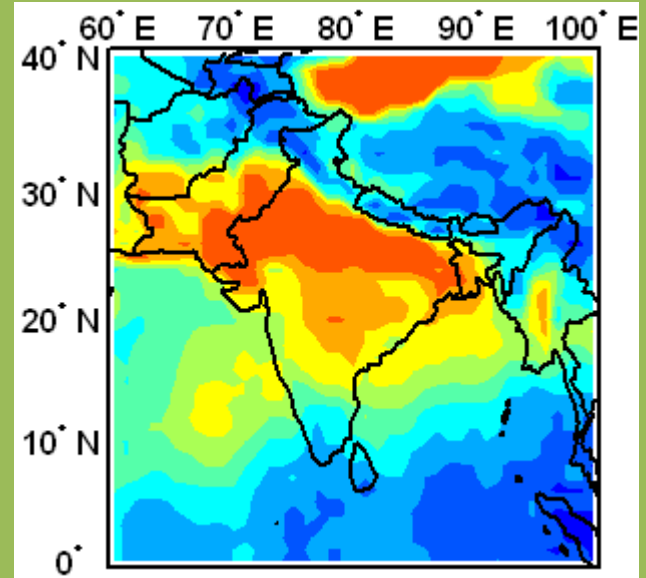


**Climatology
TOMS AI
1997-2004**

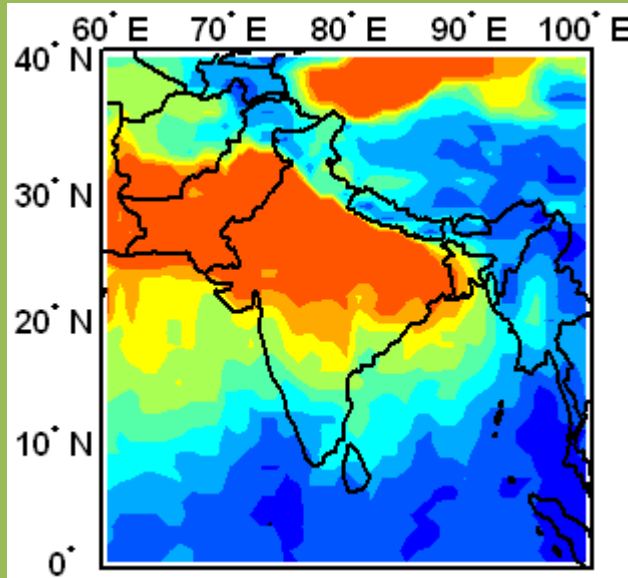
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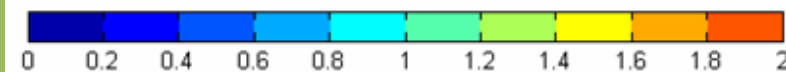
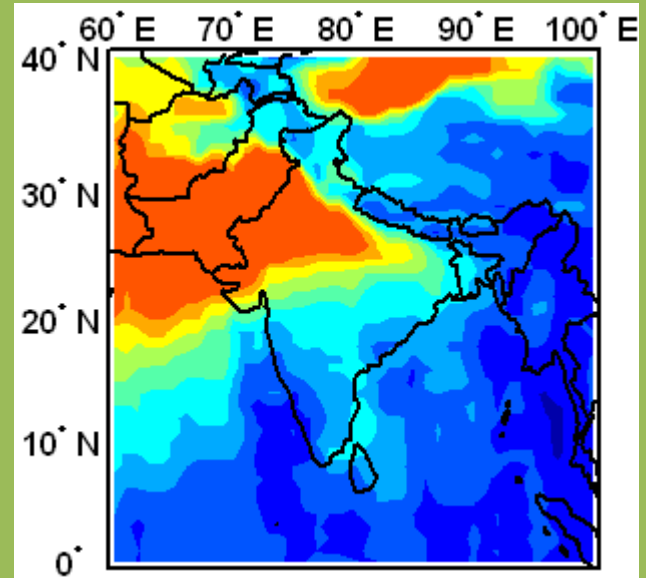
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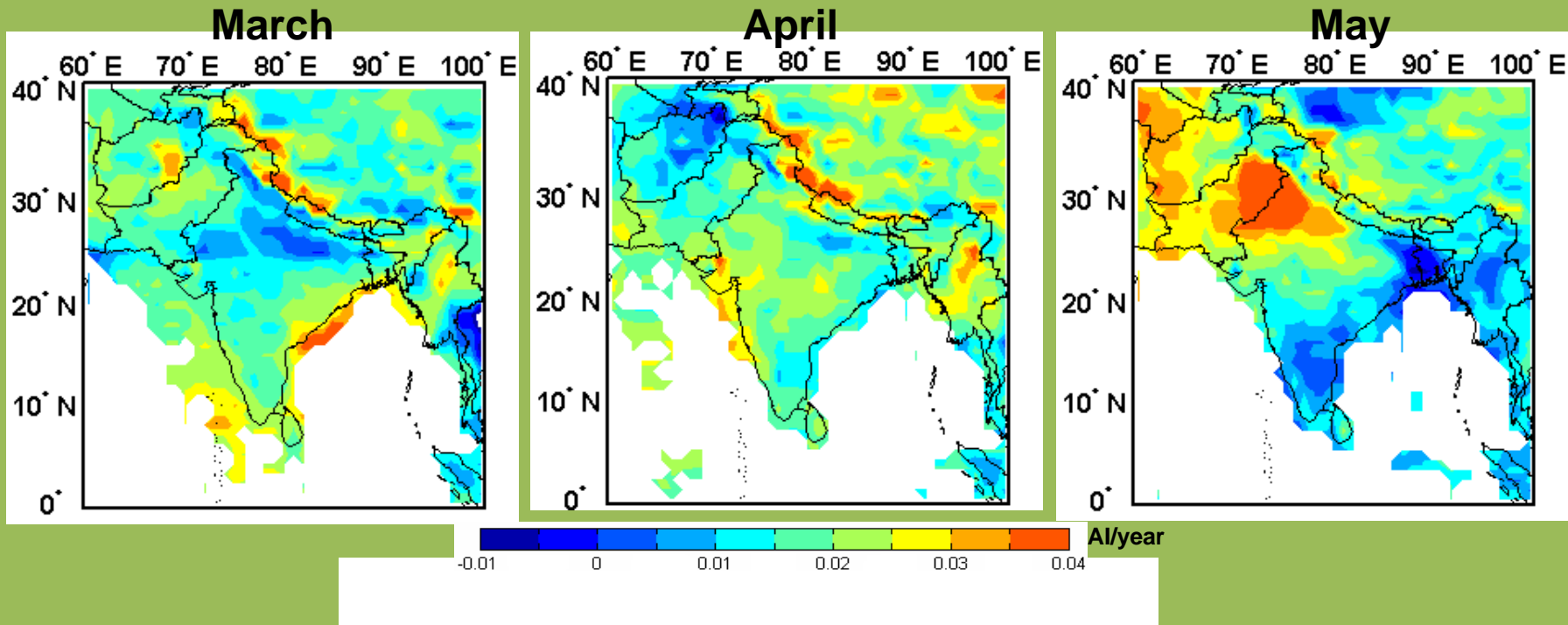
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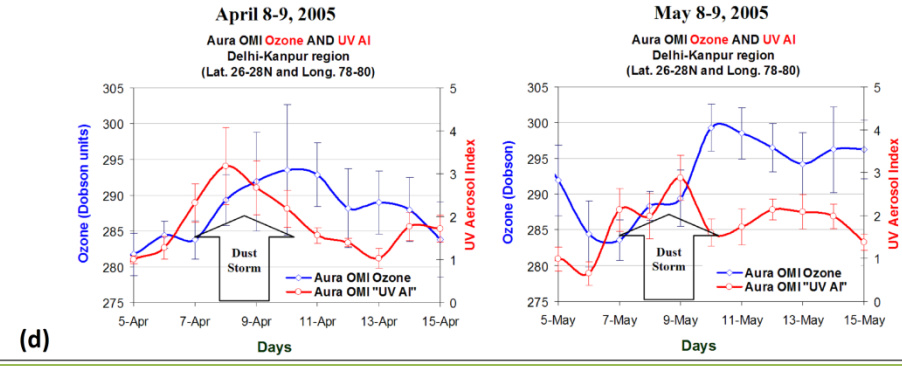
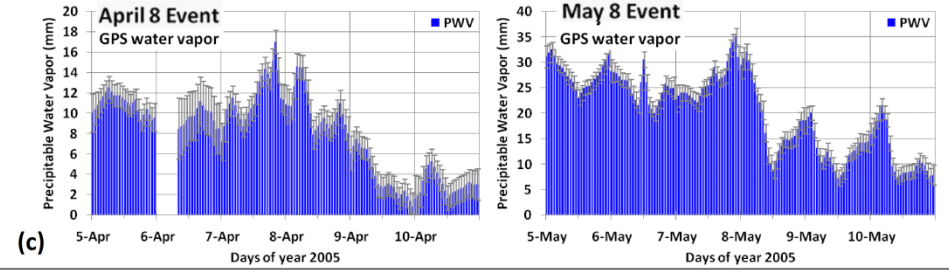
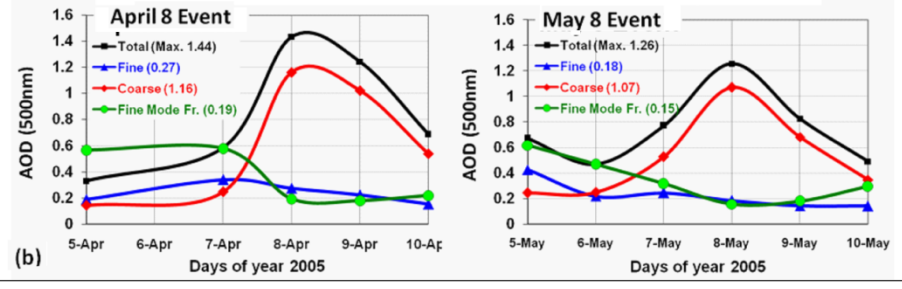
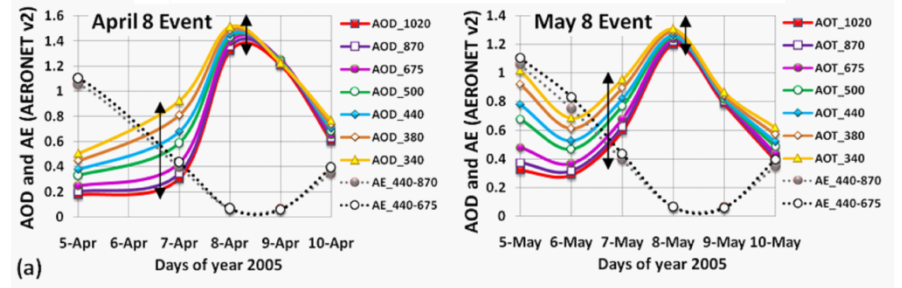
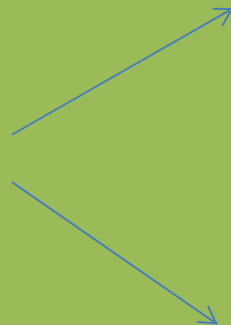
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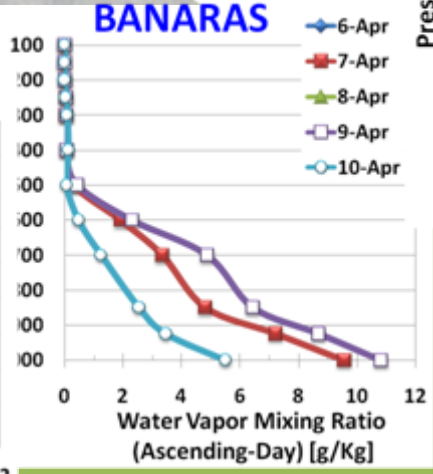
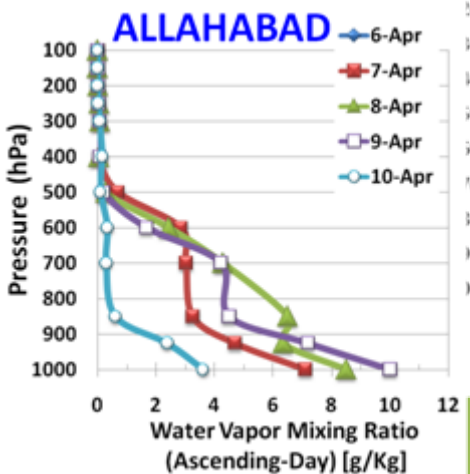
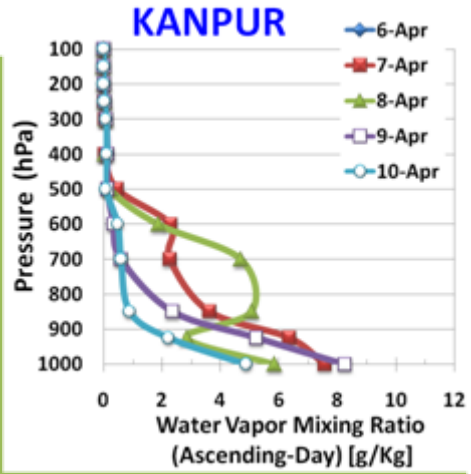
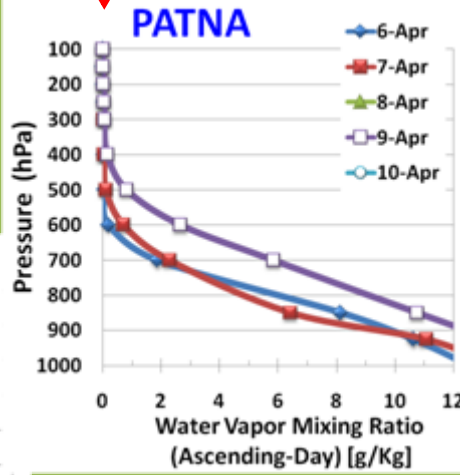
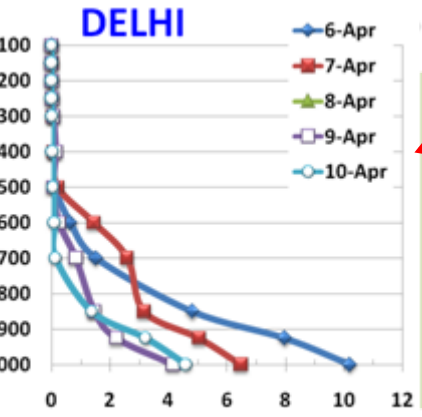
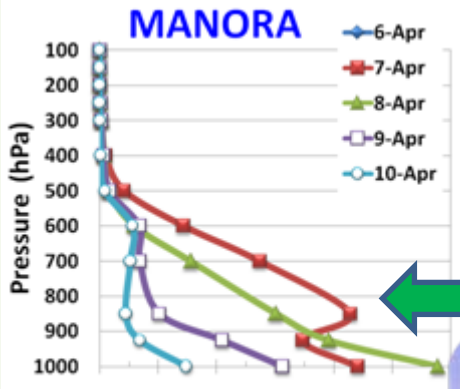
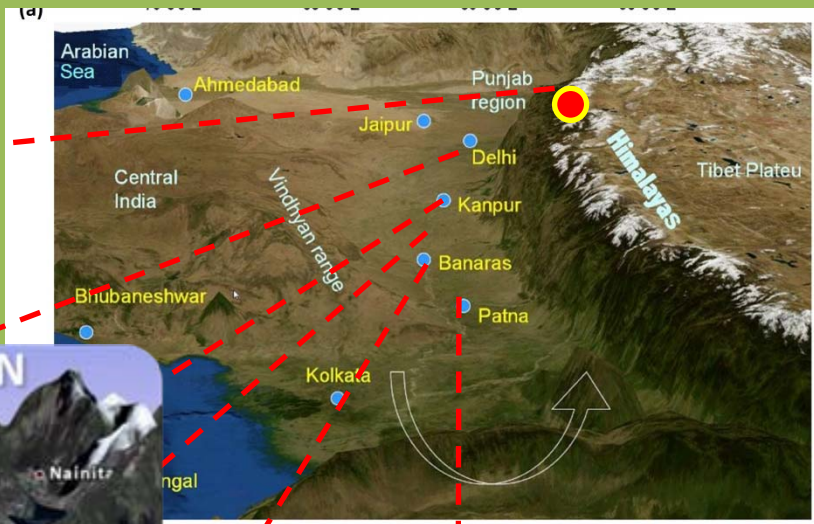
TOMS AI Trend 1979-2001



AERONET



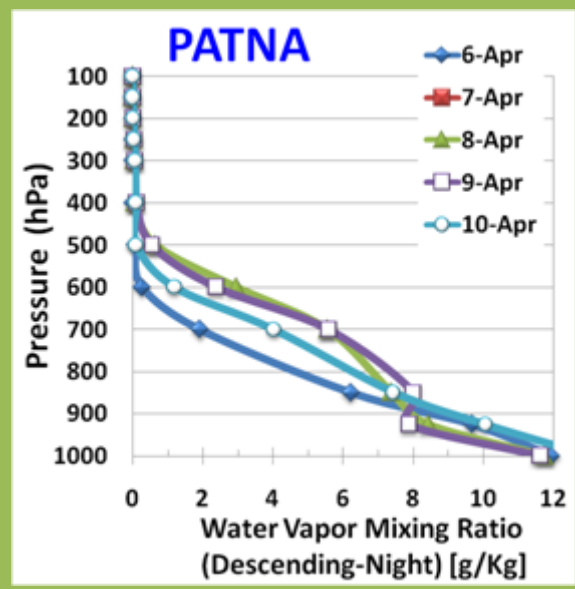
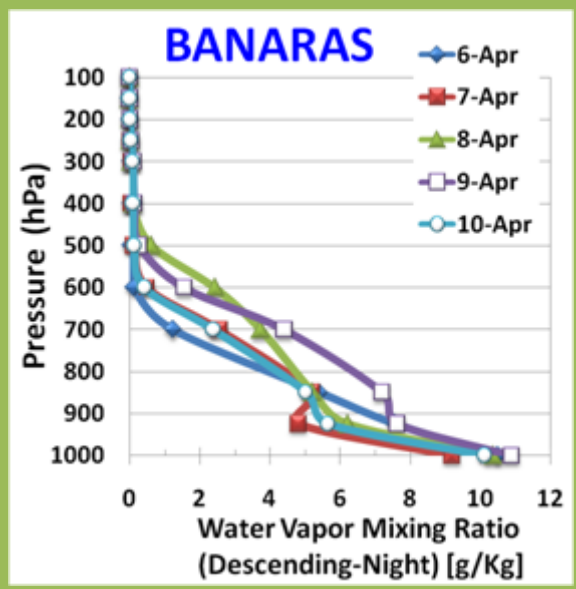
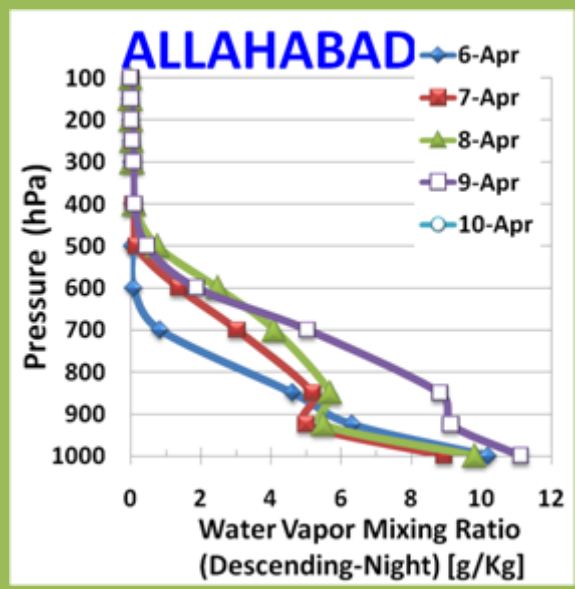
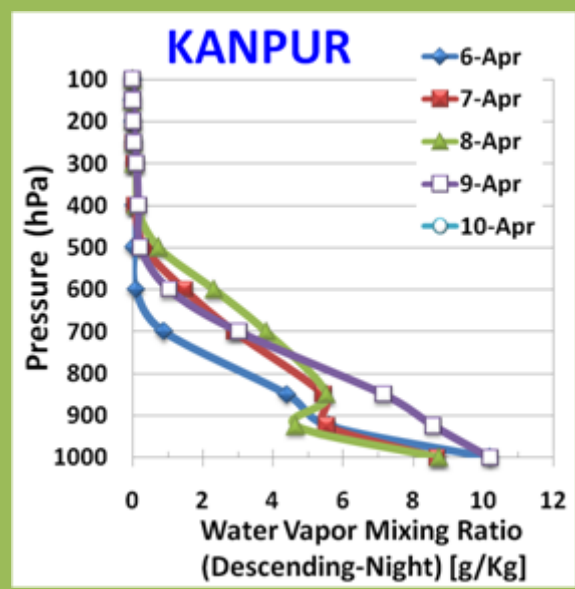
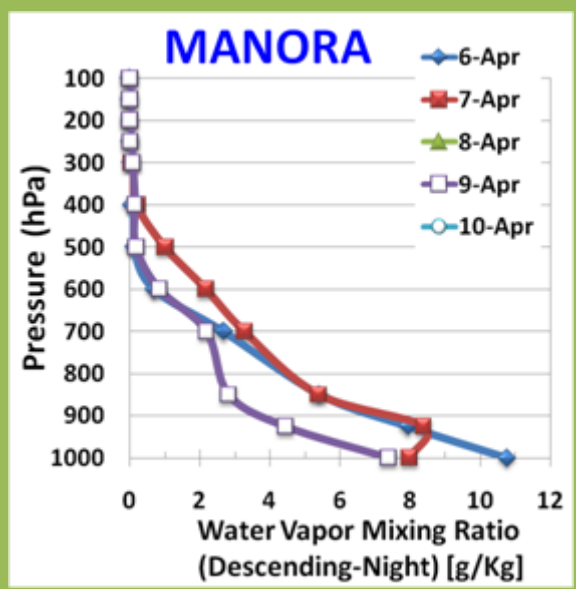
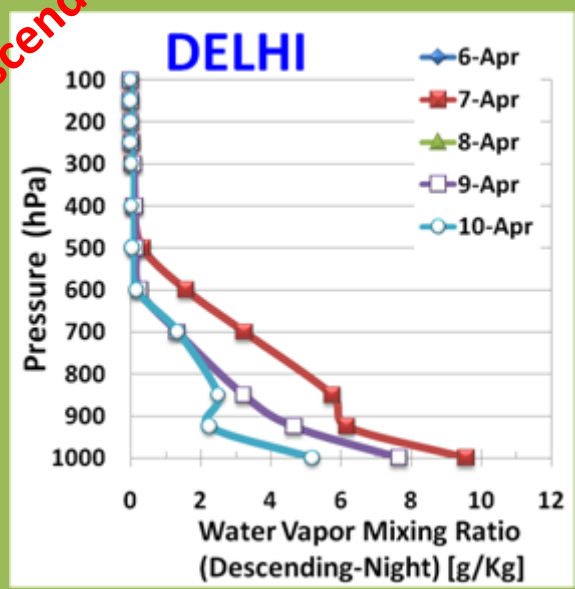
Dust storm and AIRS – Water Vapor Mixing Ratio (g/Kg)



Ascending - Day

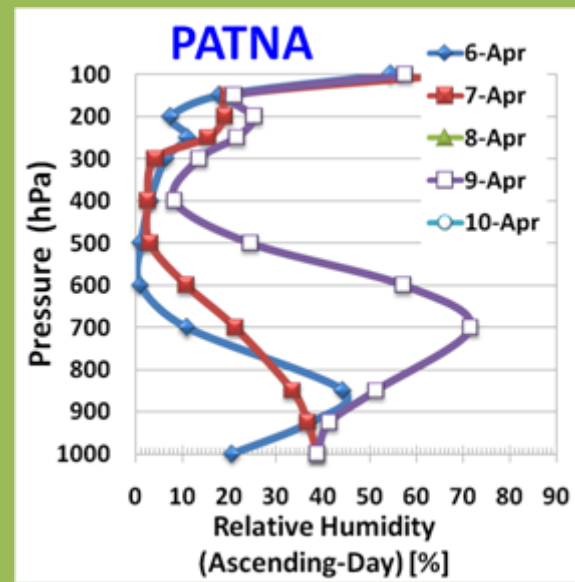
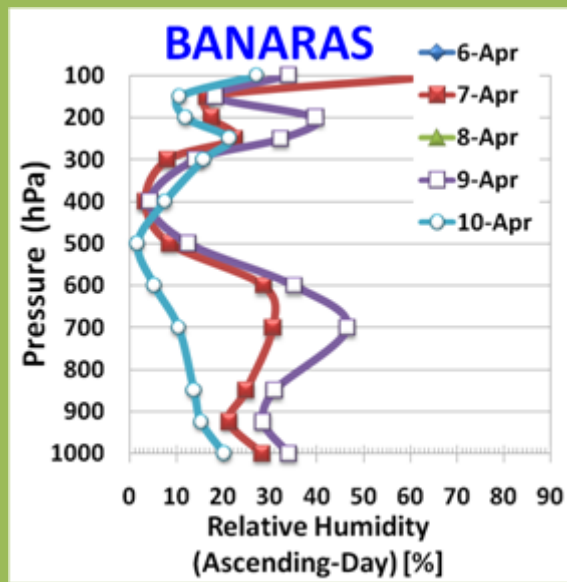
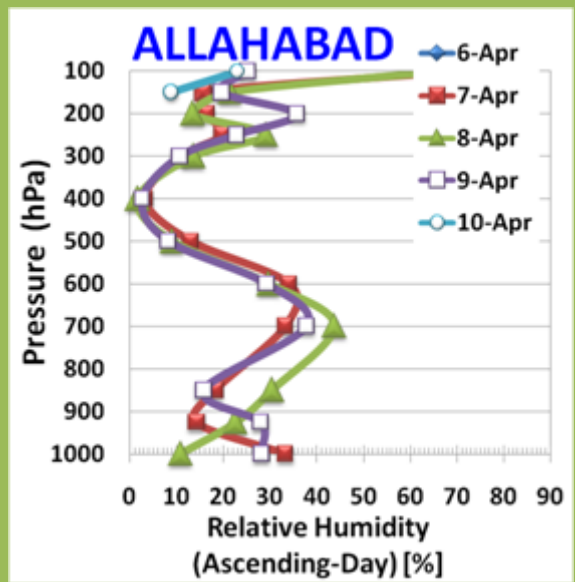
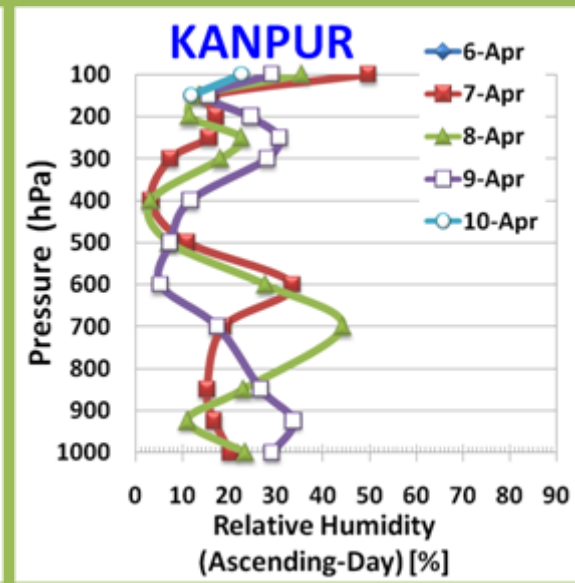
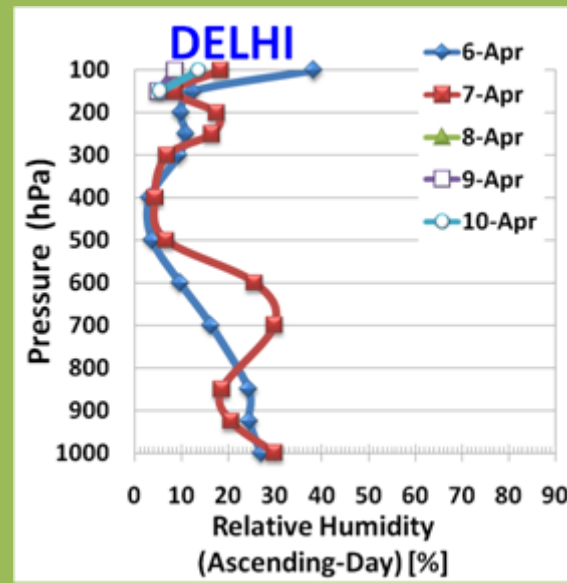
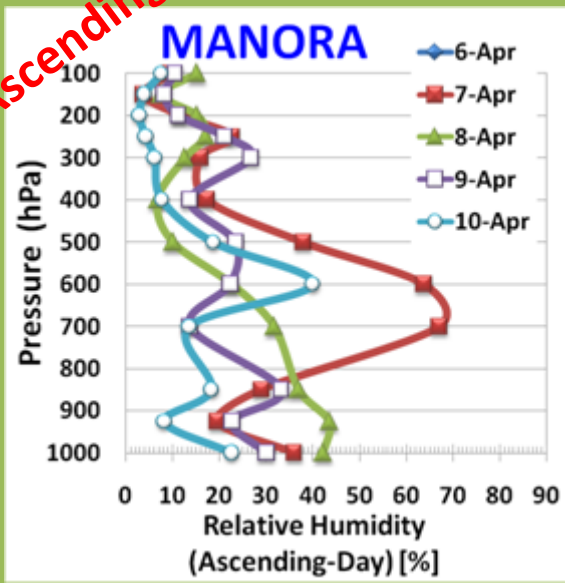
Descending - Night

AIRS – Water Vapor Mixing Ratio (g/Kg)



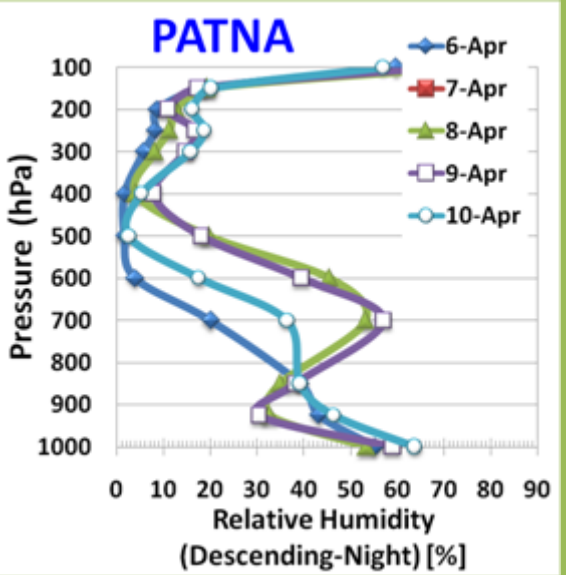
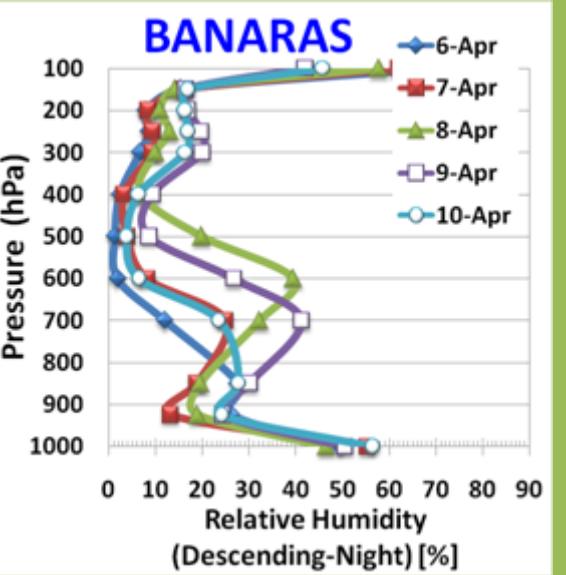
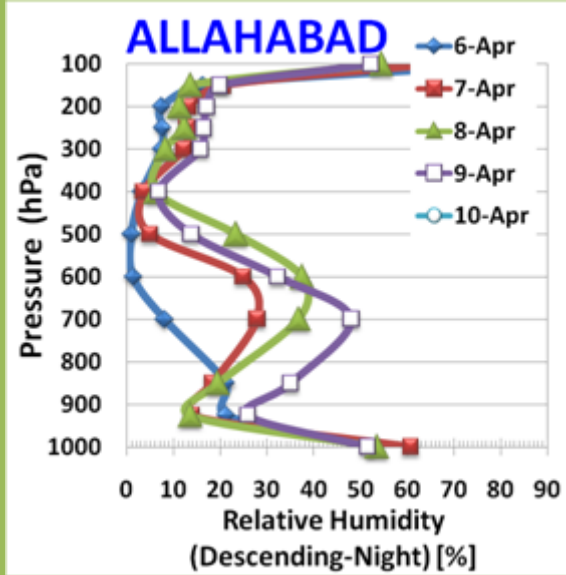
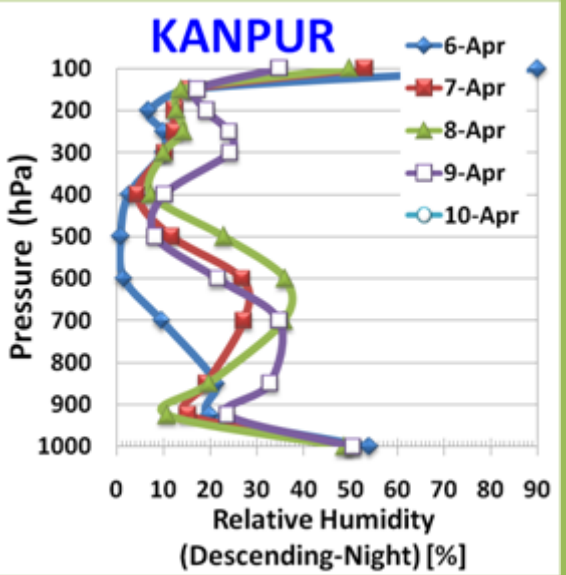
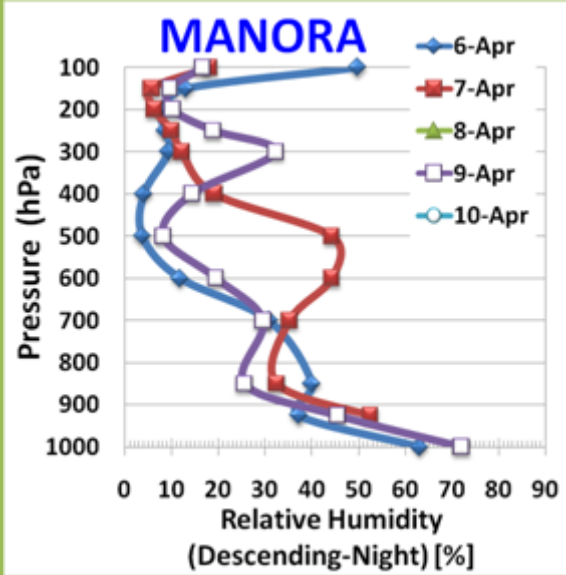
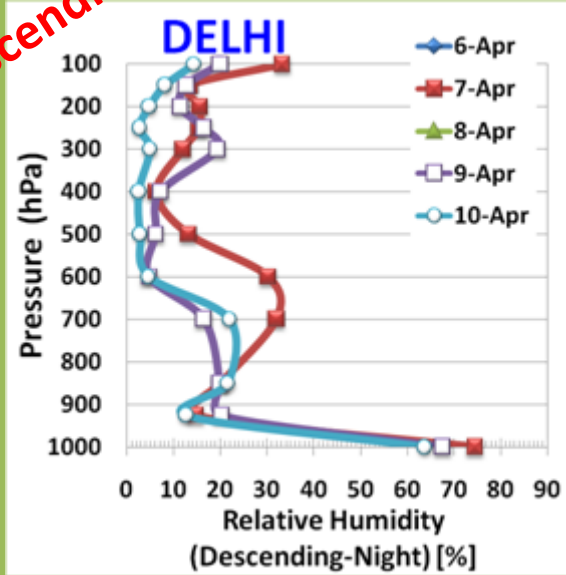
Ascending - Day

AIRS – Relative Humidity (%)



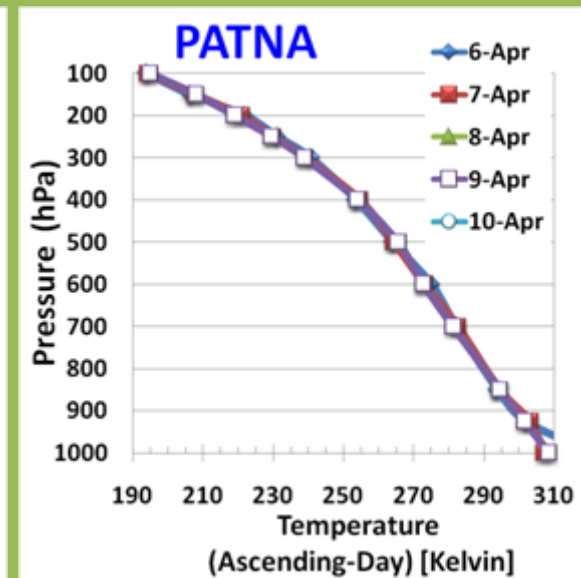
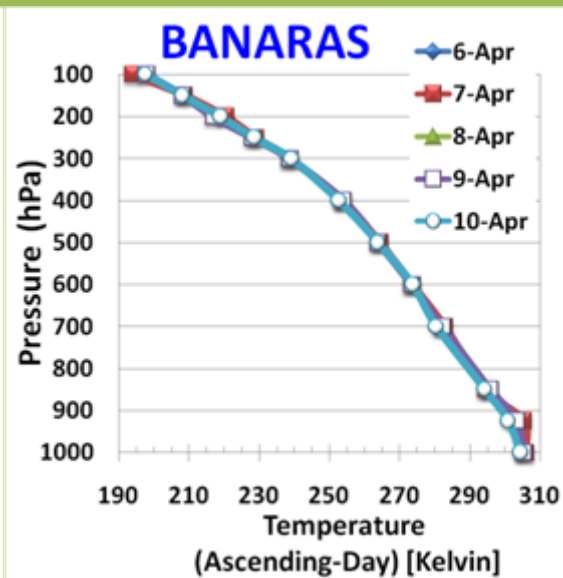
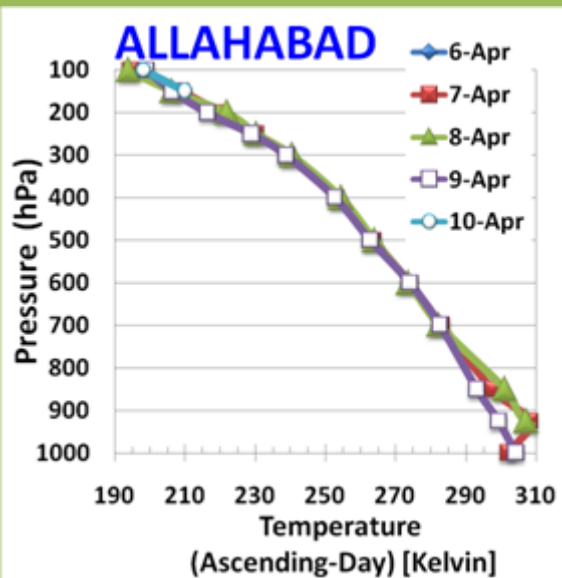
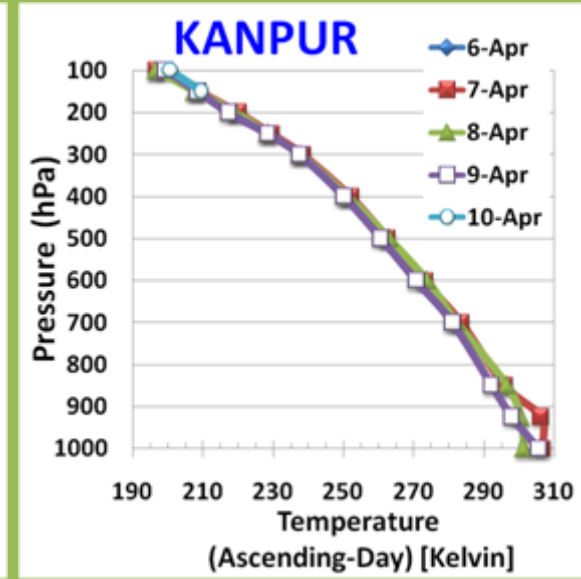
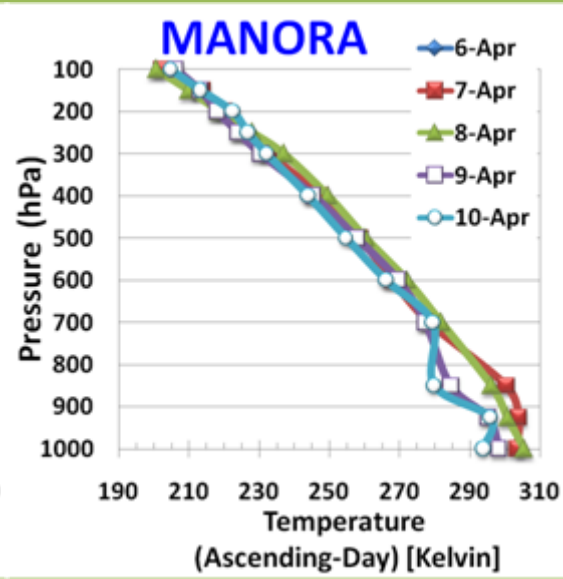
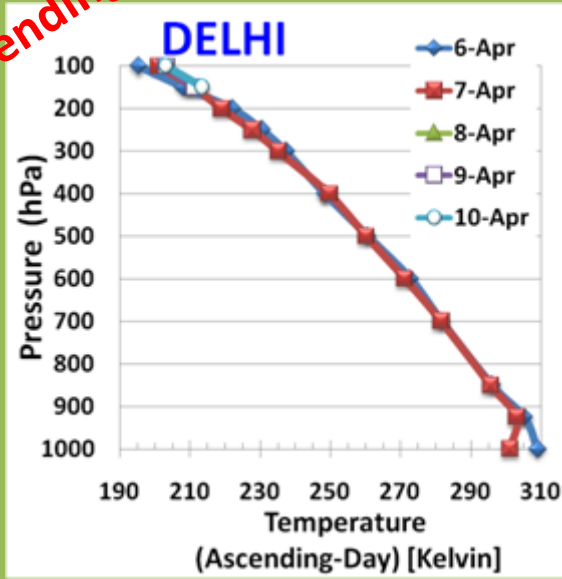
Descending - Night

AIRS – Relative Humidity (%)



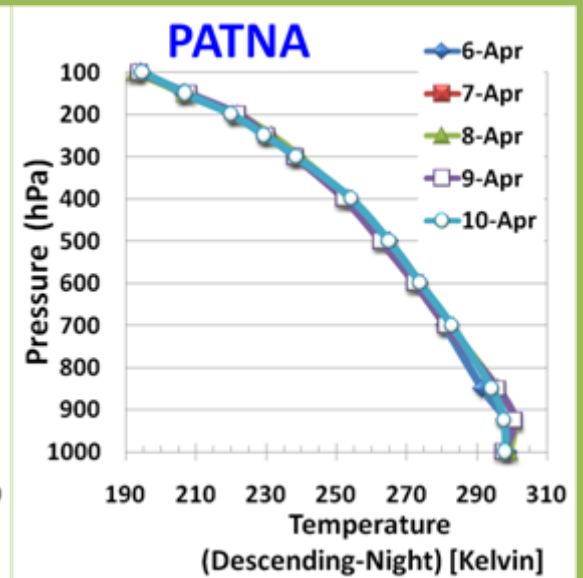
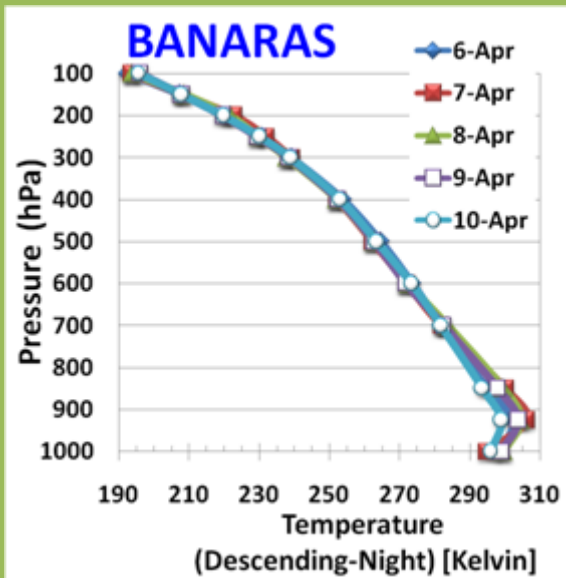
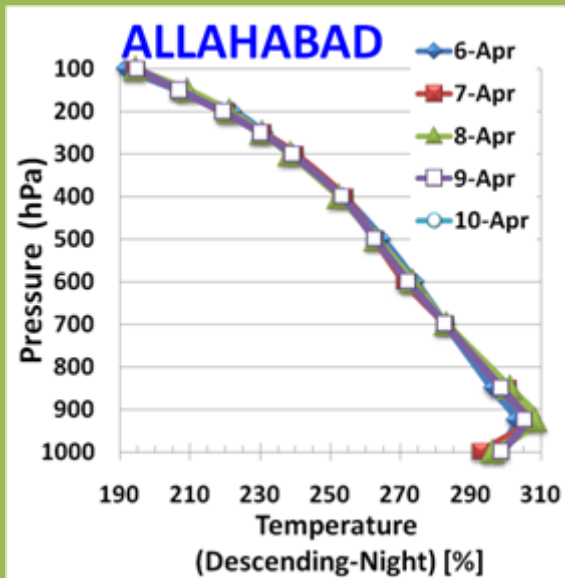
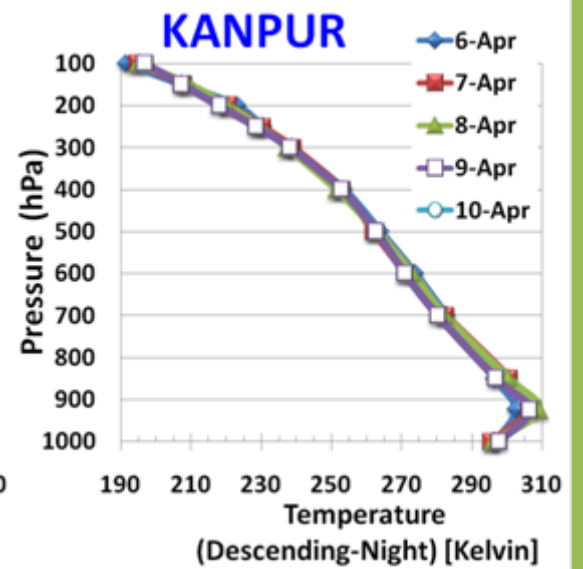
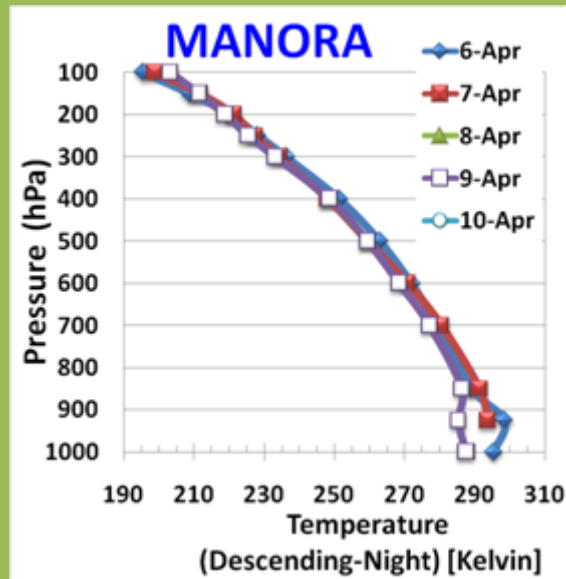
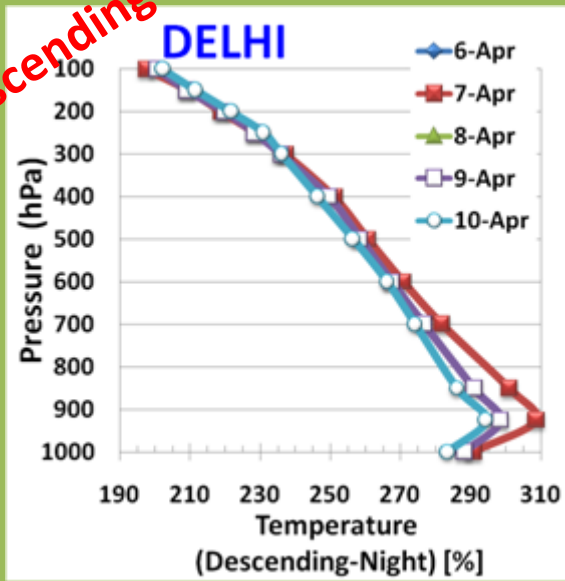
Ascending - Day

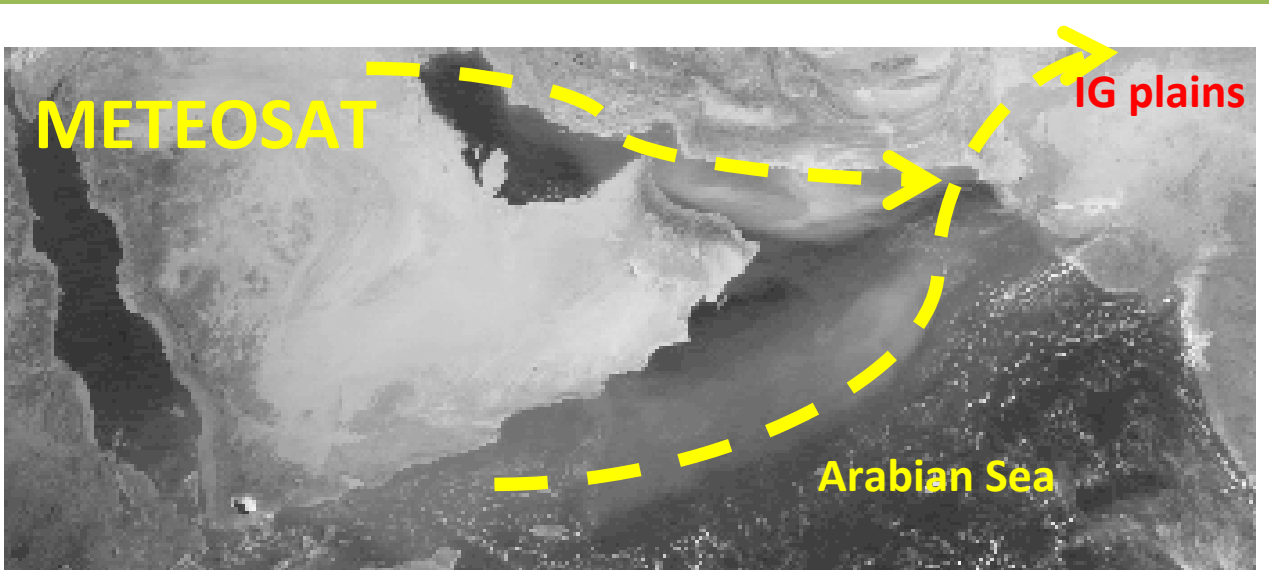
AIRS – Temperature (Kelvin)



AIRS – Temperature (Kelvin)

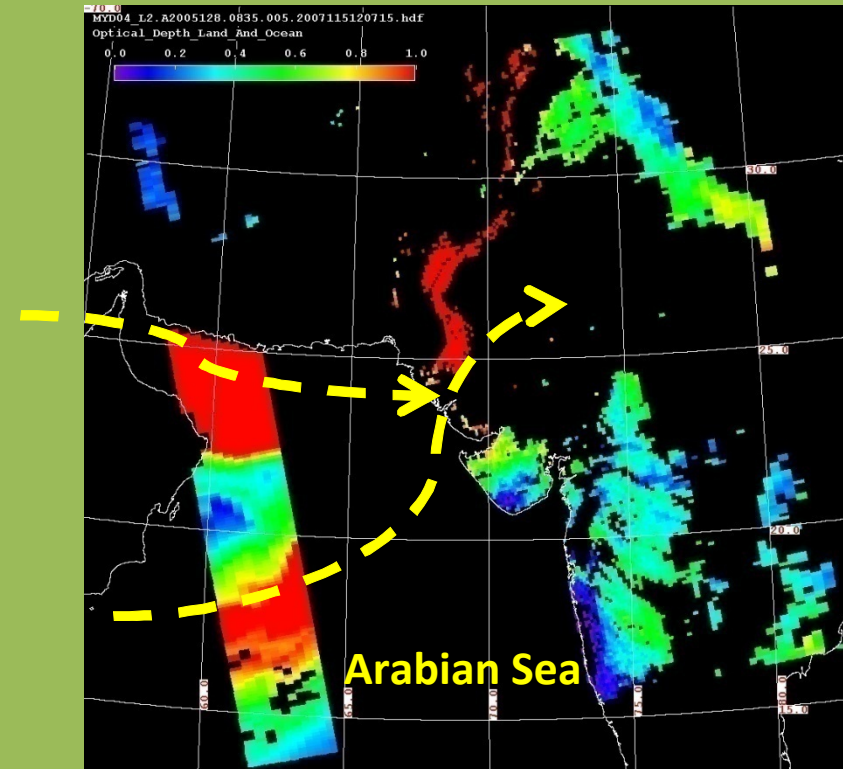
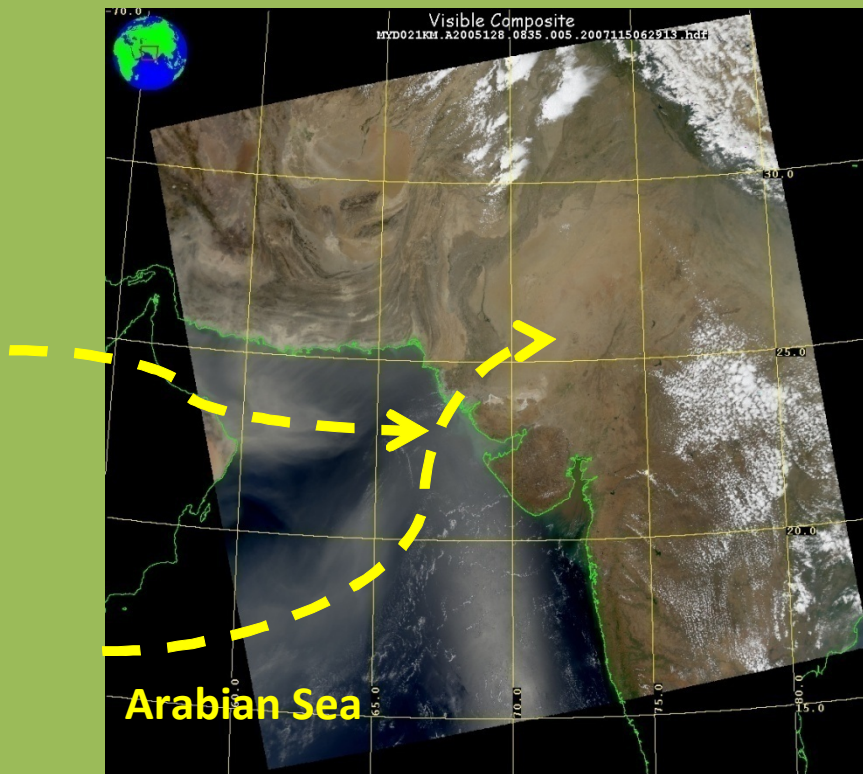
Descending - Night





Path of Dust storm

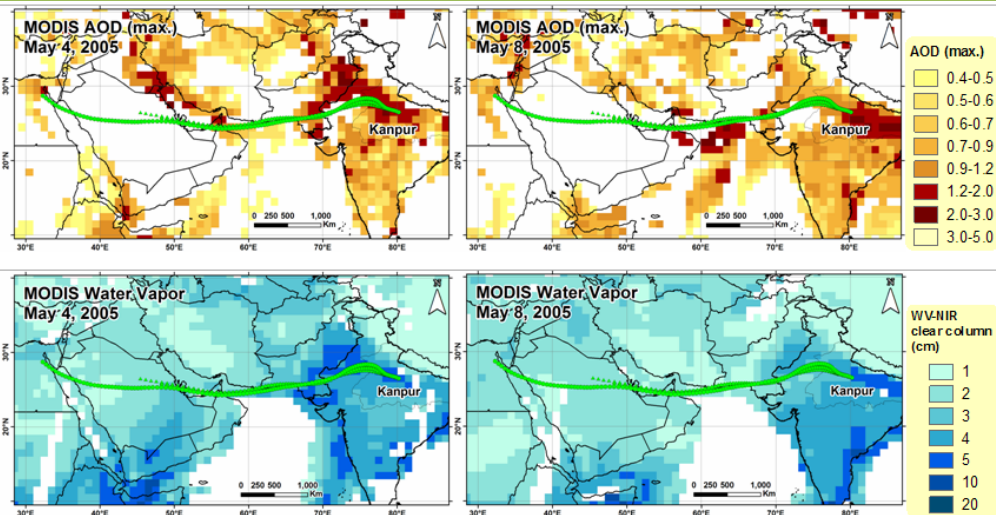
May 8, 2005



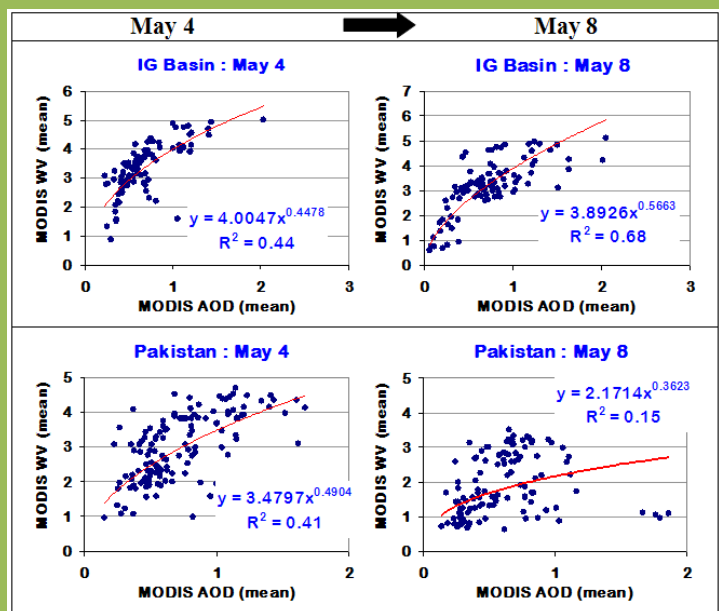
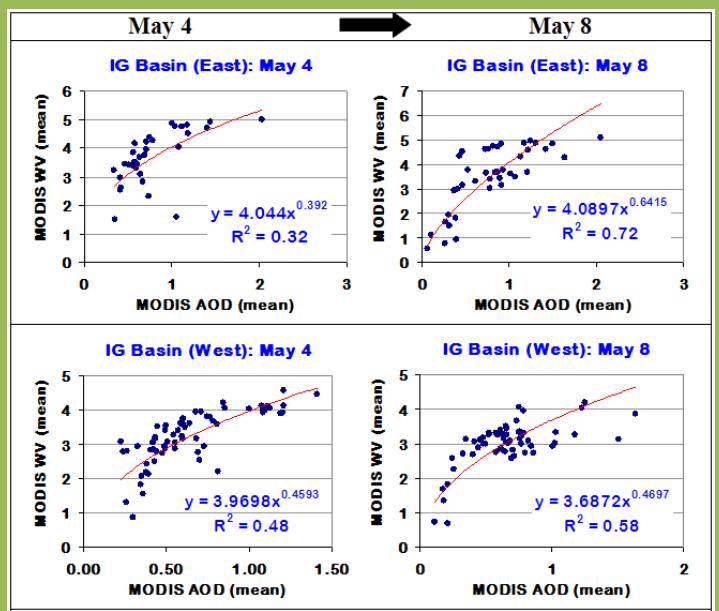
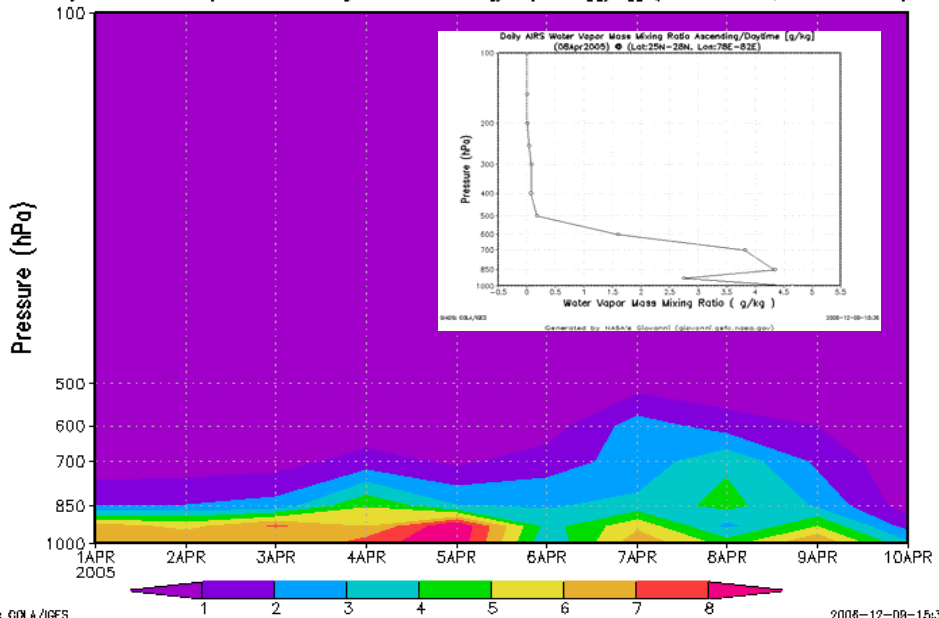
Dust storms: Association of water vapor with high AOD (Dust)

Maximum AOD (550nm)

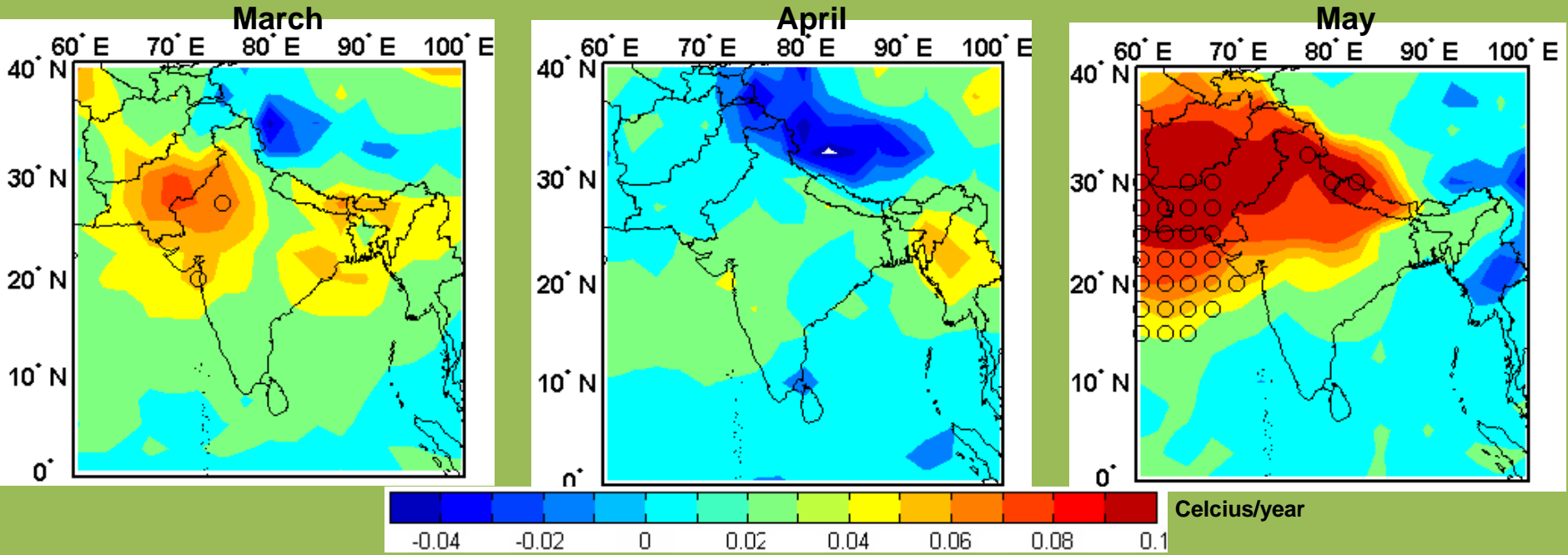
Mean Water vapor (cm) NIR-CC



Daily AIRS Water Vapor Mass Mixing Ratio Ascending/Daytime [g/kg] (Lat:25N-28N, Lon:78E-82E)

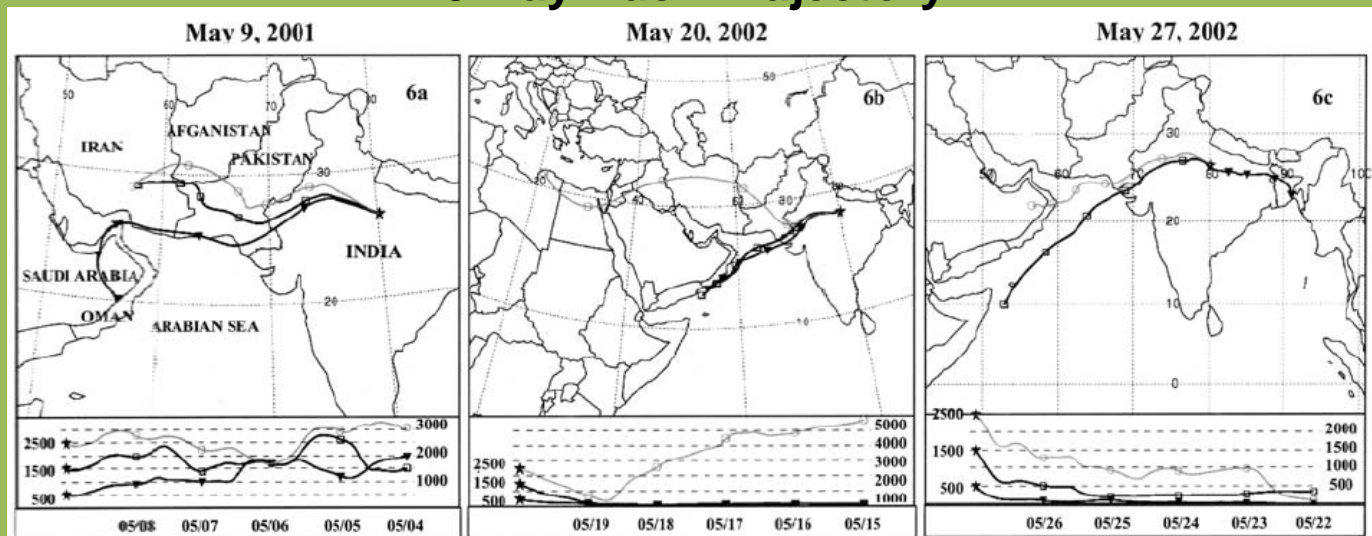


MSU mid-Trop. Temperature Trend (1979-2001)



*Black circles show regions where trend is significant at 95% confidence interval.

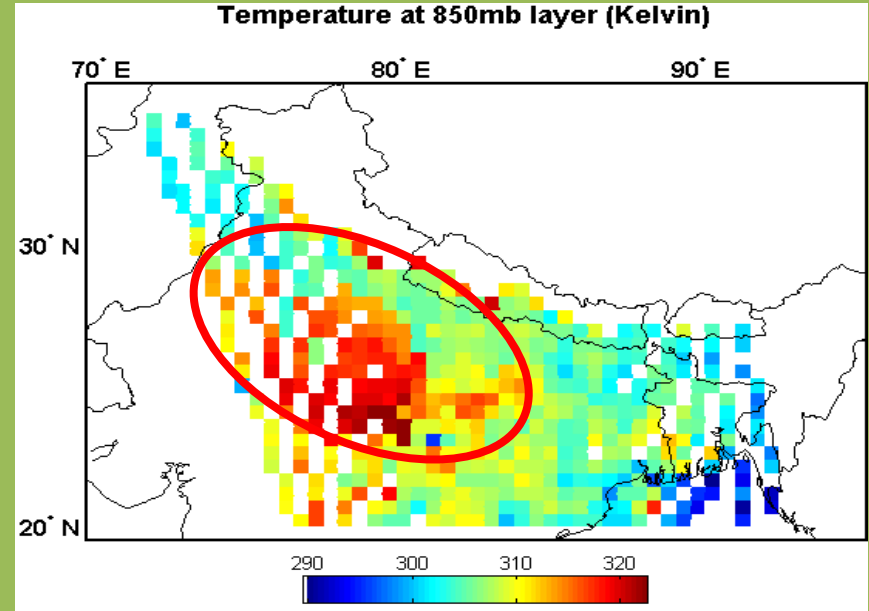
5-Day Back Trajectory



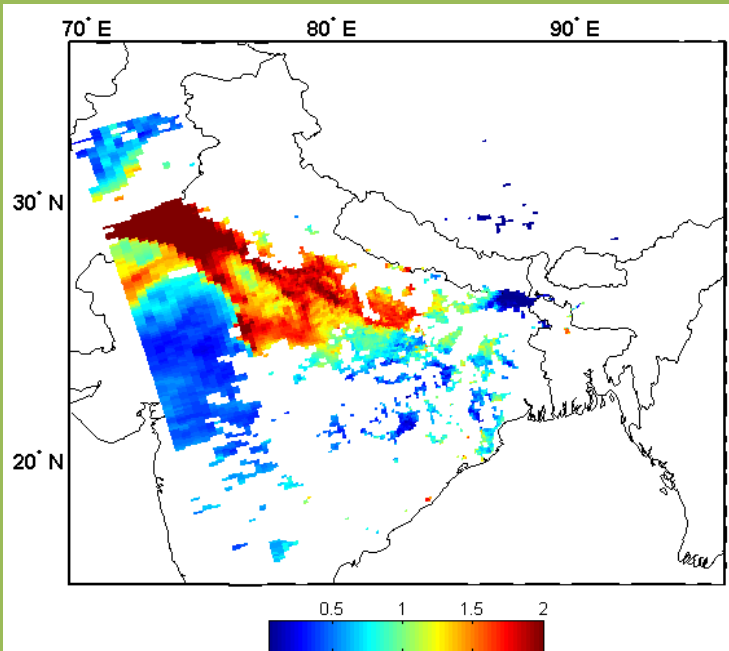
Aqua MODIS, June 10, 2005



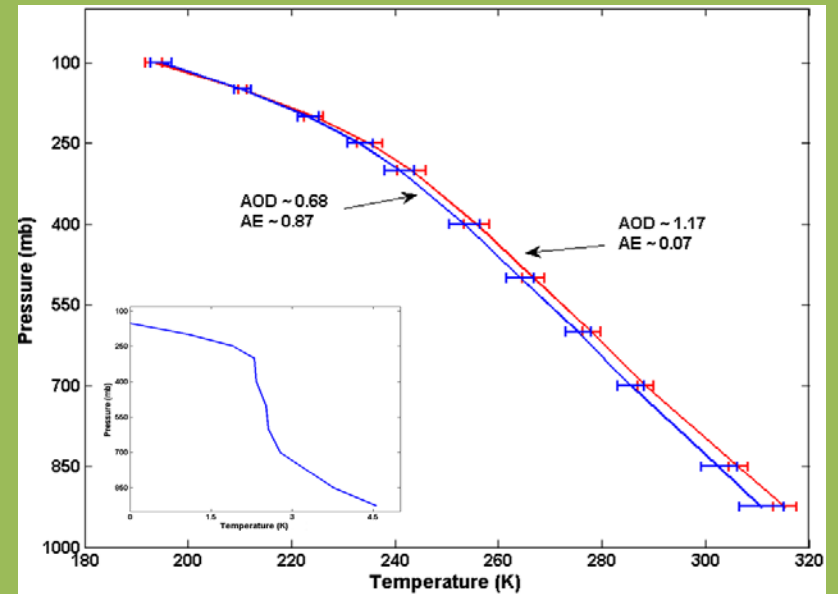
AIRS, June 10, 2005

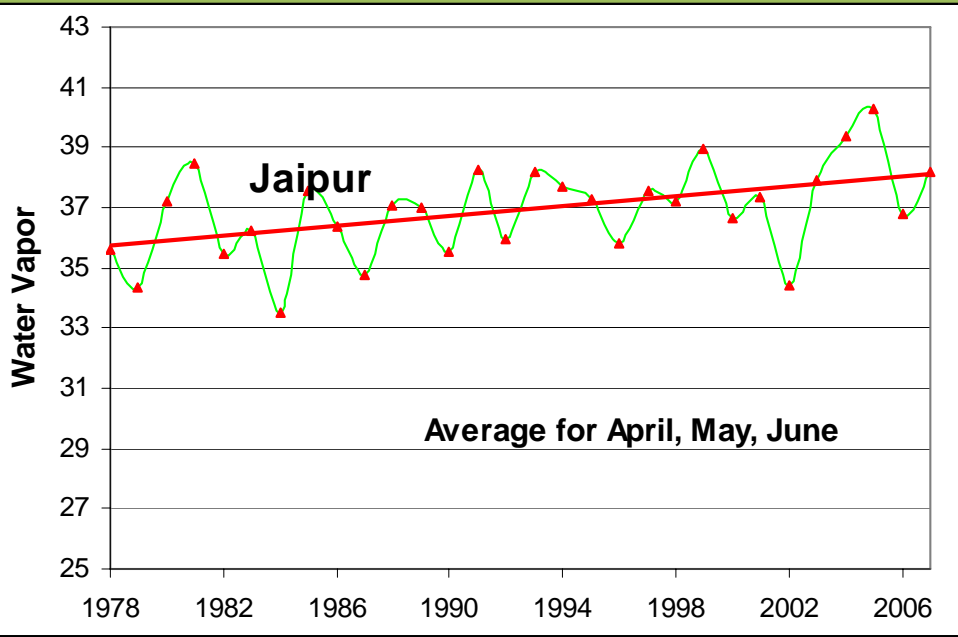
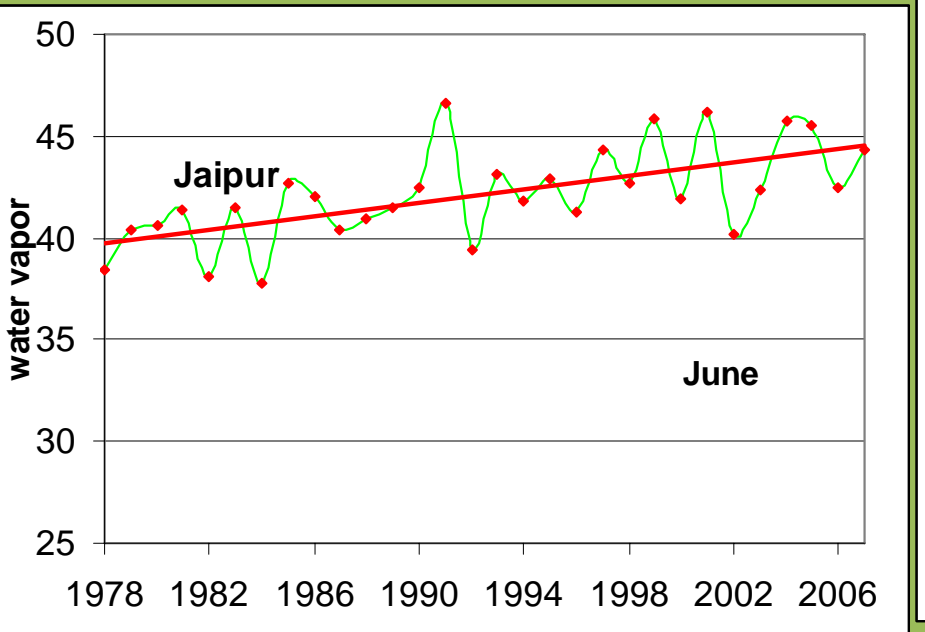
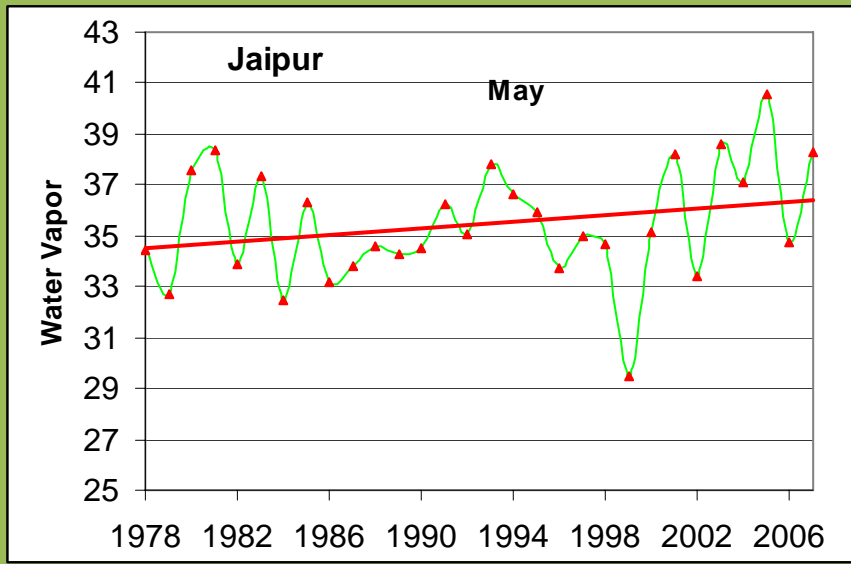
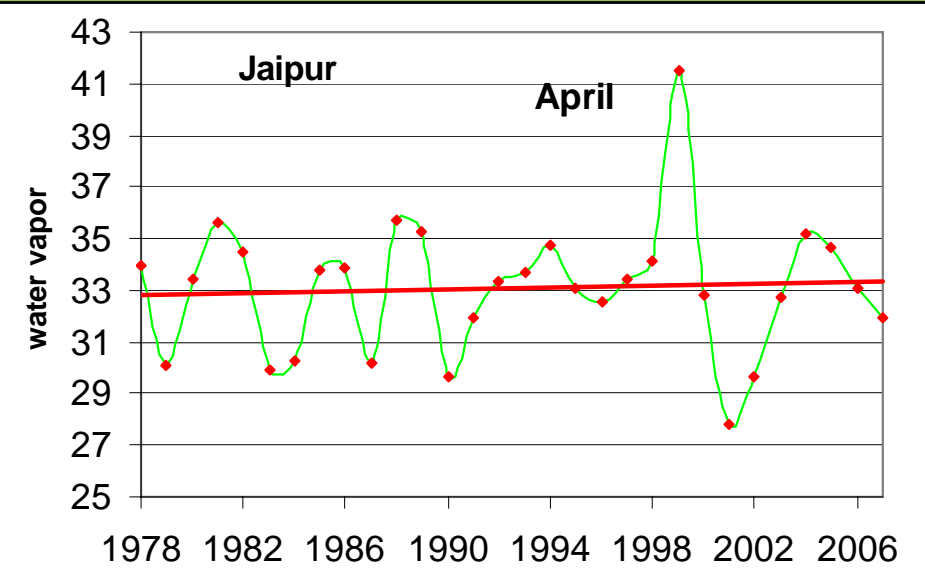


MODIS Deep Blue AOD Retrieval

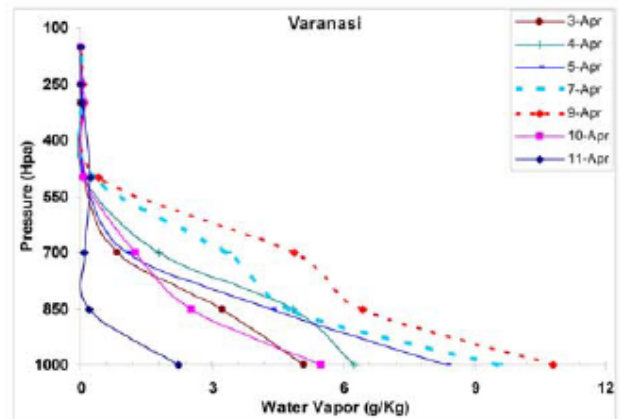
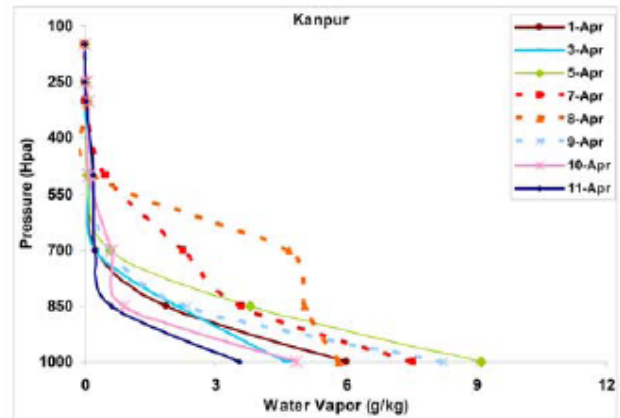
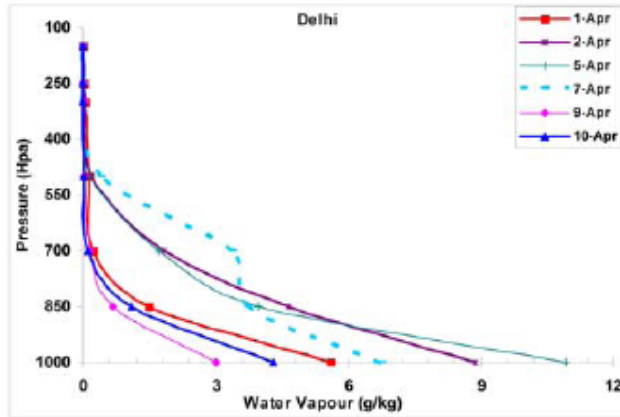


AIRS Temperature Profiles

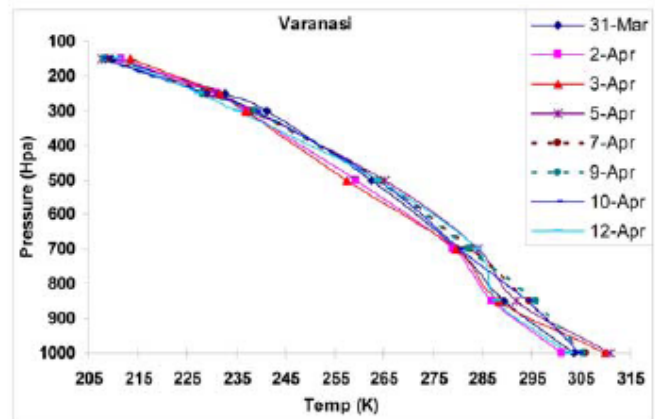
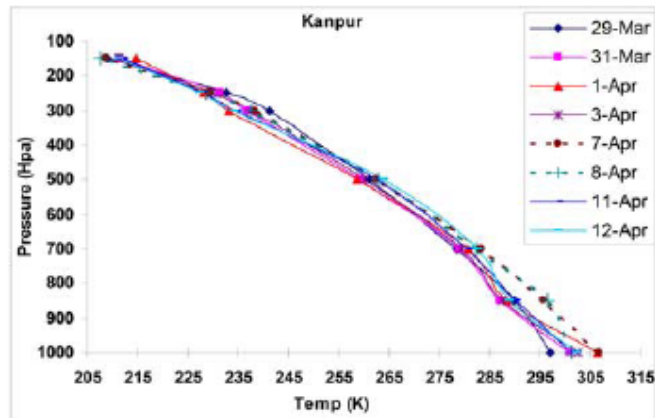
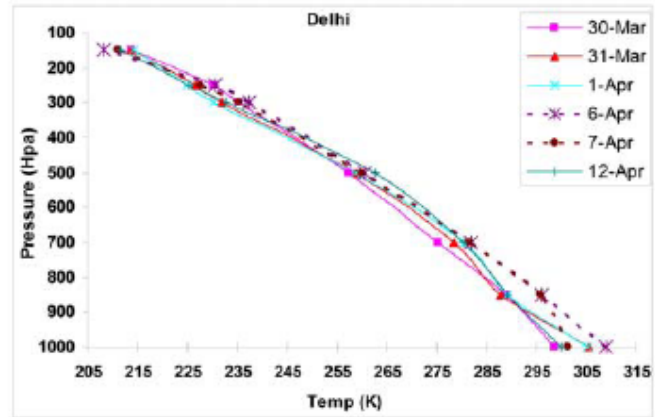




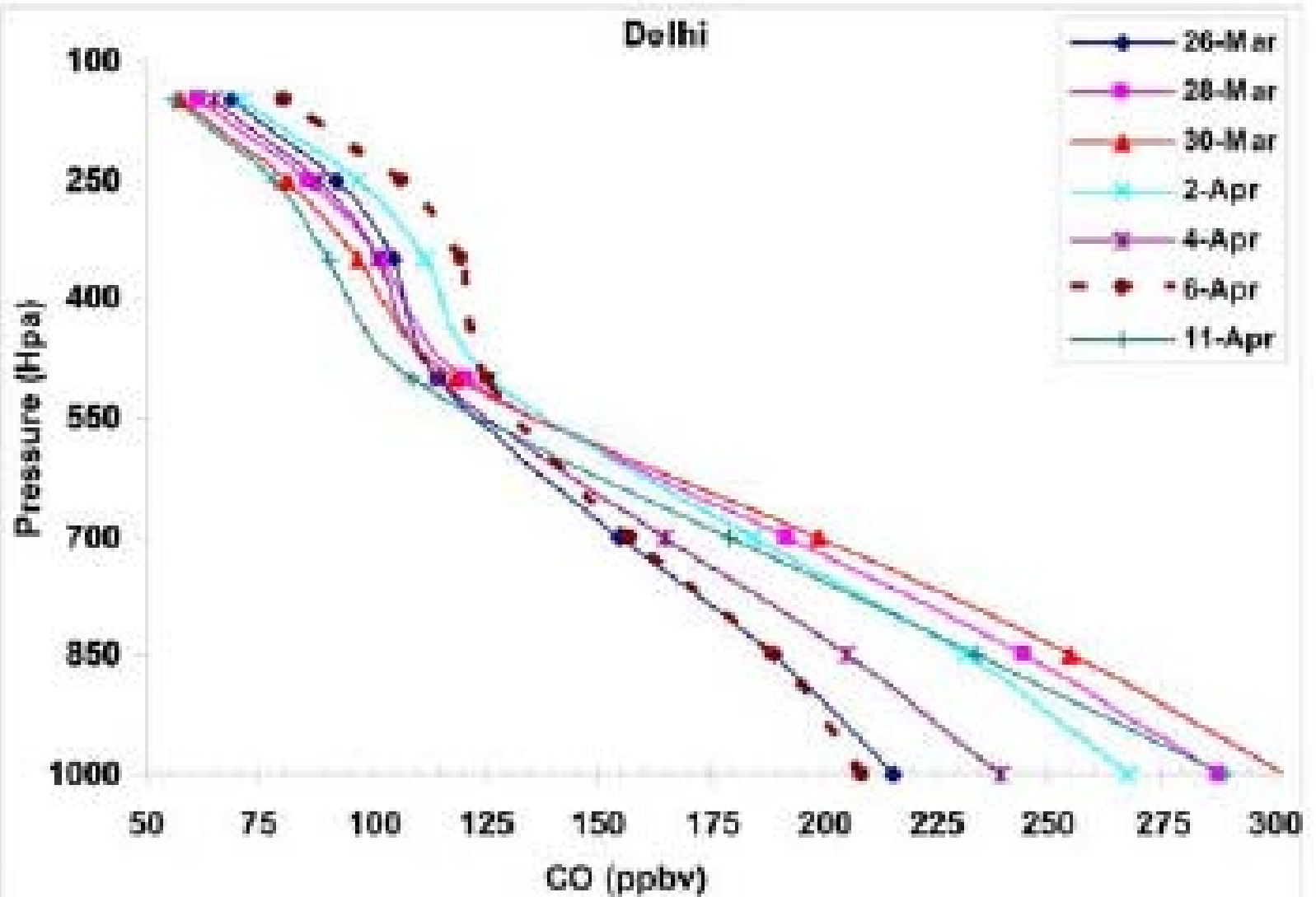
(a) Water vapor mass mixing ratio



(b) Temperature



Delhi



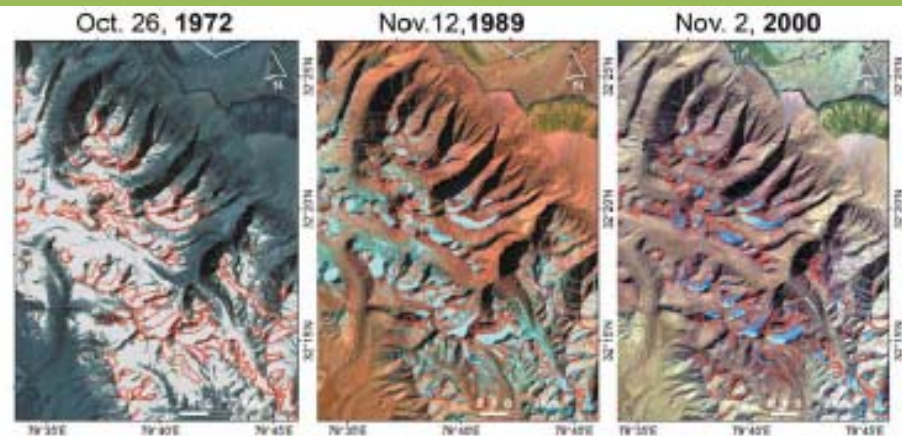


Fig. 1. Change in the snow and glacier cover in the western Himalayan region as shown in Landsat multispectral scanner (1972), thematic mapper (1989), and Enhanced Thematic Mapper Plus (2000) images. Areas outlined in red indicate information from the GLIMS database.

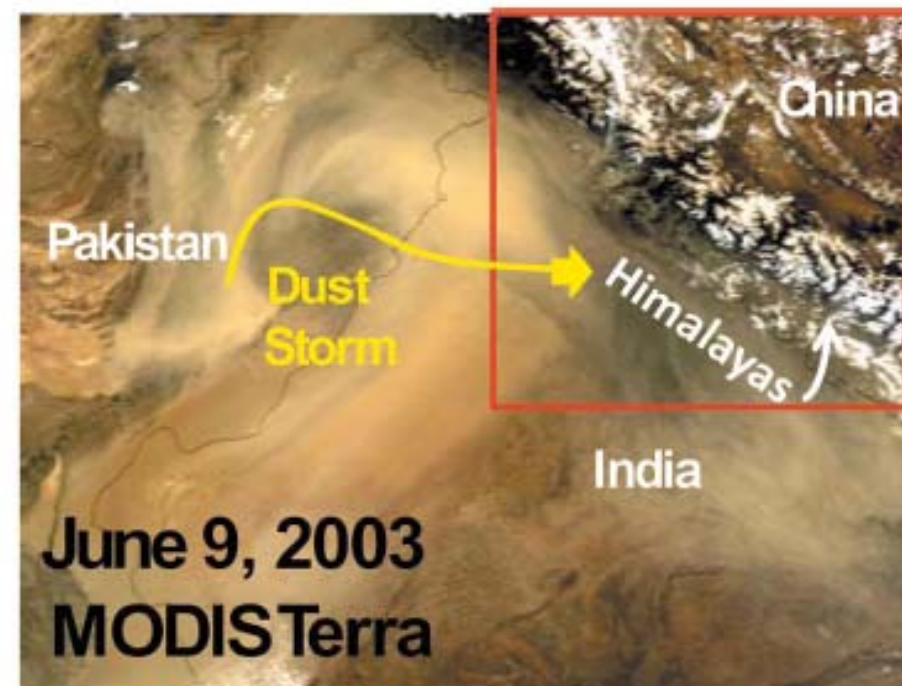


Fig. 2. Dust storms reach up to snow and glacier of Himalayas (box outlined in red) as visible in this 9 June 2003 MODIS Terra image obtained from the MODIS Web site (<http://modis.gsfc.nasa.gov/>).

Conclusion

- Multi sensor data shows enhancement of water vapor, total ozone column, CO and pronounced changes in meteorological parameters associated with dust storms.
- The warming of troposphere is found that could be associated with the increasing trend of water vapor and CO associated with dust events.
- Use of Sounders data will be useful in understanding all atmospheric and meteorological parameters associated with dust events and understanding of the changes in RF.

Thank You