

ASSESSING THE SUMMER-TIME URBAN HEAT ISLAND OVER DELHI: A CASE STUDY OF MICRO-LEVEL CLIMATE CHANGE

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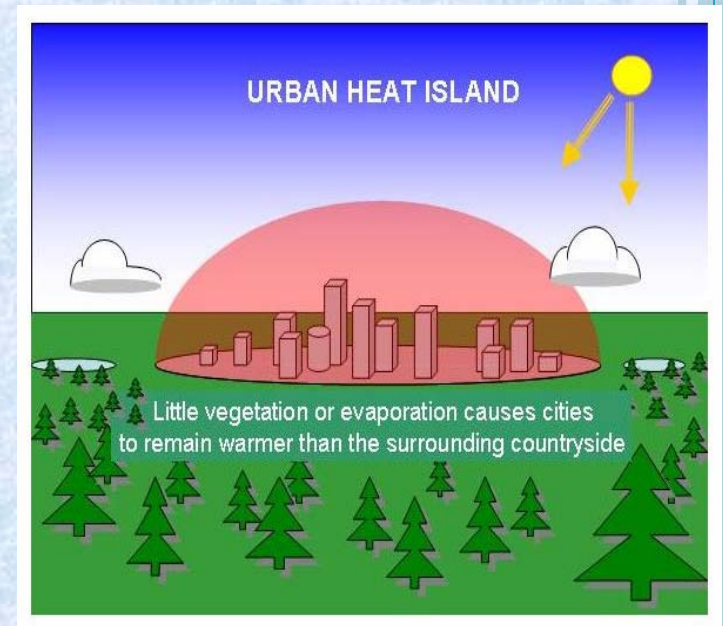
CLIMATE CHANGE

- Climate change - one of the most serious challenges
- Although the consequences are not well documented, the domain has been receiving greater attention in the past few decades.
- Climate change poses a serious threat to developing countries like India




URBAN HEAT ISLAND (UHI)

- Elevated atmospheric temperatures at central urban locations
- Climate modifications at the local level - wind, radiation, humidity, visibility, albedo, temperature.
- As the present century progresses, climate change will worsen the UHI effect



UHI- AIR POLLUTION

- Aerosol concentration in the ambient air - key parameters
- Heat island induced modifications have a bearing on human comfort and urban air quality
- Research has moved towards interaction between urban heat and air pollution (Crutzen, 2004).
- A cause and effect relationship (Ling-jun *et. al.*, 2007) 

UNIT- AIR POLLUTION (CONTD...)

- Indian Studies: Pune (Deosthali, 2000), Hyderabad (Kiran Chand *et. al.*, 2005), Chennai (Devadas *et. al.*, 2009), Delhi (Mohan *et. al.*, 2009).
- The remote sensing studies provide the unique opportunity to compute indirect estimates of climate change.
- Aerosols - important role in the scattering of radiation




OBJECTIVE OF THE STUDY

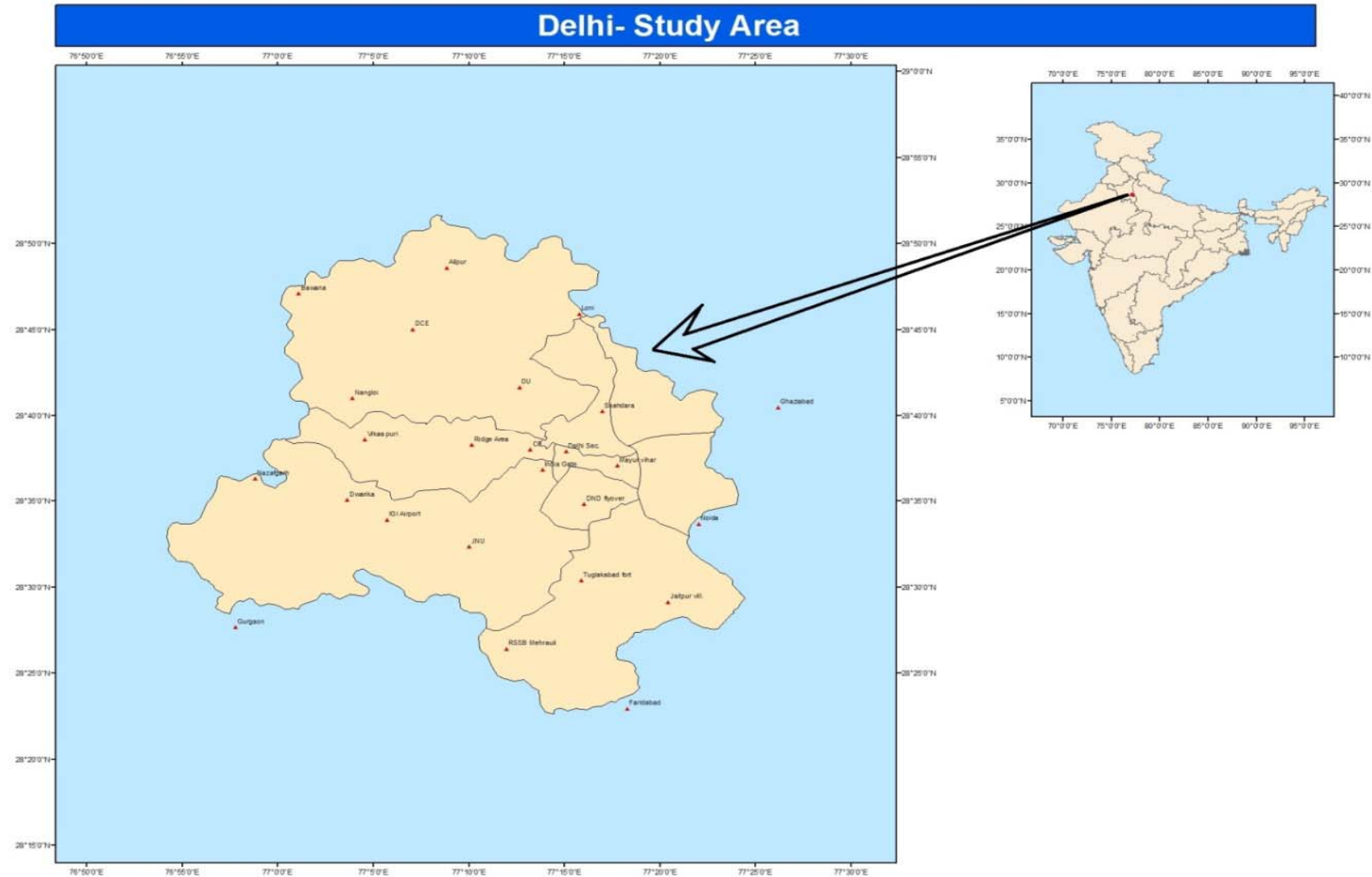
- To assess the formation of UHI over the Indian capital city, Delhi.
- To study its relationship with aerosols during the summer season, using the techniques of remote sensing and GIS.



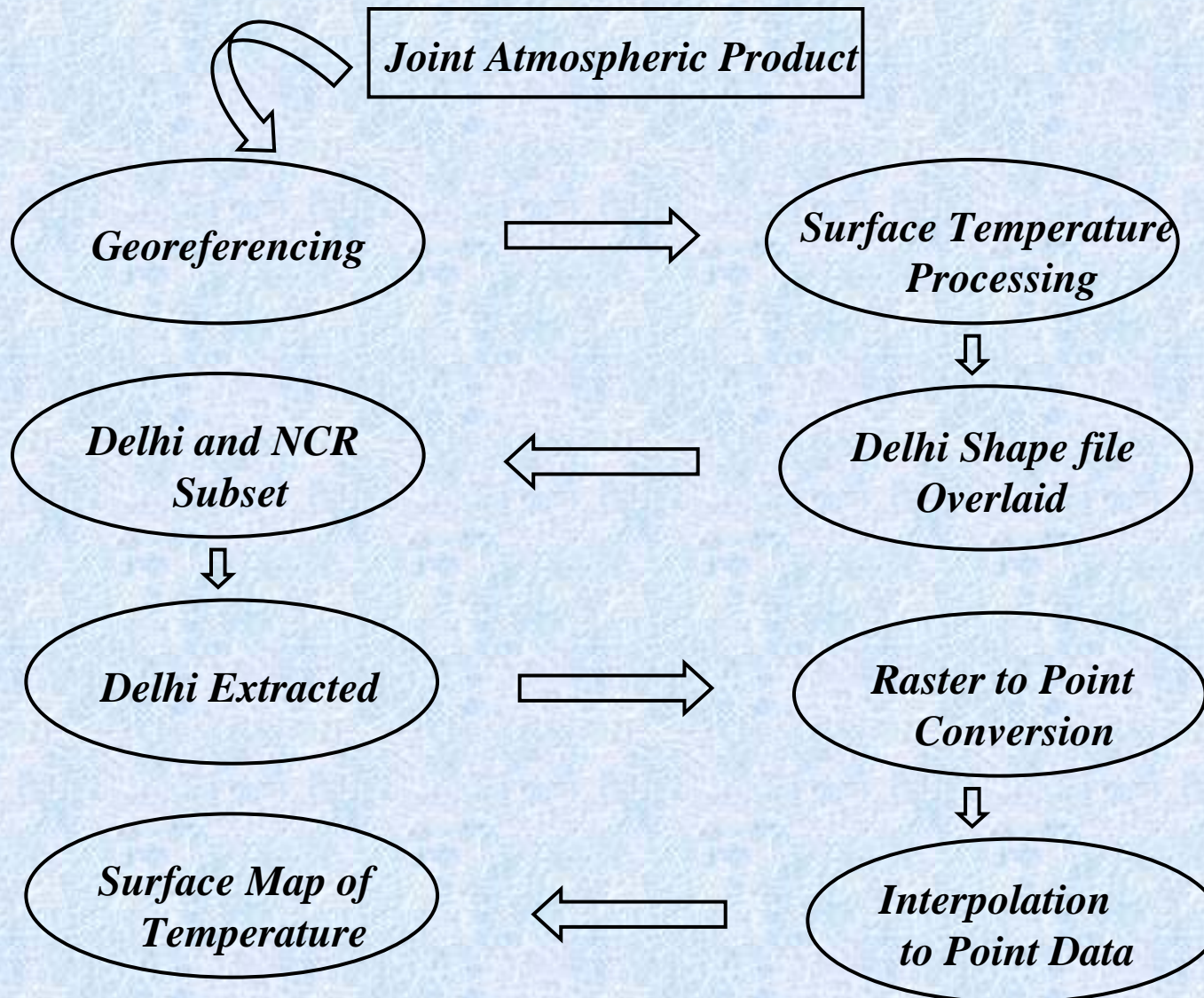
METHODOLOGY

- Thermal and AOD mapping of Delhi and surrounding areas
 - Day and night MODIS data obtained for summer months (April, May and June) for the years 2007, 2008 and 2009.
 - Surface temperature and AOD distribution data on a typical clear day in each month.
 - Georeferencing and processing of images using ENVI
 - Raster data was vectorized in ArcGIS and interpolated to generate maps of surface temperature and AOD
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Study area - Delhi and its surrounding regions



Steps for preparing Surface Temperature maps using MODIS data

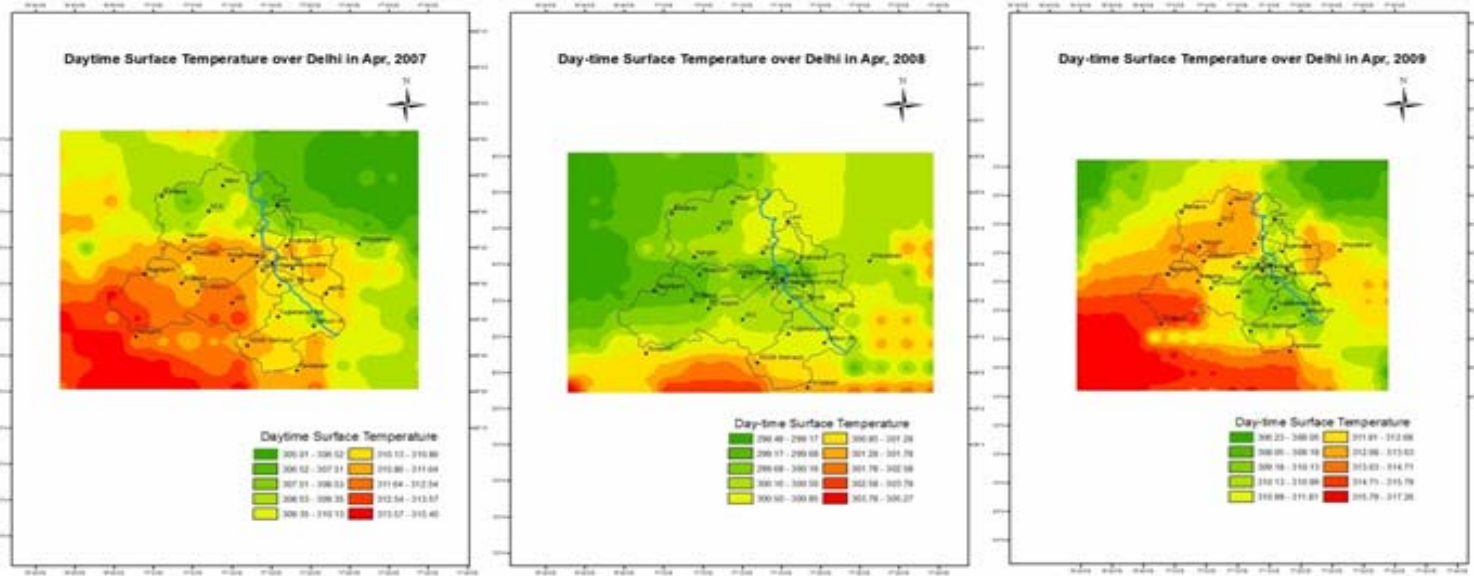


RESULTS AND DISCUSSION

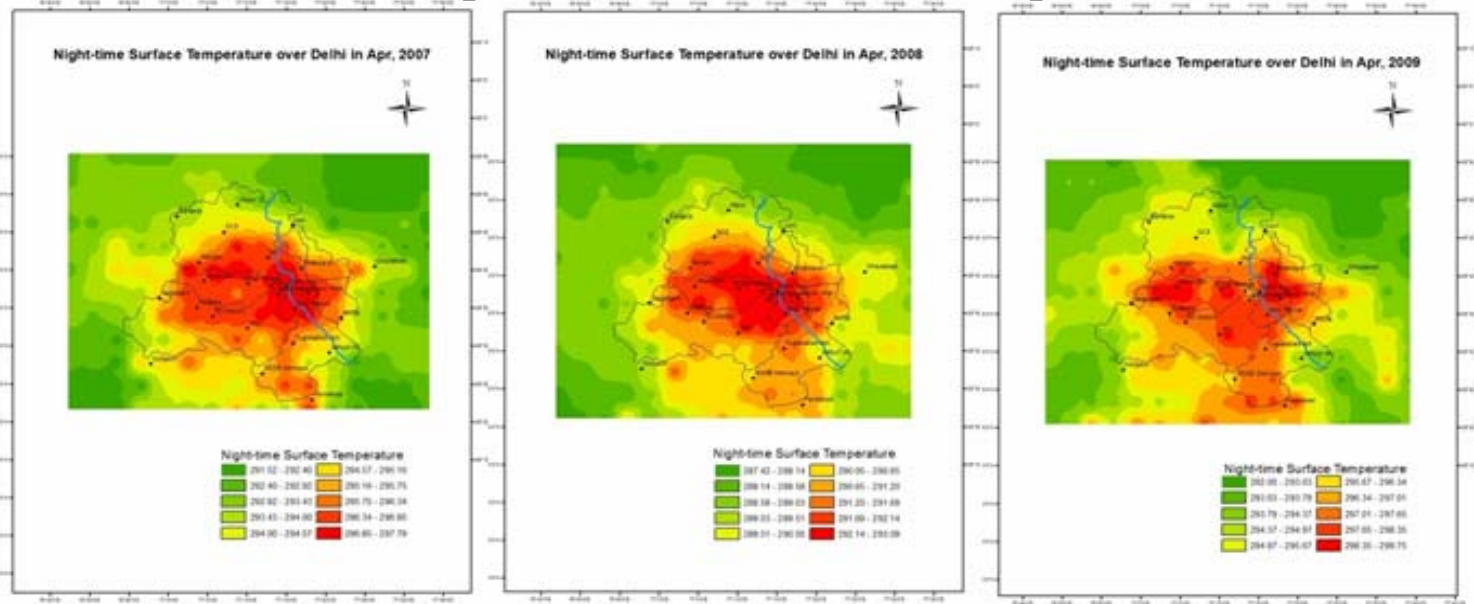
- During daytime, surface temperatures in central parts - cooler than the surrounding regions in south and south-west of Delhi.
- Existence of an urban 'cool' island over the central parts of Delhi
- Thermal contrast varies from 4-7°C in April to 7- 10°C in May-June.
- At night, the temperature over the central parts of Delhi is 4-7°C, higher than the surrounding regions
- Existence of an urban heat island at night during the summer months



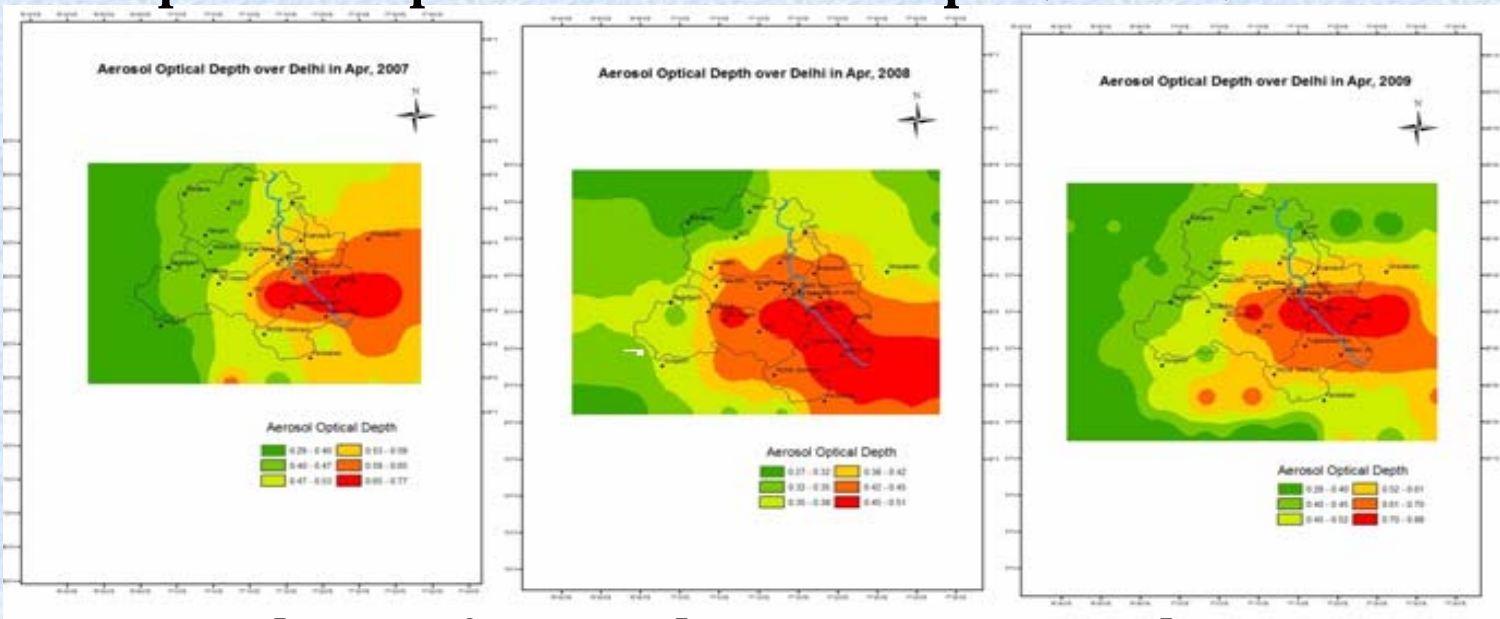
Day time Surface Temperature over Delhi in April, 2007, 2008 and 2009



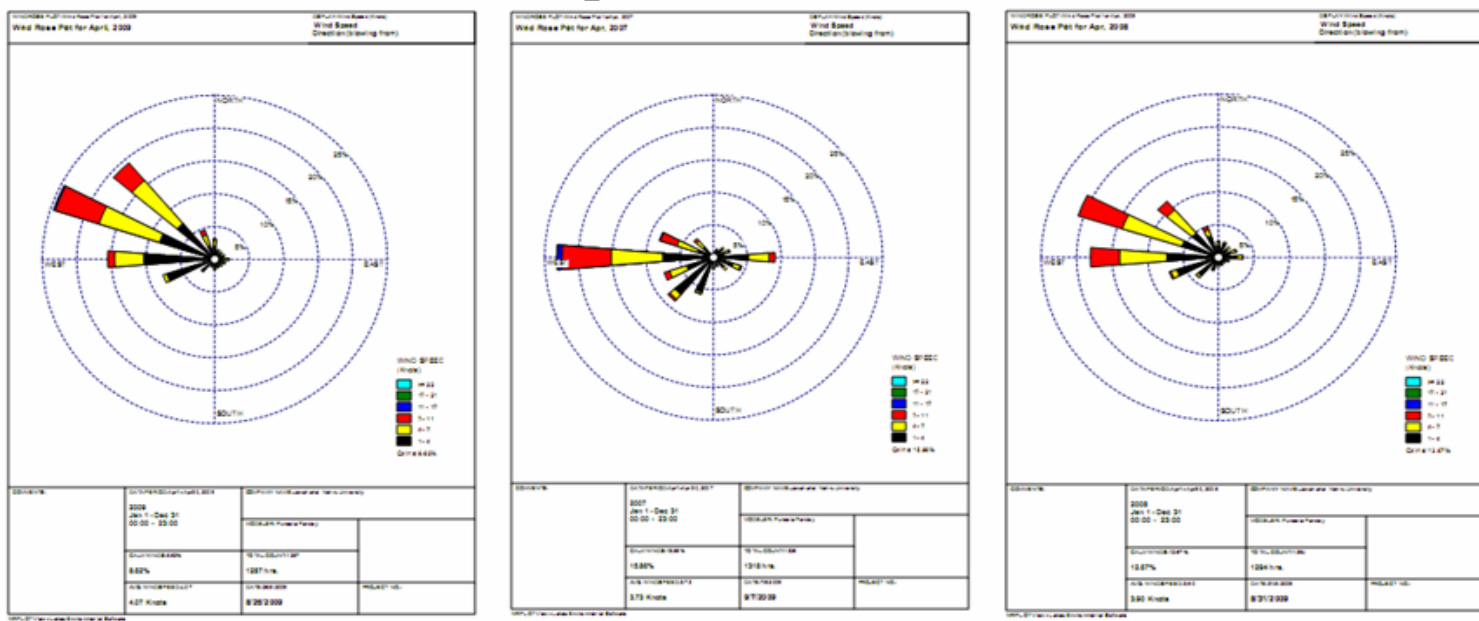
Night-time Surface Temperature over Delhi in April, 2007, 2008 and 2009



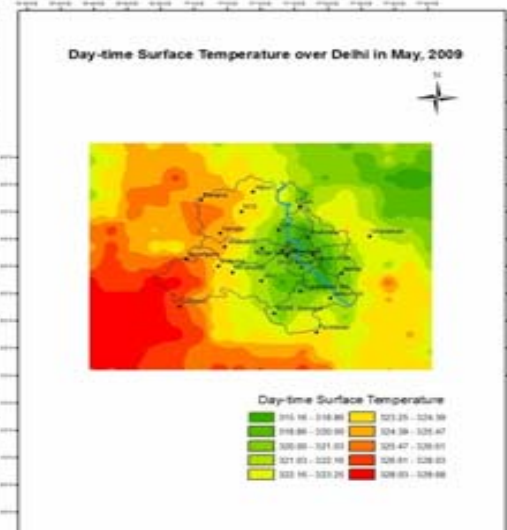
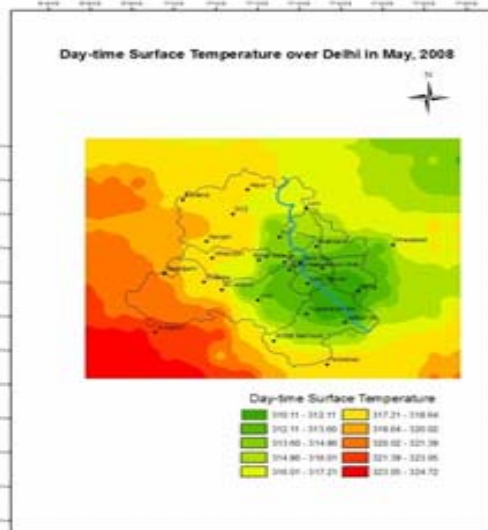
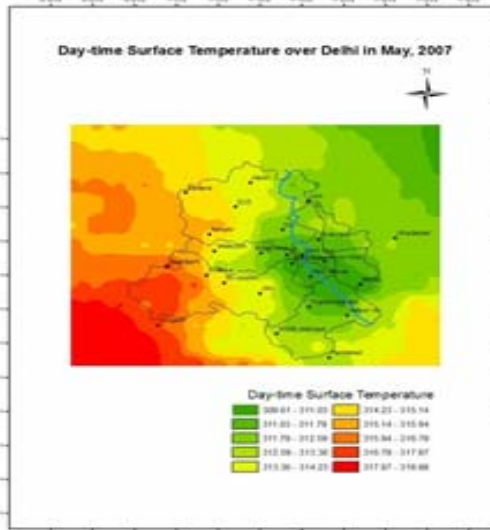
Aerosol Optical Depth over Delhi in April, 2007, 2008 and 2009



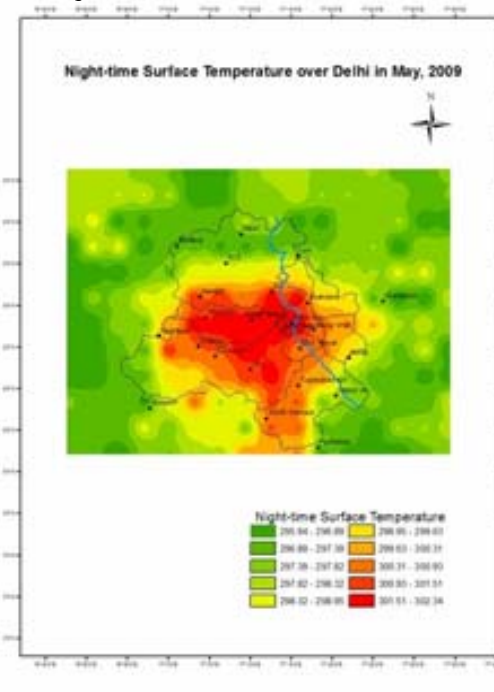
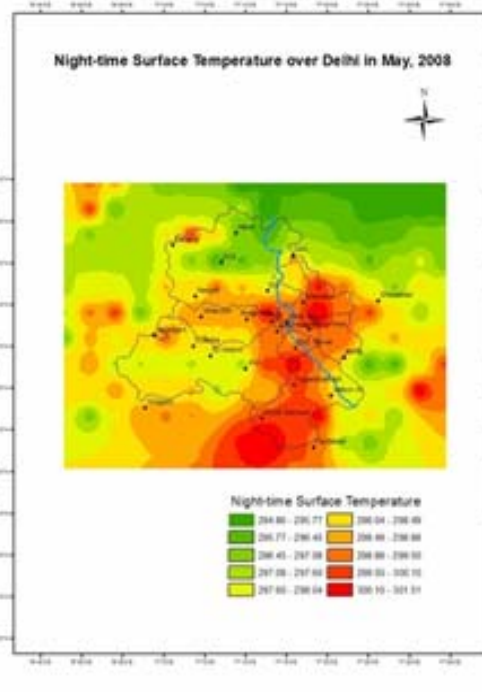
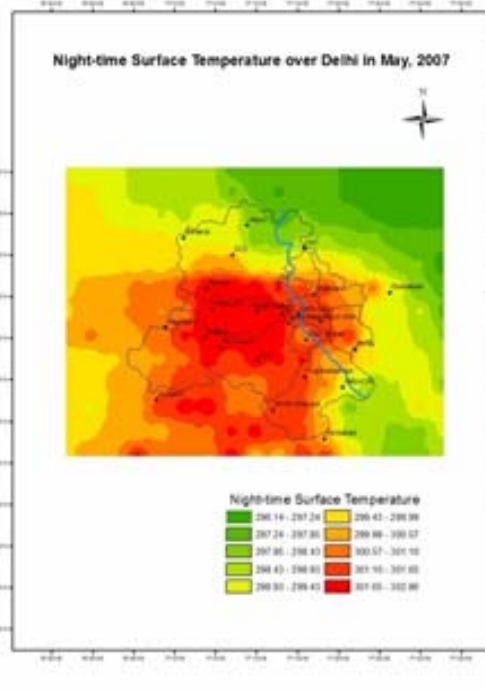
Windroses for April 2007, 2008 and 2009



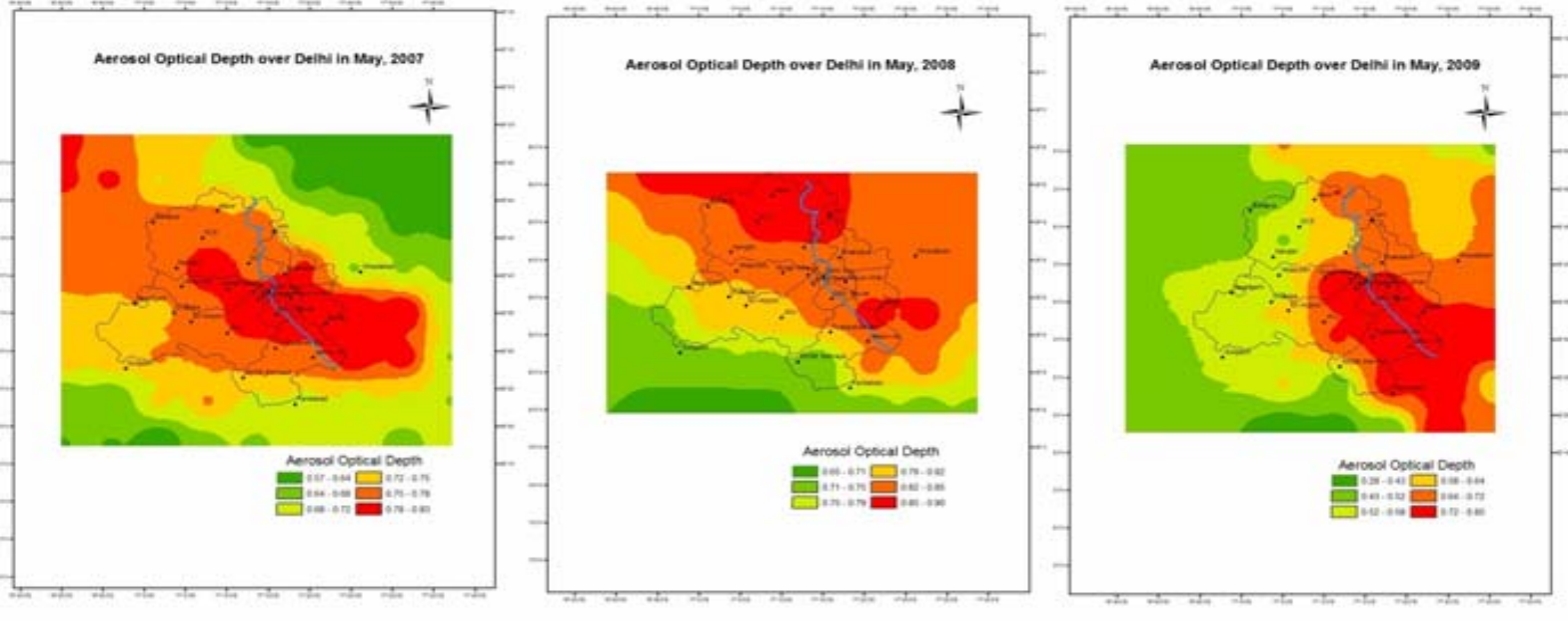
Day time Surface Temperature over Delhi in May, 2007, 2008 and 2009



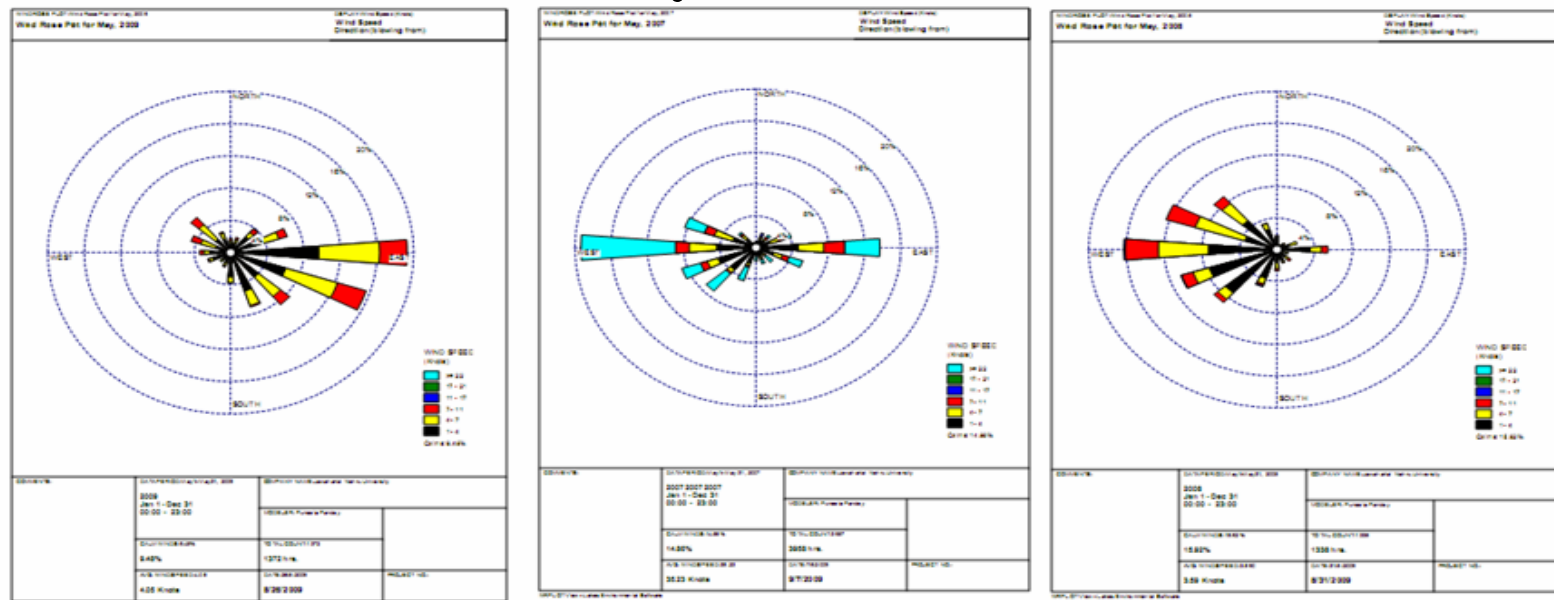
Night-time Surface Temperature over Delhi in May, 2007, 2008 and 2009



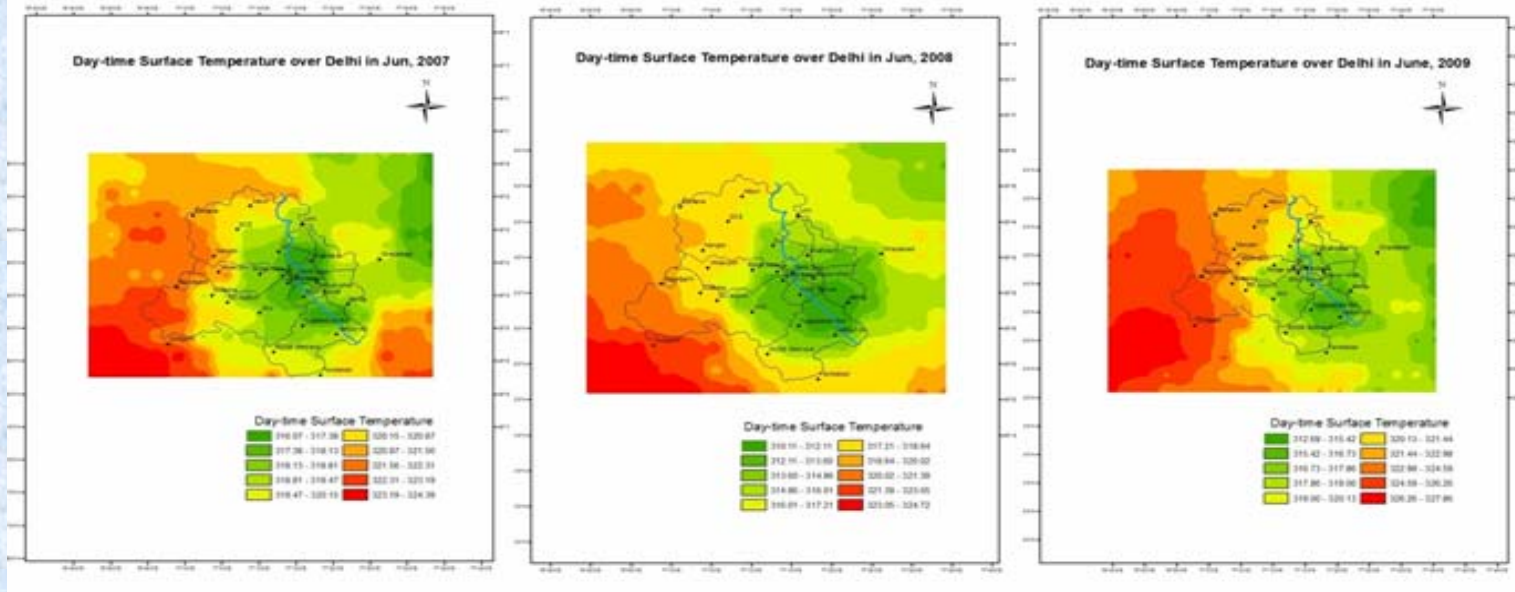
Aerosol Optical Depth over Delhi in May, 2007, 2008 and 2009



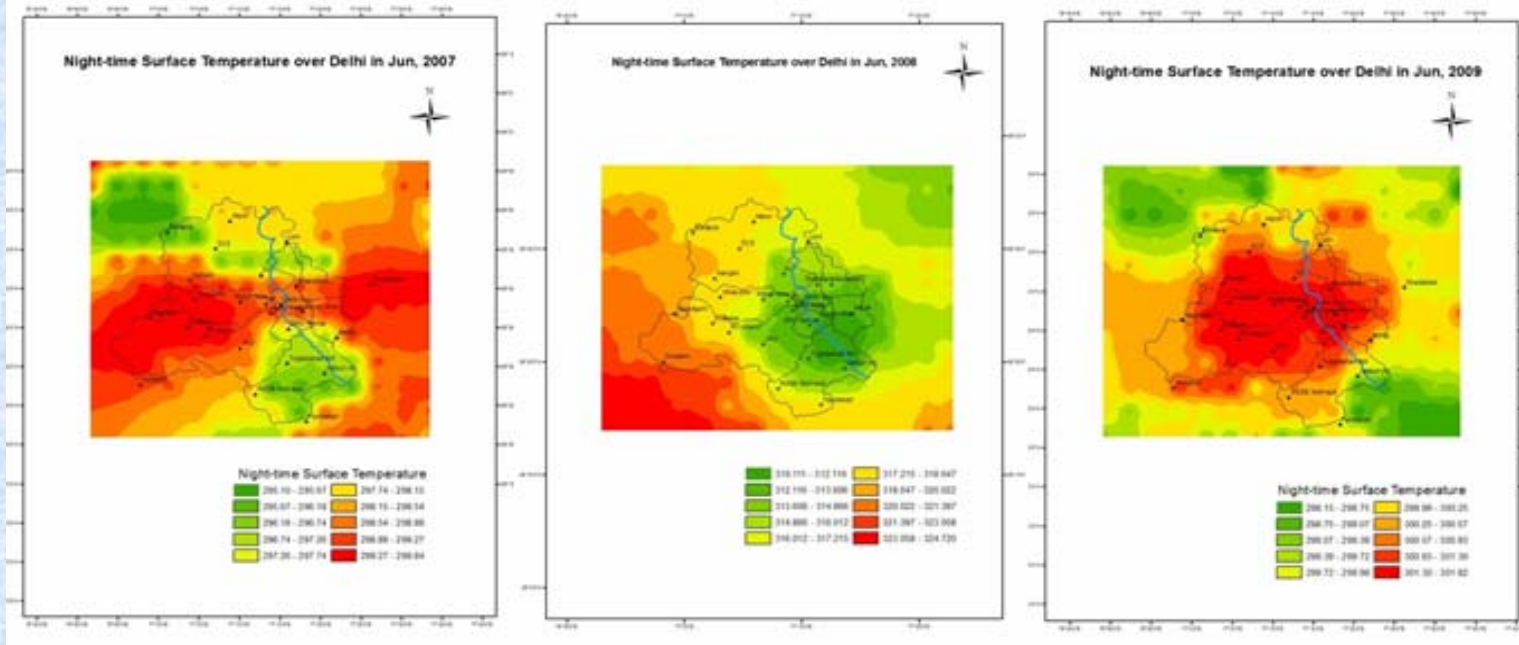
Windrose for May 2007, 2008 and 2009



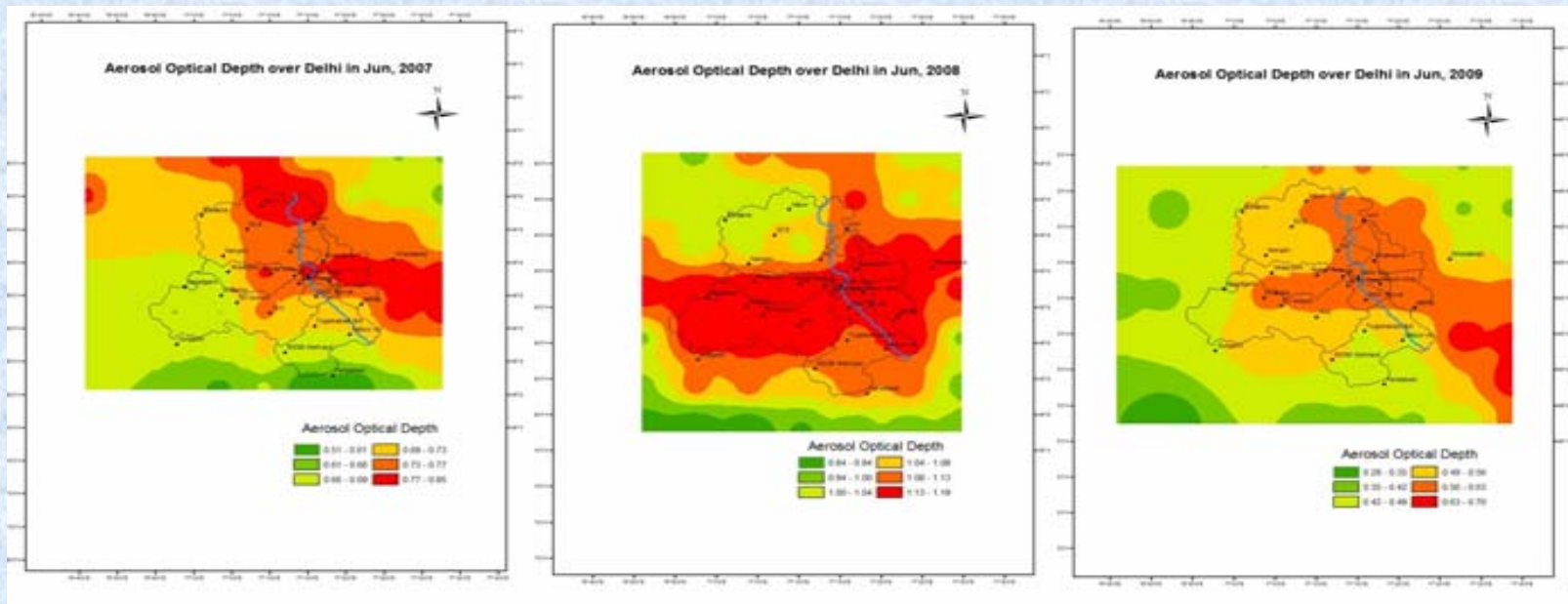
Day time Surface Temperature over Delhi in June, 2007, 2008, 2009



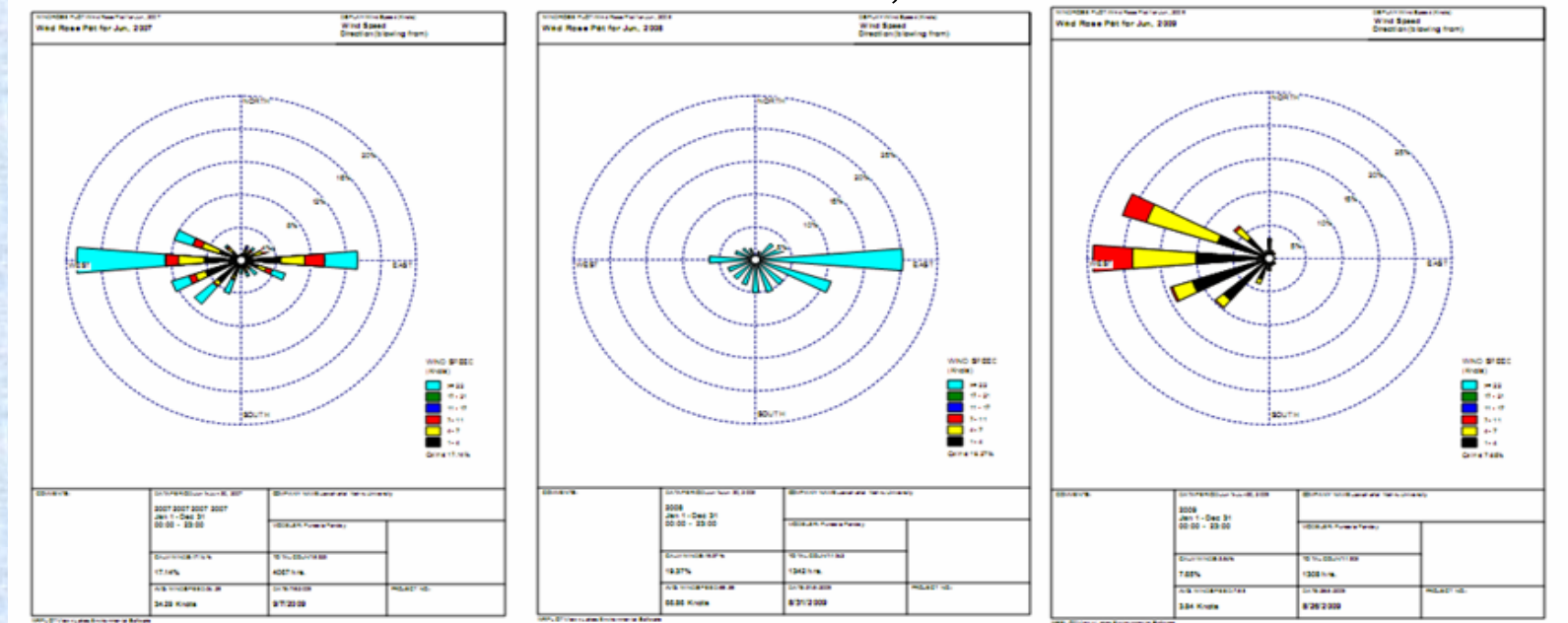
Night time Surface Temperature over Delhi in June, 2007, 2008, 2009




Aerosol Optical Depth over Delhi in June, 2007, 2008, 2009



Windrose for June 2007, 2008 and 2009.



CONCLUSIONS

- Regions with high AOD values tend to have lower temperatures and vice-versa.
 - Presence of aerosols reduced the intensity of incoming solar radiation during daytime.
 - No significant influence of AOD on the night time thermal structure.
 - Major part of the city covered by dense bituminous roads - relative heating seems to be neutralized by
 - presence of Yamuna river, and
 - aerosol distribution over Delhi and surrounding regions.
 - Increased human discomfort leads to people opting for cooling devices such as water coolers and air conditioners.
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THANK YOU

