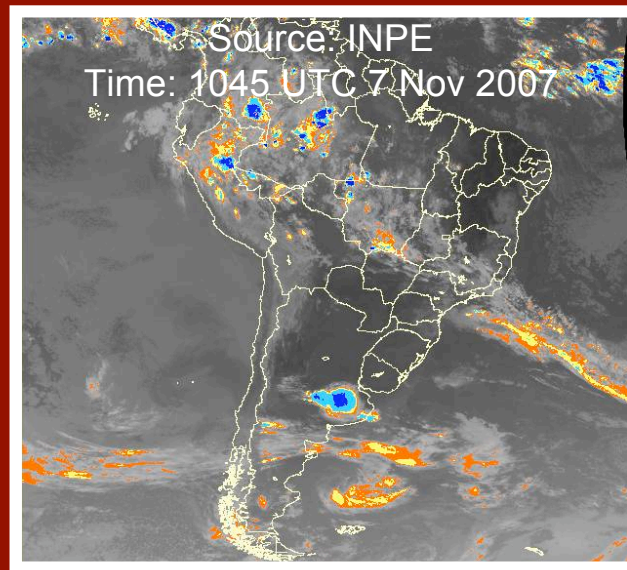


Role of terrain and land cover in triggering deep convection



Socorro Medina and Robert Houze

University of Washington

Anil Kumar

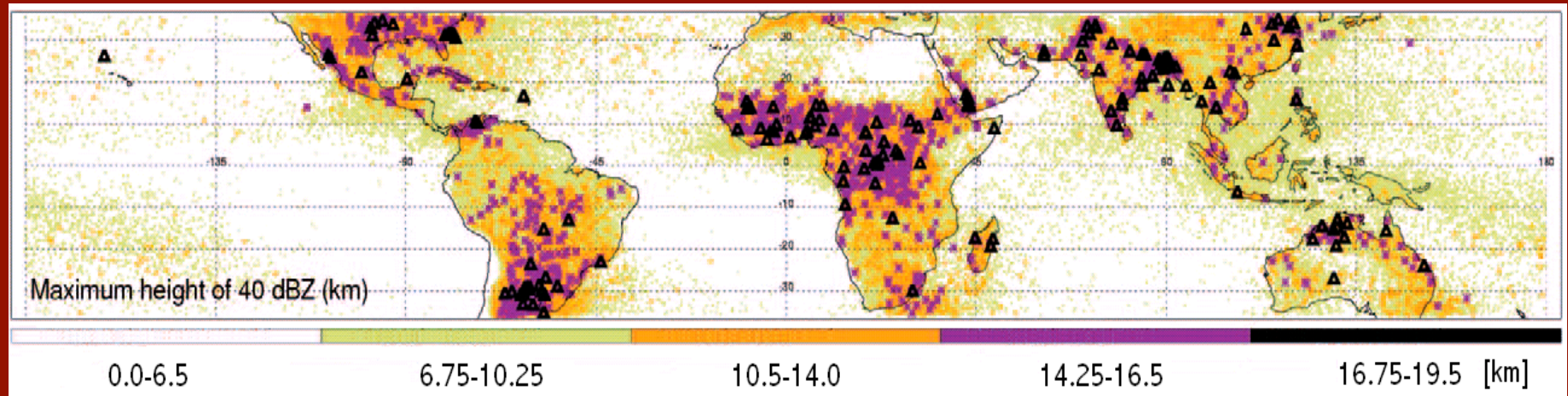
NCAR and Purdue University

Dev Niyogi

Purdue University

Occurrence of deep convective systems in Tropics

TRMM Precipitation Radar (PR) statistical study (Jan 98 – Dec 04)
Maximum Height (km) of 40 dBZ reflectivity contour

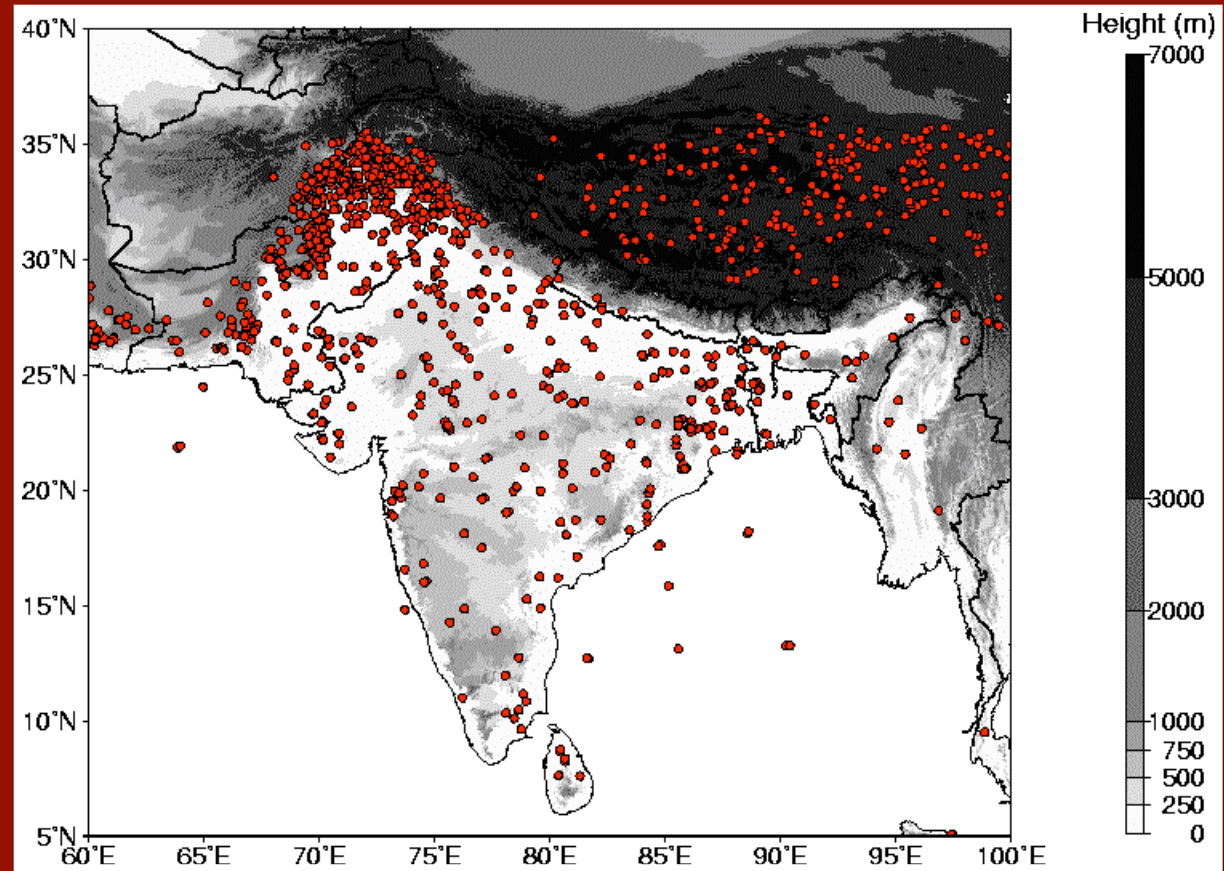


Zipser et al. 2006

Occurrence of deep convective systems in Indian Peninsula (TRMM-PR)

Deep convective system:
40 dBZ reflectivity contour
> 10 km in height

Monsoon season:
Jun-Sep (1999-2007)

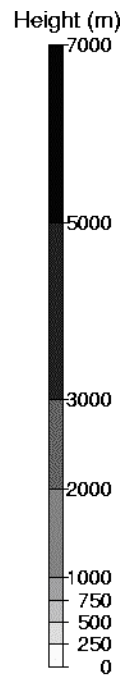
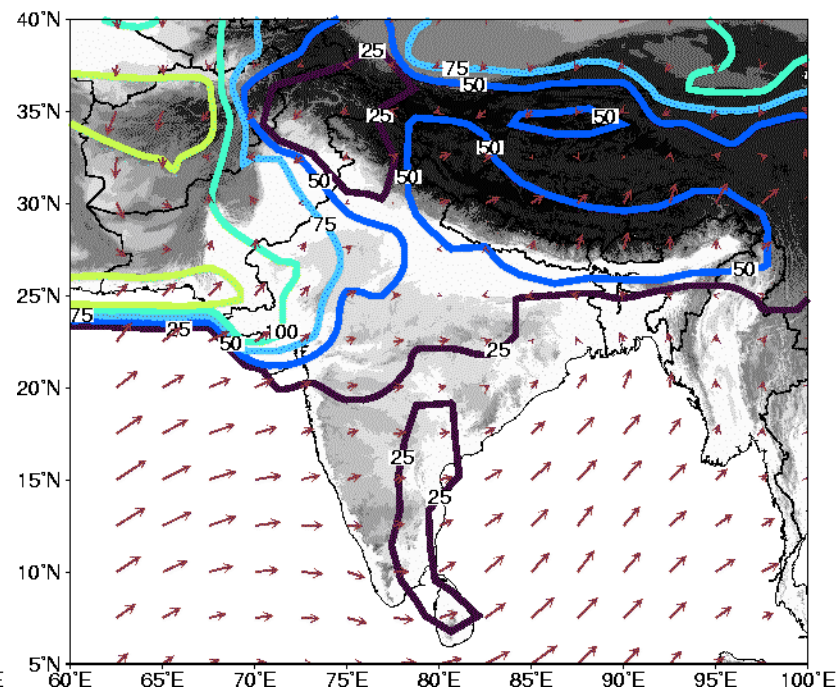
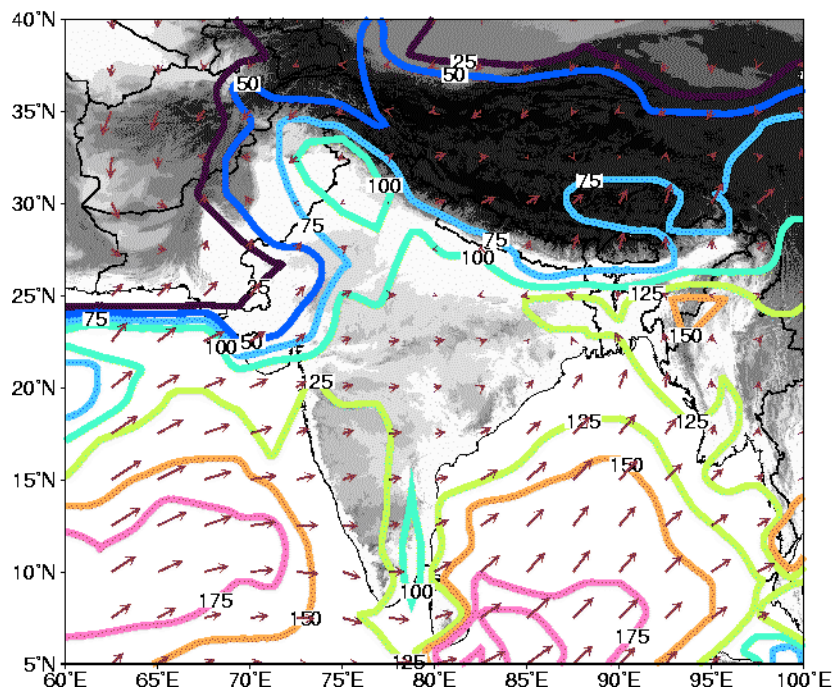


Houze et al. 2007,
Romatschke et al. 2008 (In preparation)

NCEP surface heat fluxes and winds Indian Peninsula (monsoon)

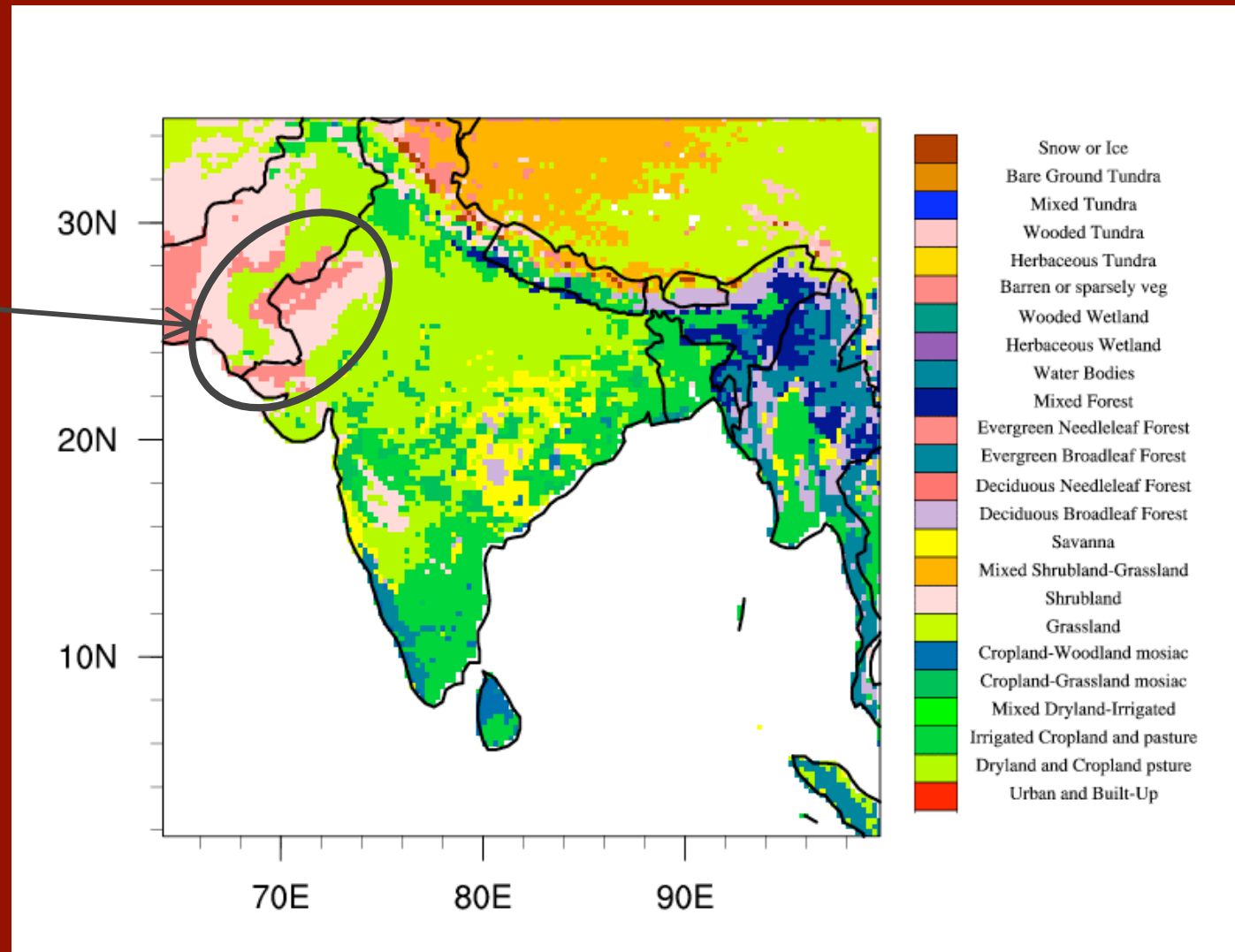
Latent heat flux (W/m^2)

Sensible heat flux (W/m^2)



Land cover map of Indian Peninsula

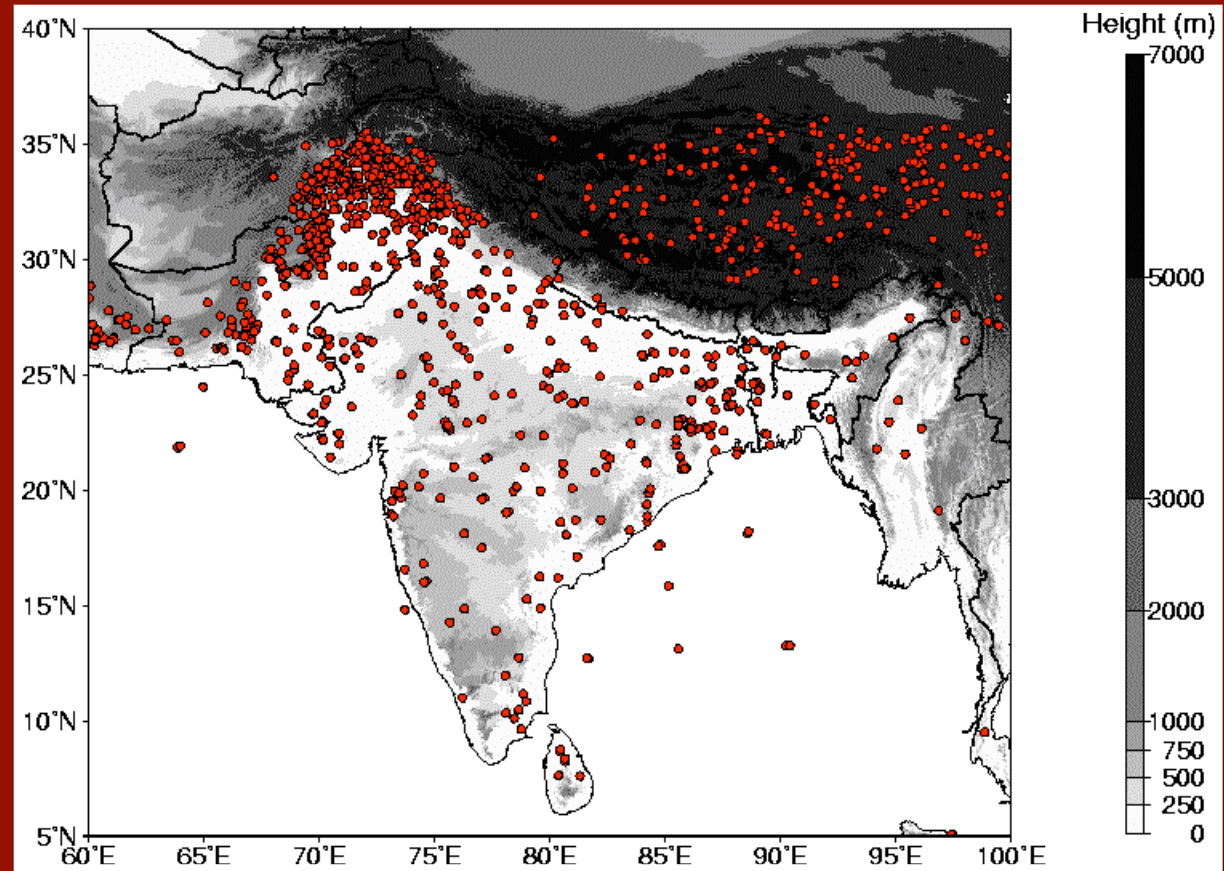
Thar Desert



Occurrence of deep convective systems in Indian Peninsula (TRMM-PR)

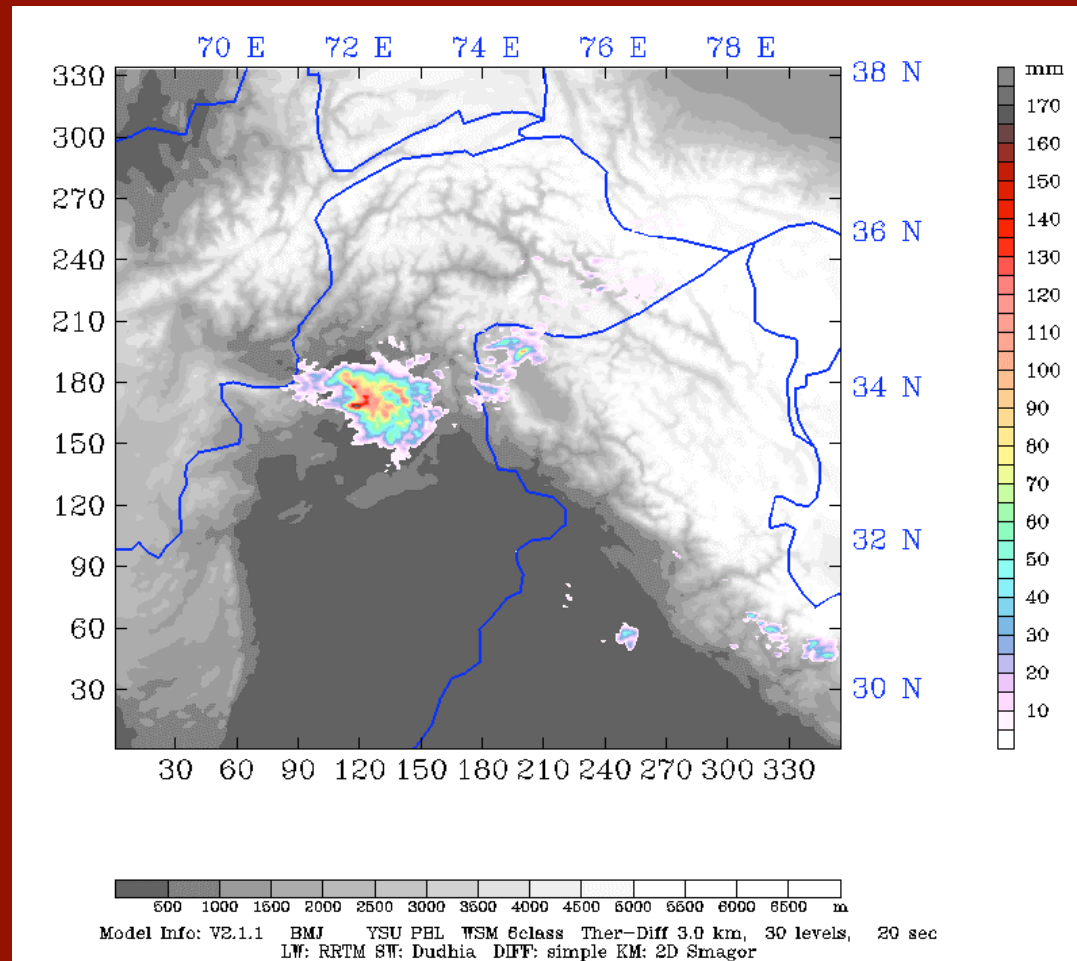
Deep convective system:
40 dBZ reflectivity contour
> 10 km in height

Monsoon season:
Jun-Sep (1999-2007)



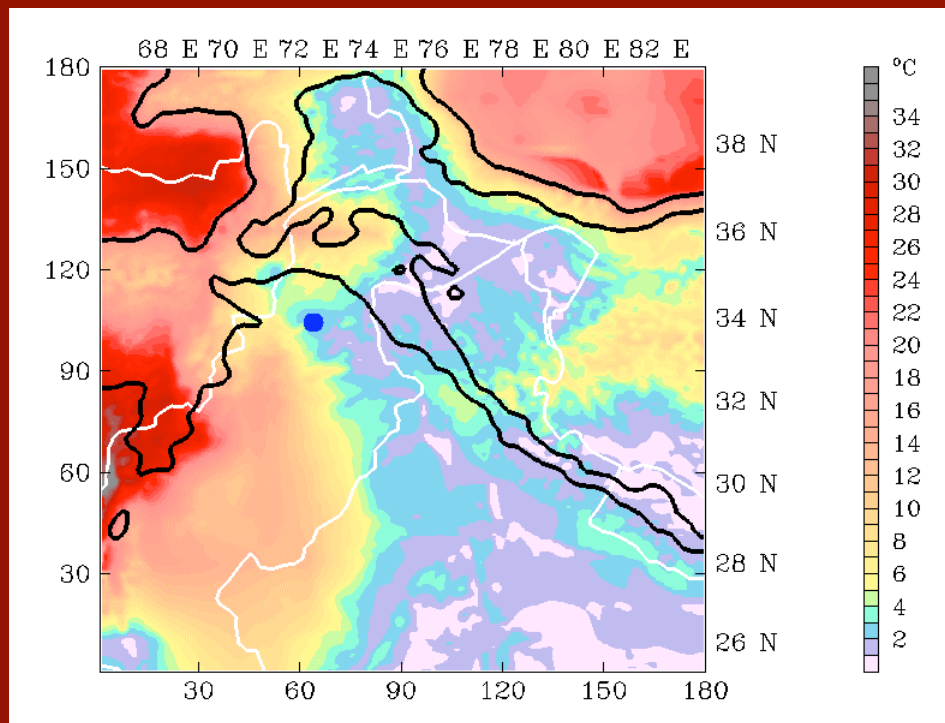
Houze et al. 2007,
Romatschke et al. 2008 (In preparation)

Terrain and accumulated precipitation as simulated by WRF @ 3 km resolution for a typical convective system (18-23 UTC 3 Sep 2003)

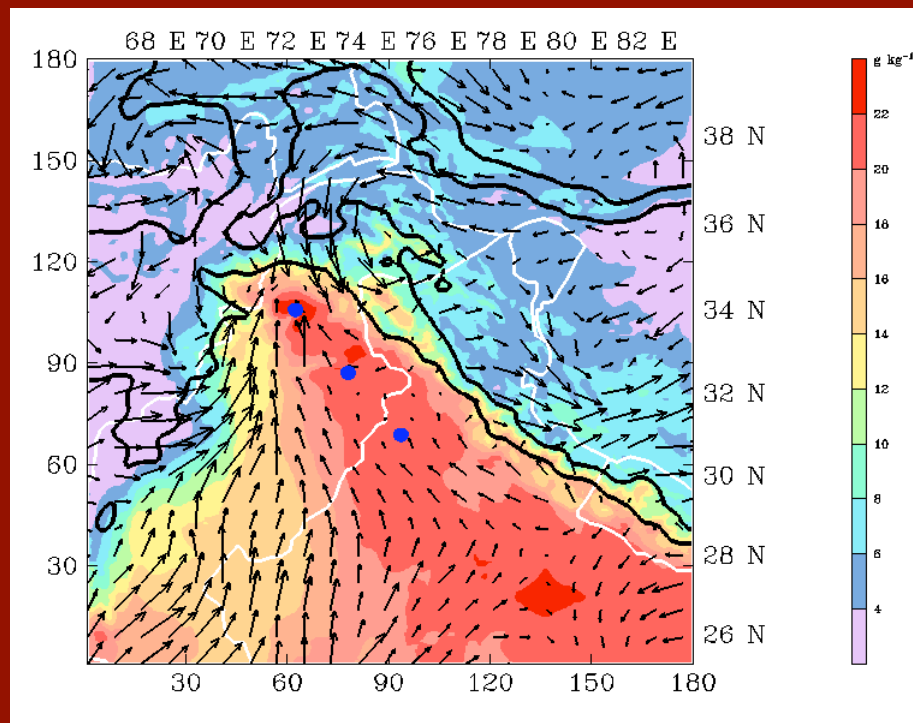


Low-level moist flow capped by dry flow off Afghan mountains

Simulated surface dew point depression ($^{\circ}\text{C}$)

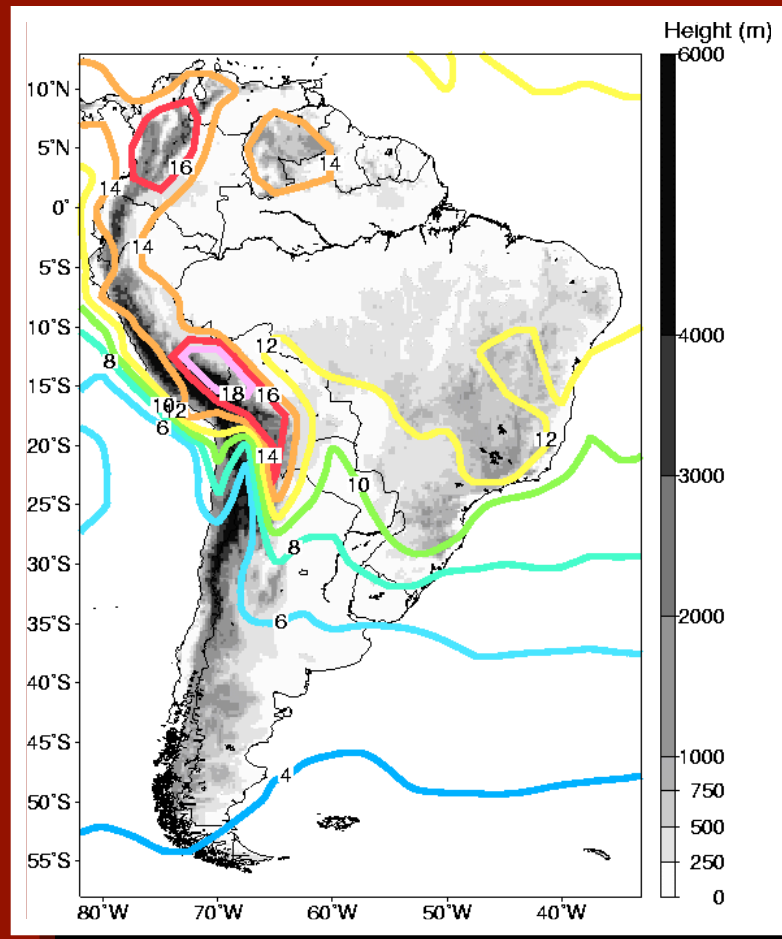


Simulated surface mixing ratio (g/kg)

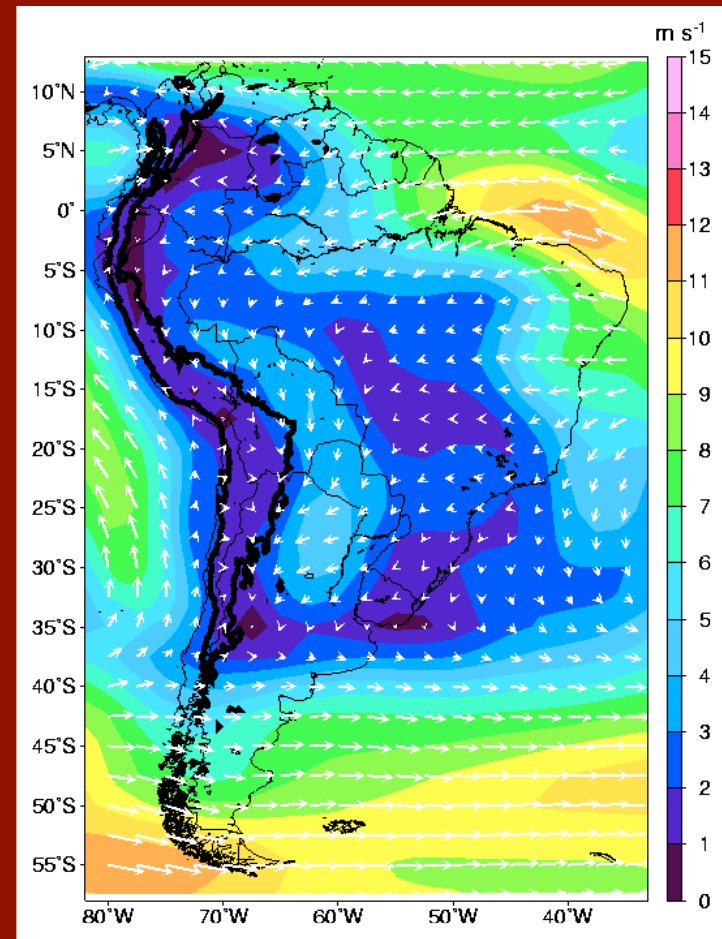


Some similarities in La Plata Basin (LPB) Crest-level dry flow over low-level moist flow

925 mb mean Sep-Nov specific humidity (g/kg)

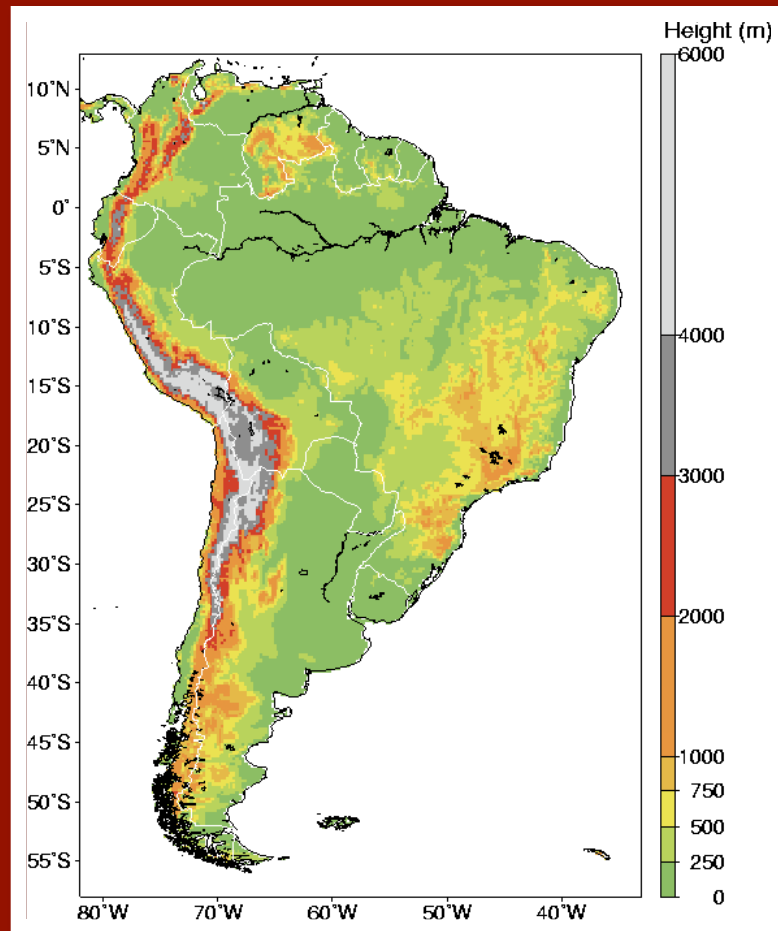


925 mb mean Sep-Nov flow

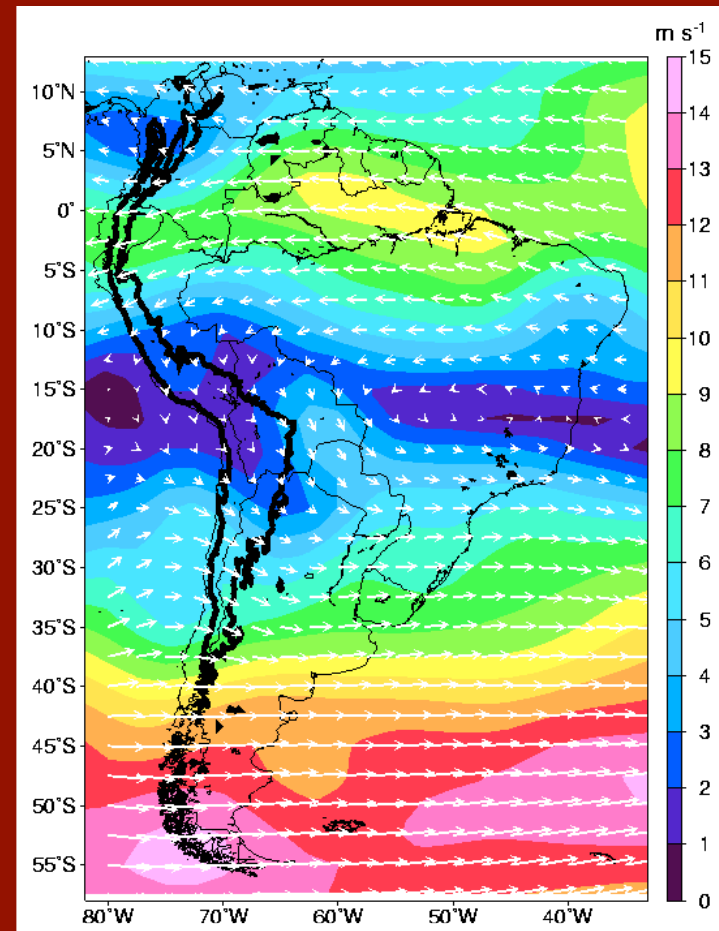


Some similarities in LPB: Crest-level dry flow over low-level moist flow

Orography



700 mb mean Sep-Nov flow

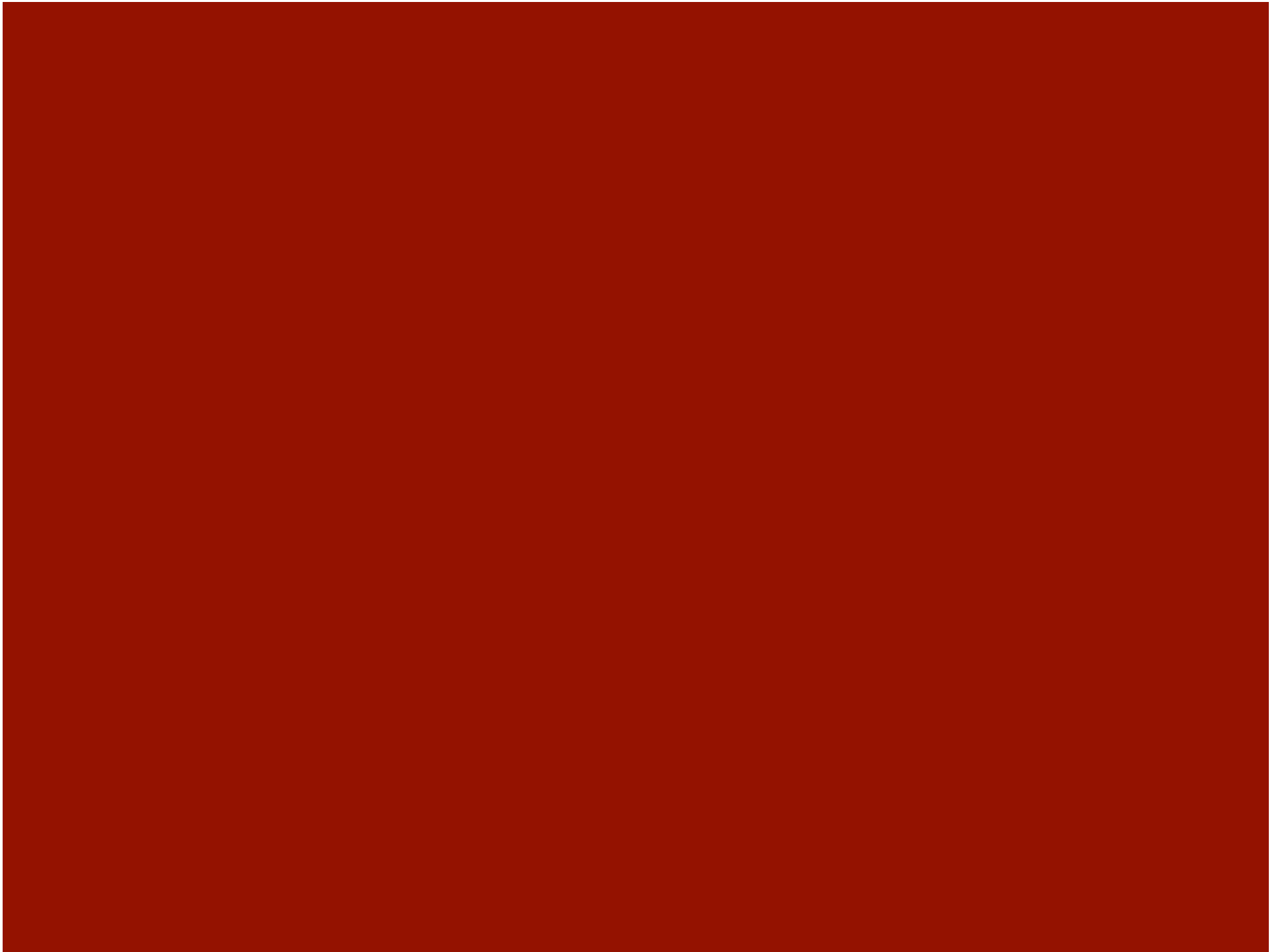


Proposed study

- Have identified land-atmosphere interactions important in development of convection in Himalayan region
- Some similarities between Himalayas and LPB, in particular, crest-level dry flow over low-level moist flow
- Objective: use PLATEX observations and high resolution numerical simulations to investigate role that terrain and land cover play in triggering convection in LPB

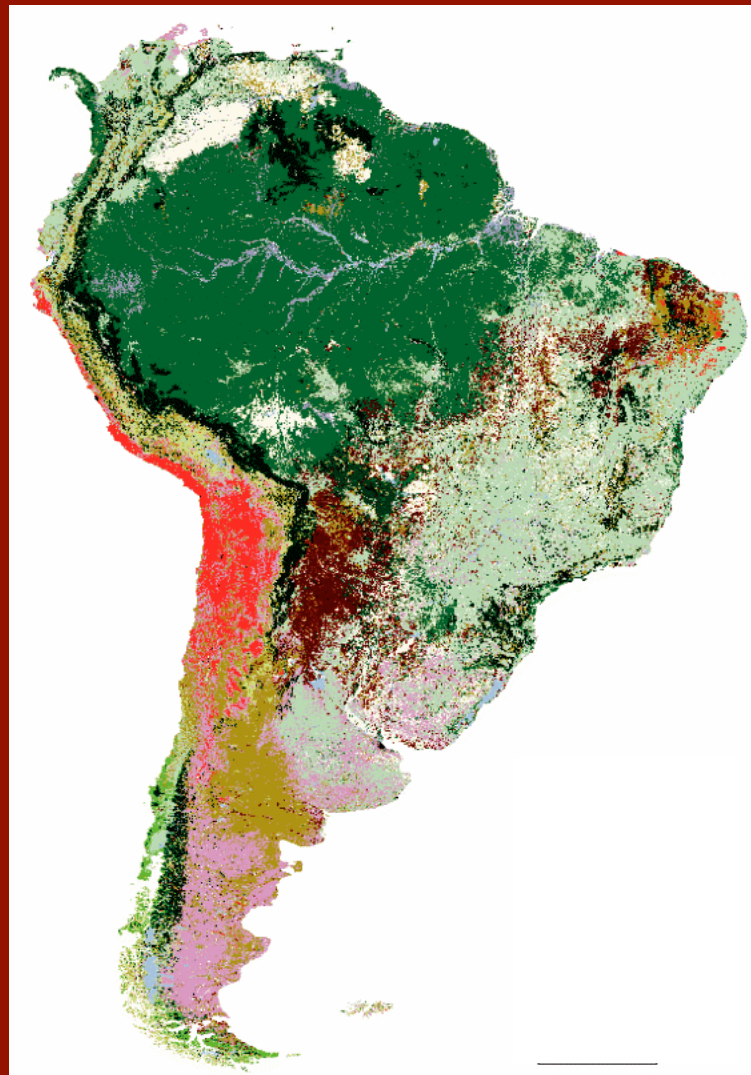
Instruments/measurements requested

- S-Polka (reflectivity, radial velocity, polarimetric variables, and moisture measurements)
- Integrated Surface Flux Facility (ISFF) network: heat and radiation fluxes, surface meteorological parameters, and soil parameters
- Soundings
- Precipitation gauges network



Additional plots

Land cover map of South America

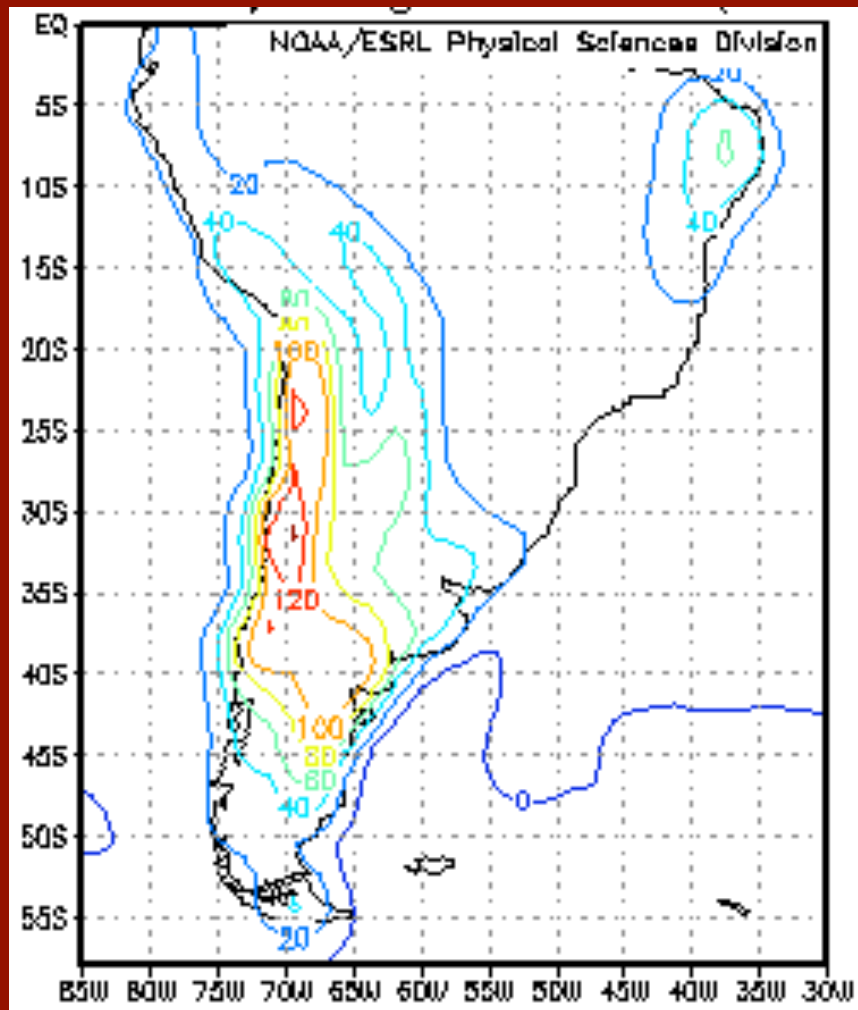


- Lowland humid forests
- Montane forests :
- Deciduous forests
- Flooded forests
- Temperate forests
- Agriculture
- Grasslands
- Shrub lands
- Steppe
- Barren
- Water, ice and snow
- Urban

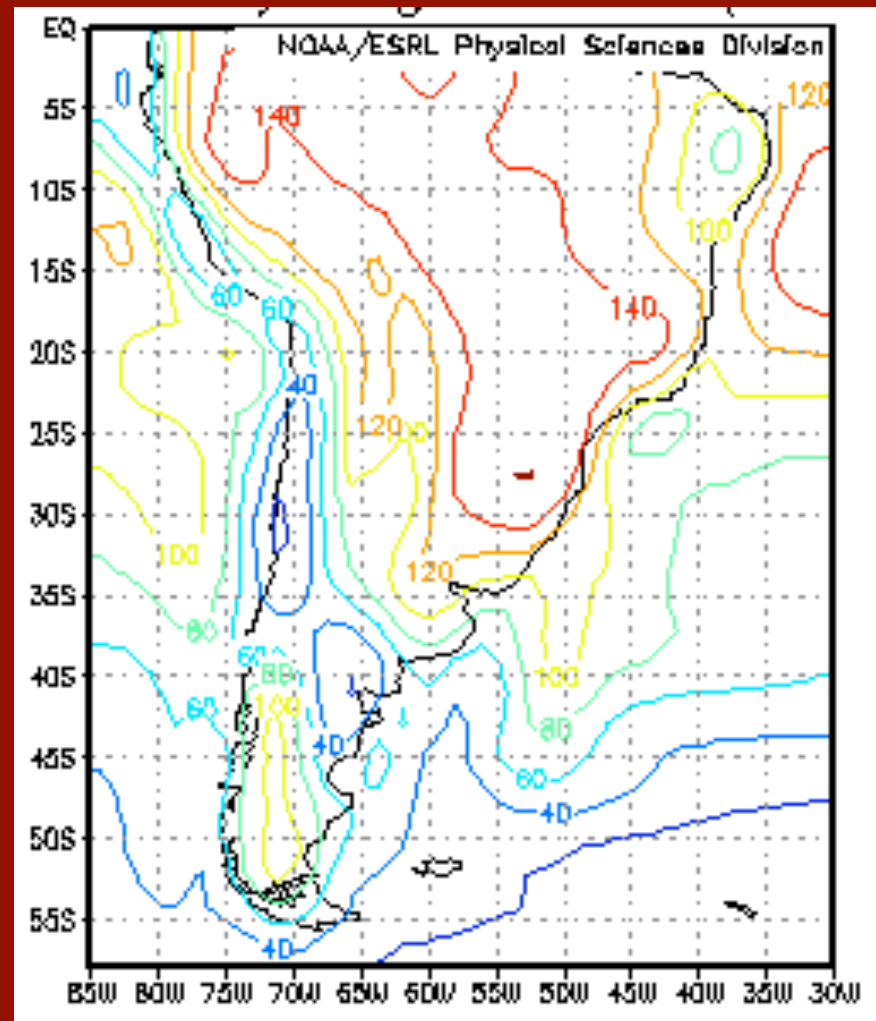
Eva et al. 2004

Surface fluxes in South America (NDJF)

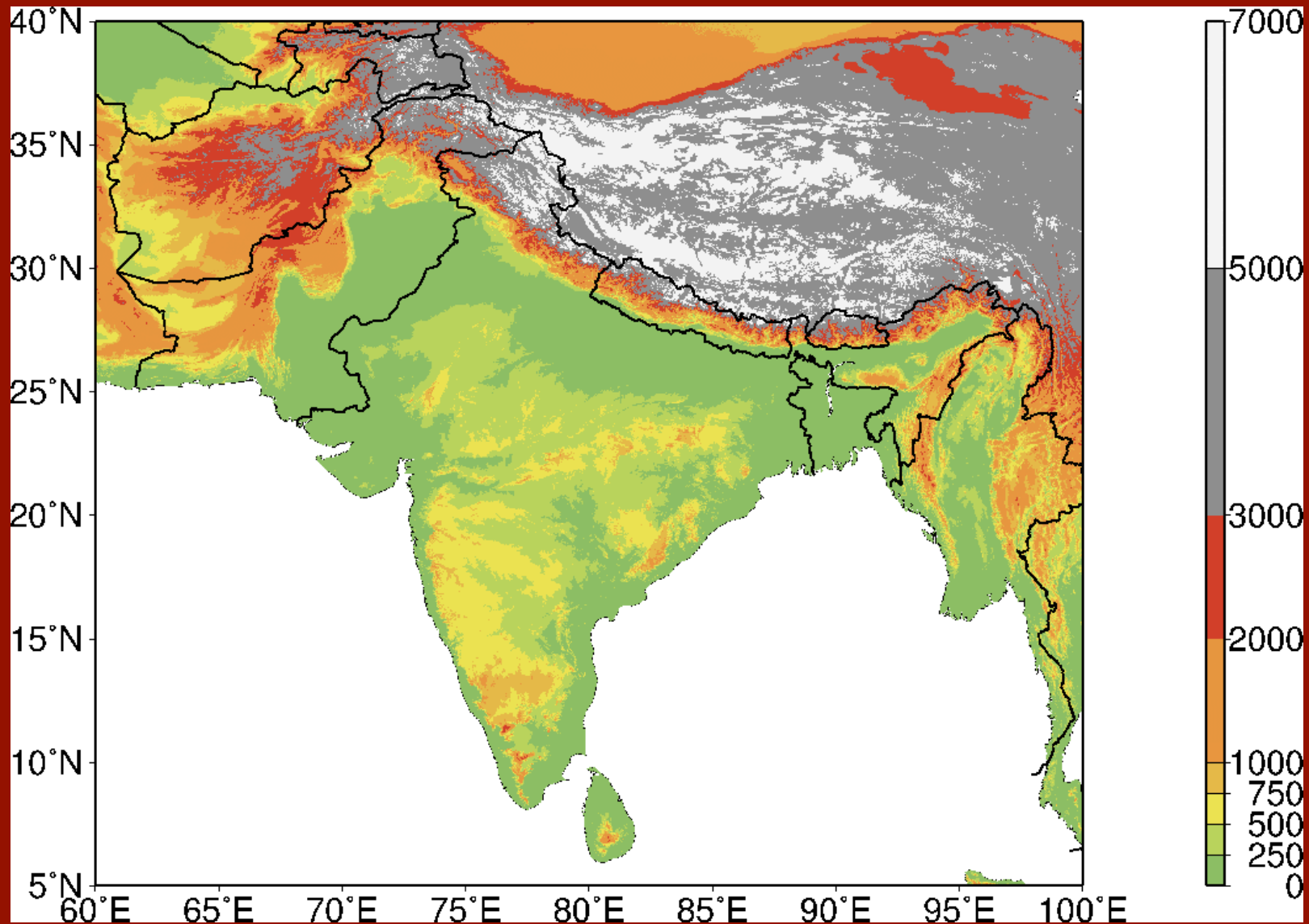
Sensible Heat (W/m^2)



Latent Heat (W/m^2)

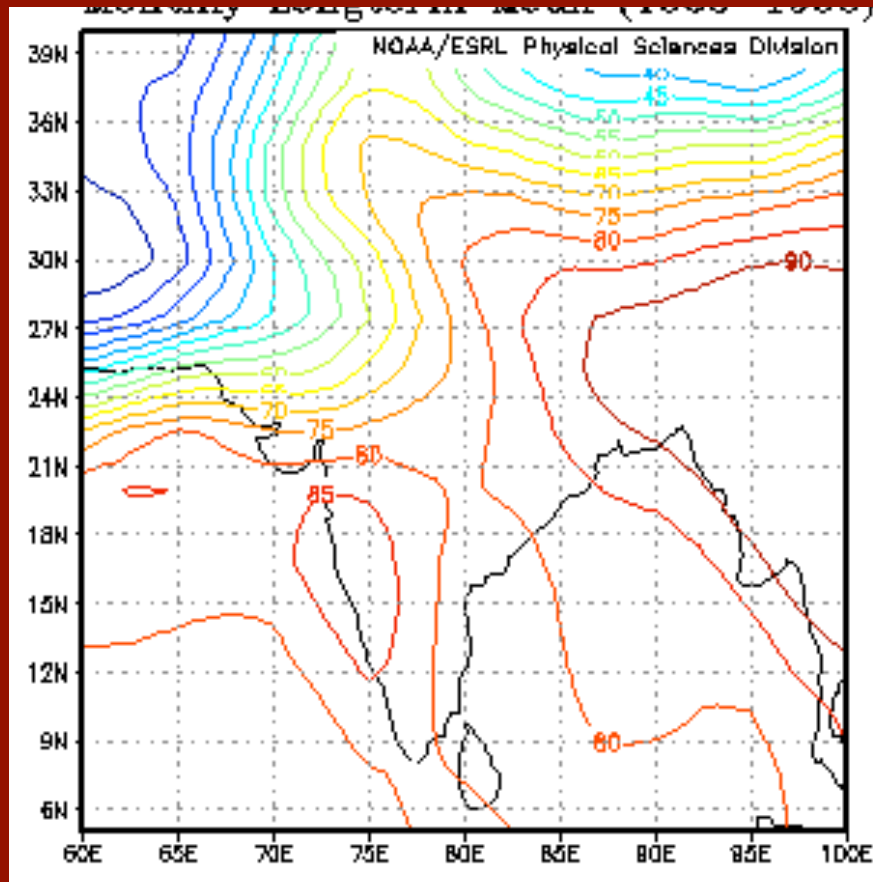


Orography of Indian Peninsula

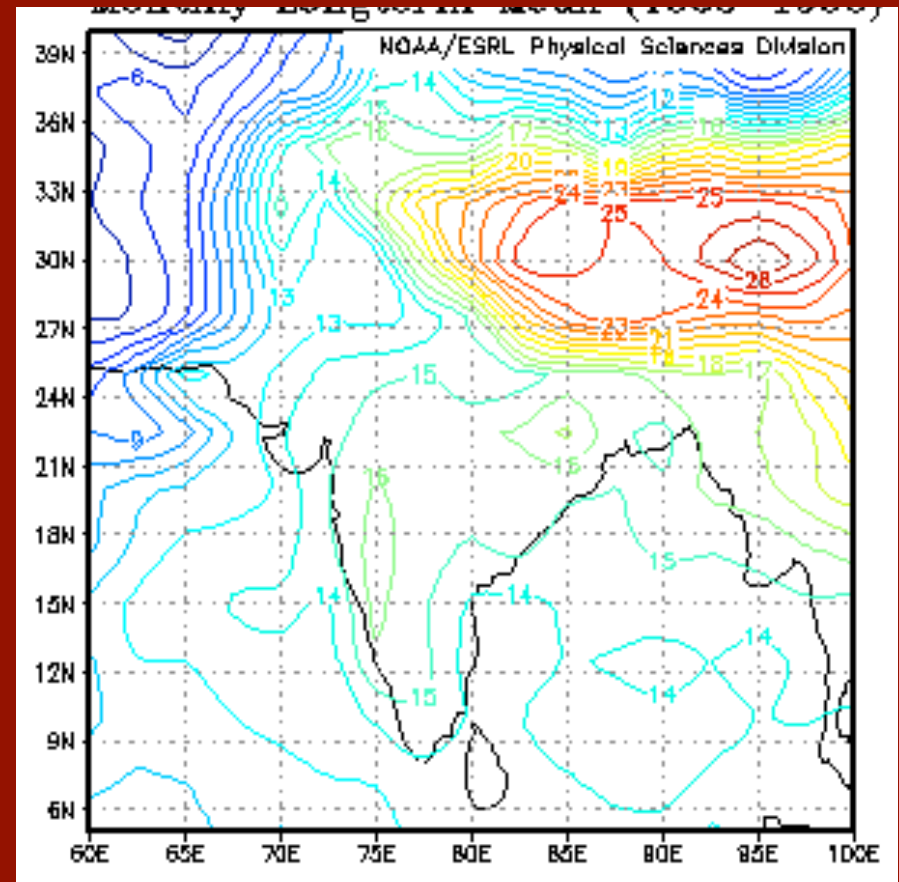


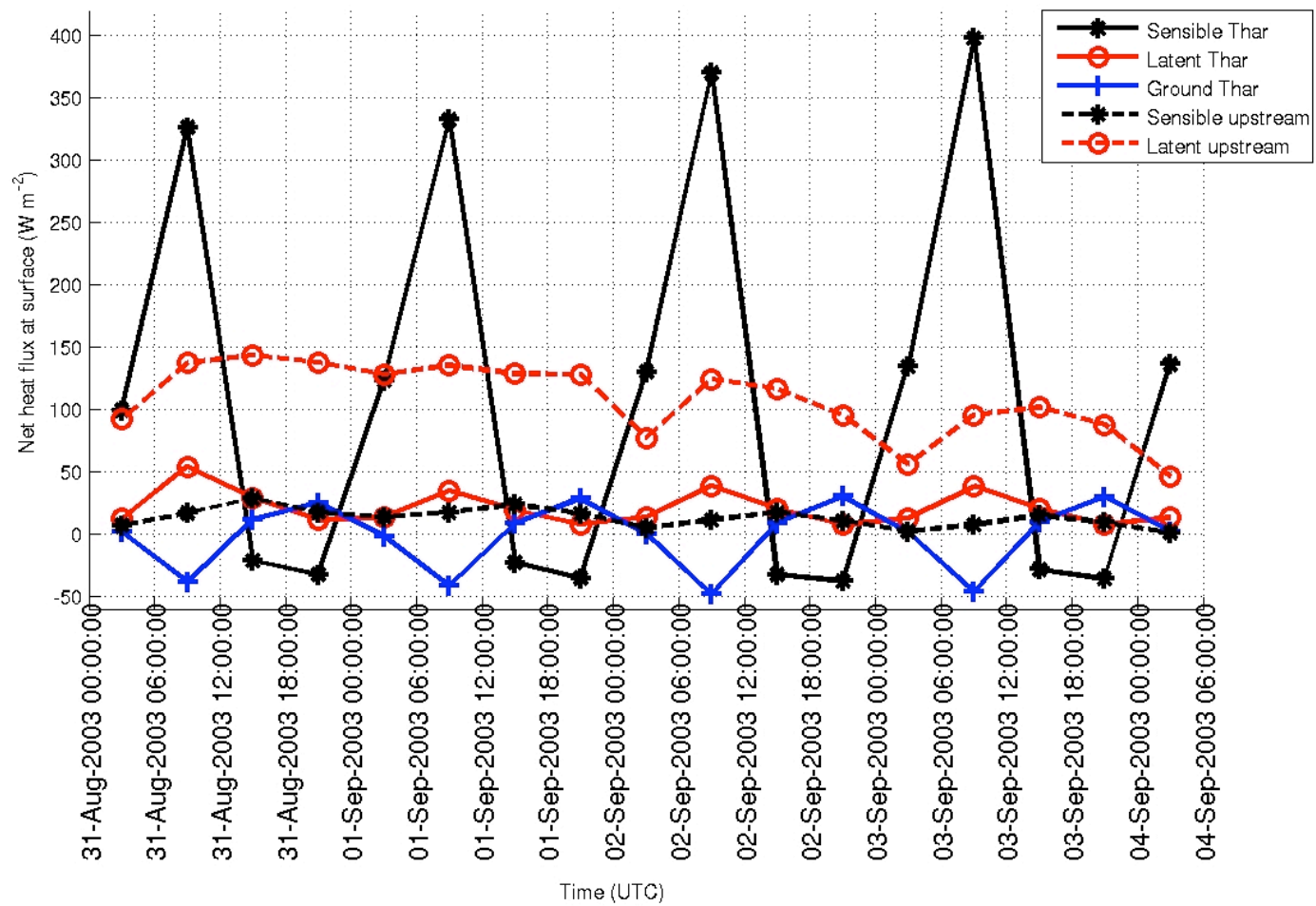
Dry-line in Indian Peninsula (monsoon)

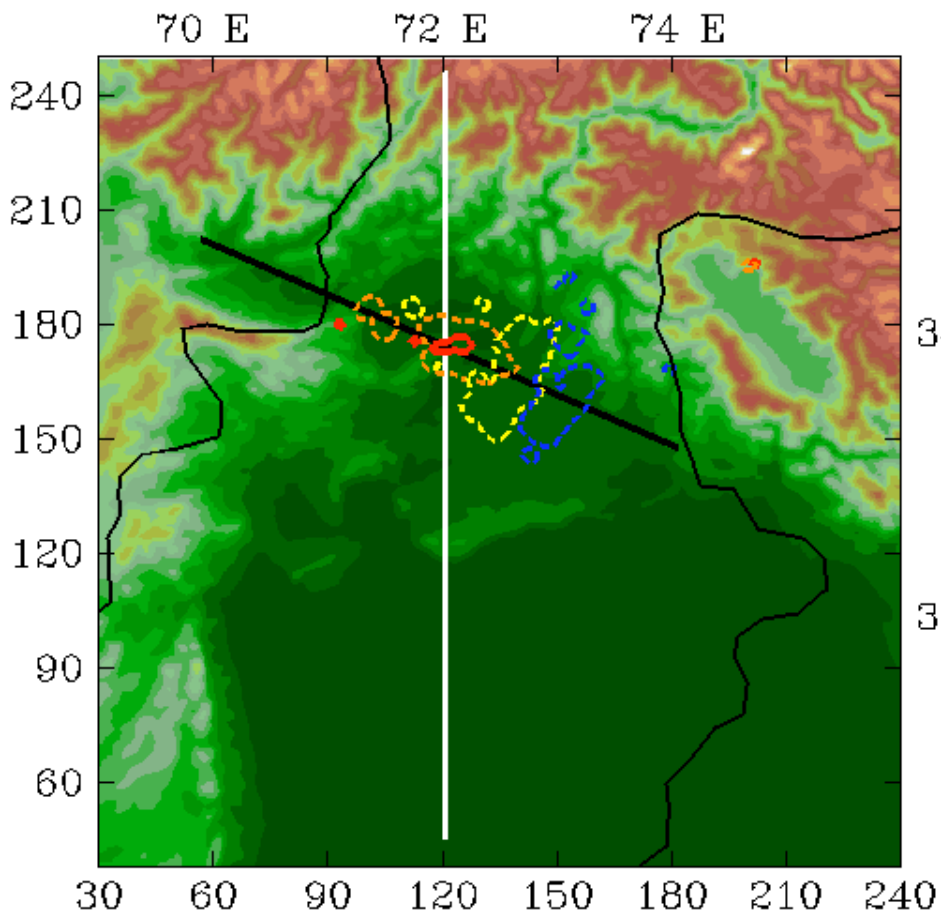
Surface RH (%)



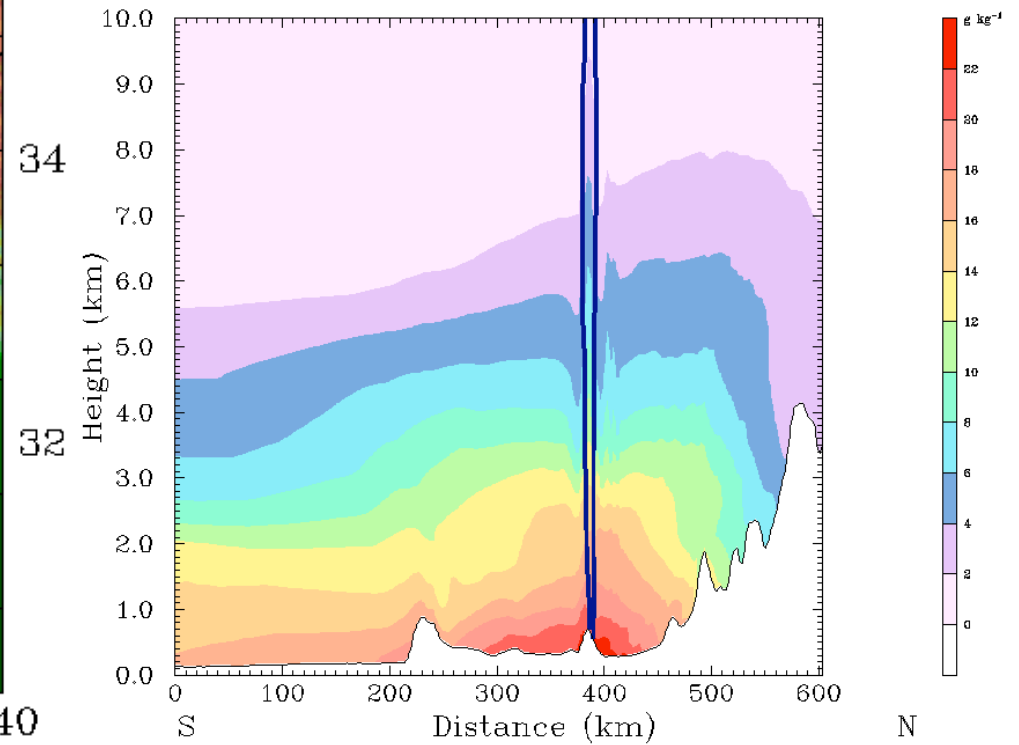
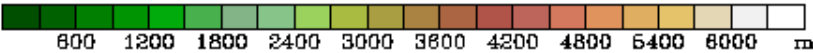
925 mb Specific Humidity (g/kg)







CONTOURS: UNITS=mm LOW= -10.000 HIGH= -10.000 INTERVAL= 10.00
CONTOURS: UNITS=mm LOW= -10.000 HIGH= -10.000 INTERVAL= 10.00
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CONTOURS: UNITS=mm LOW= -10.000 HIGH= -10.000 INTERVAL= 10.00



Low-level moist flow capped by dry flow off Afghan mountains

NOAA HYSPLIT backward trajectories (FNL)

1.0 km AGL
3.5 km AGL

