

An investigation on the frequency and intensity of extreme precipitation in Chennai city in the context of climate change

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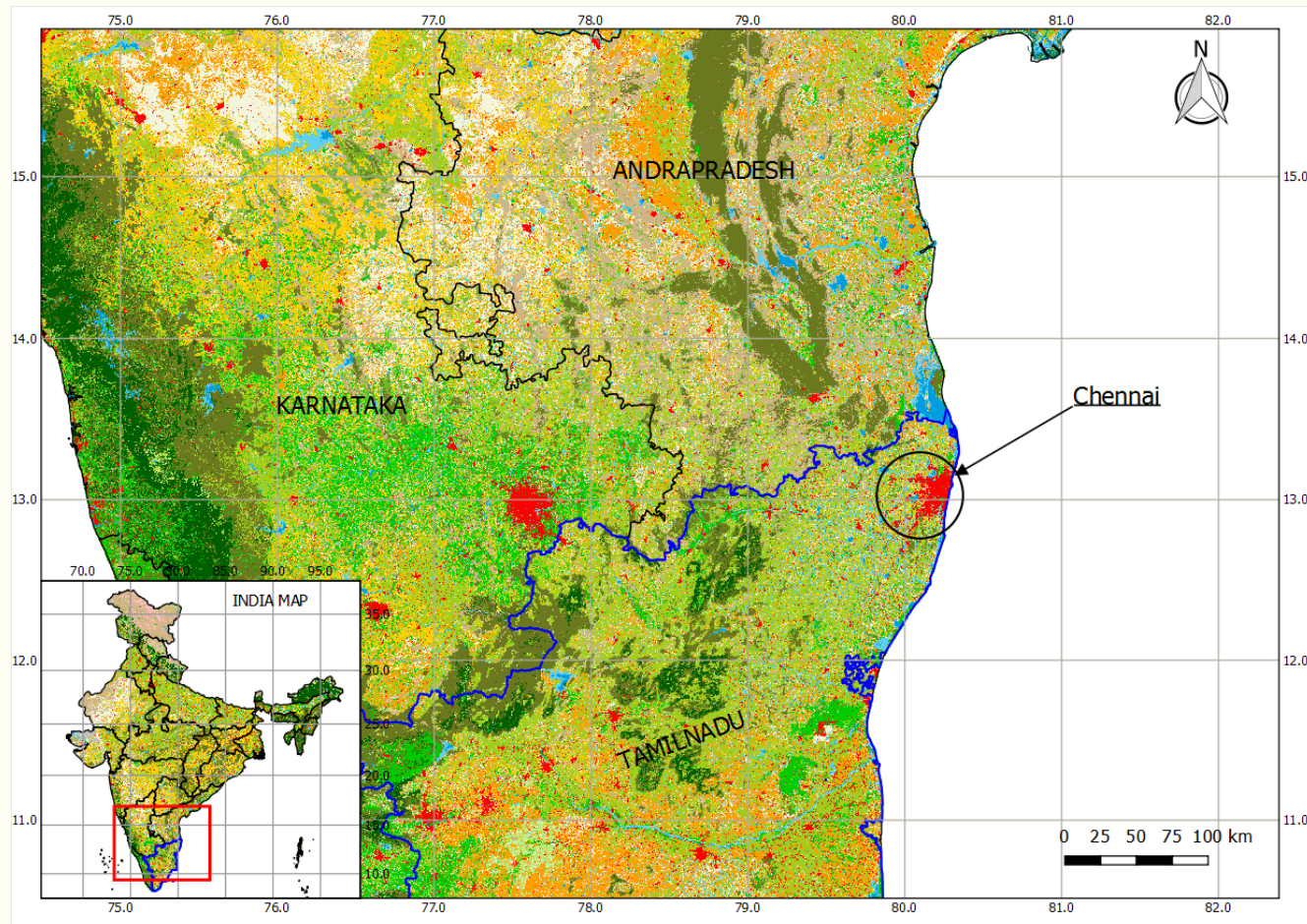
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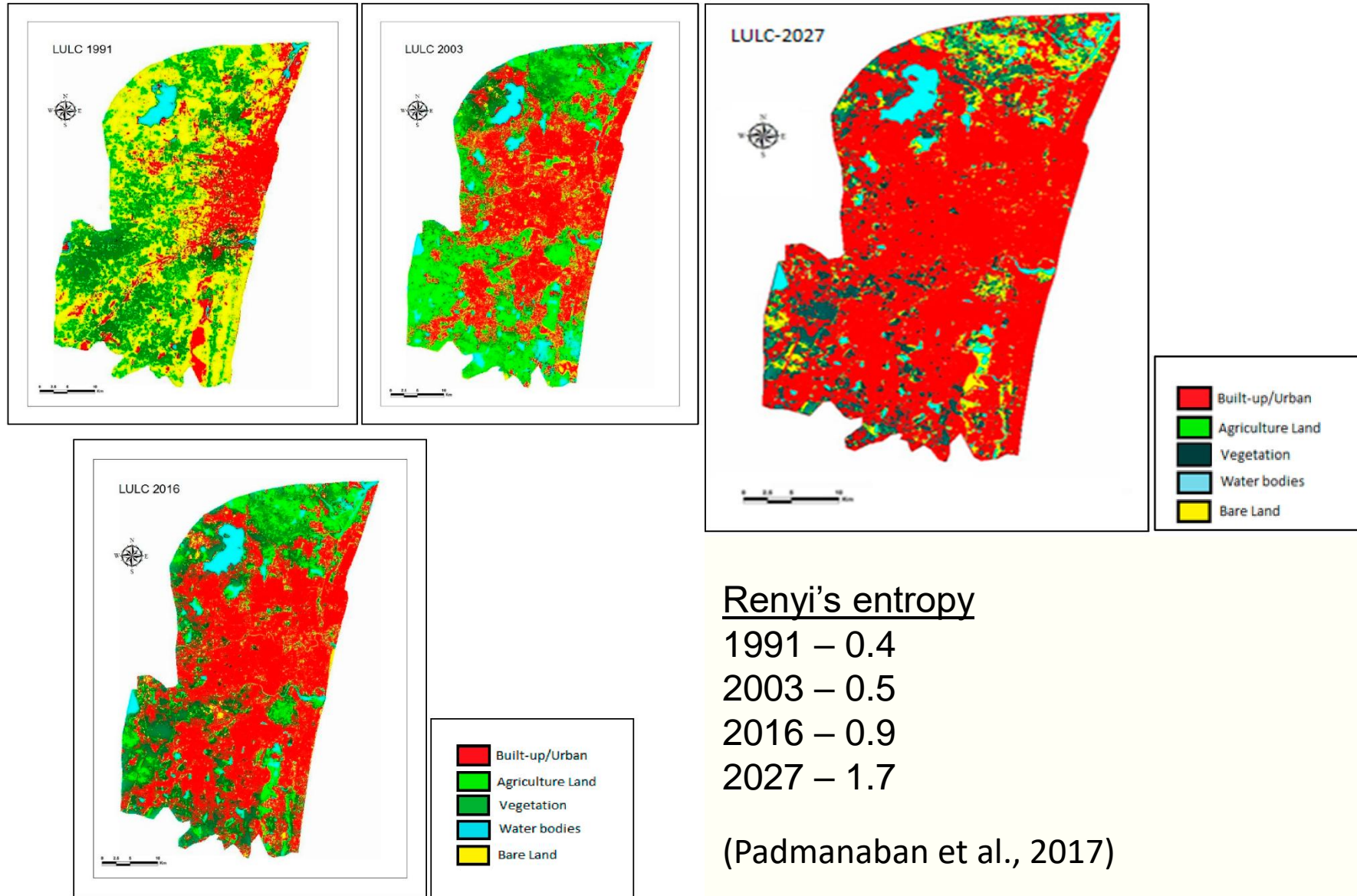
Chennai Flood During December 2015



Chennai City



Rapid Urbanization



Causes

- Improper maintenance
- Inadequate drainage capacity



Waste Removal from drainage in B V K Iyengar road Bengaluru, (October 20, 2016)



Drainage water overflowing onto Avenue Road in Bangalore on Monday, (The Hindu, December 18, 2012)

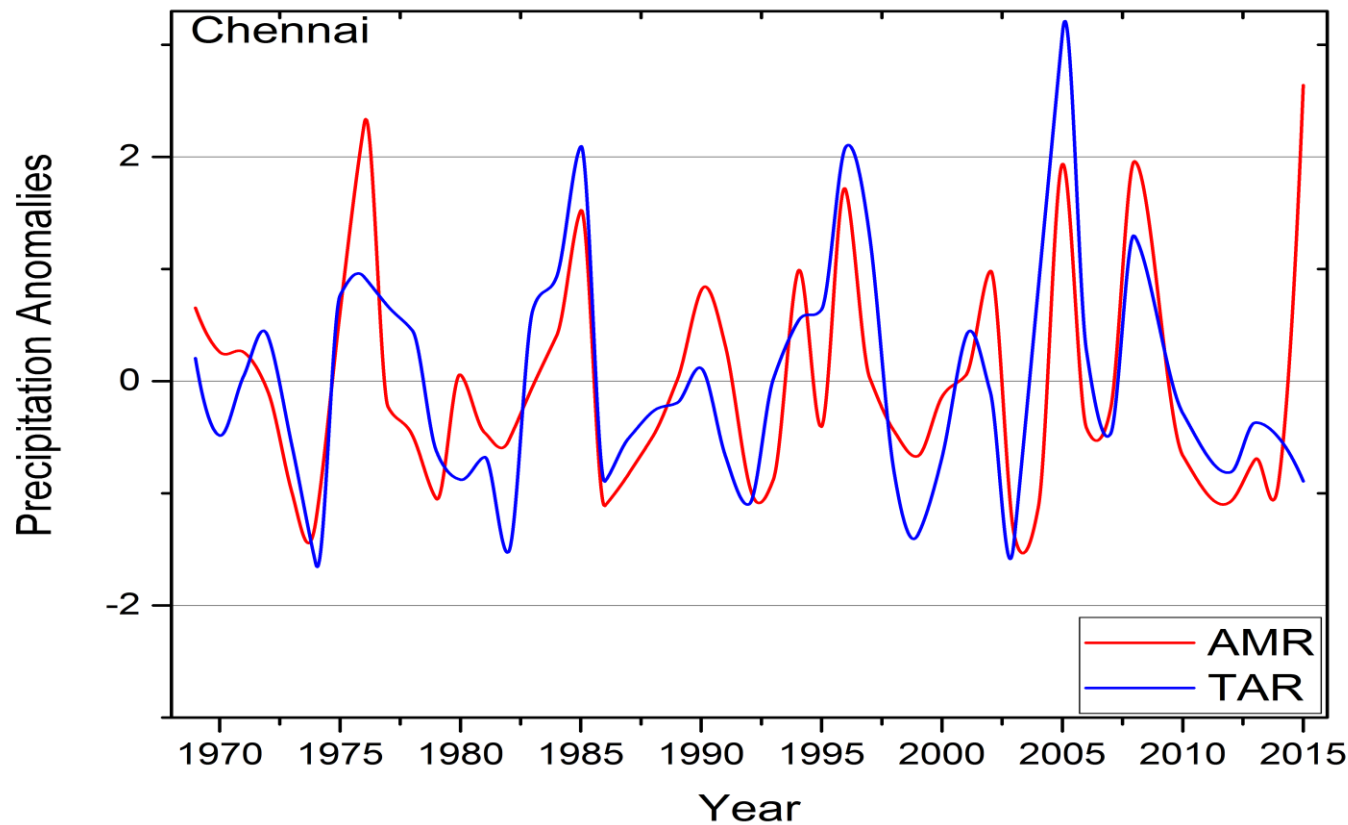
Chennai Rainfall



- Average annual rainfall **1300** mm 73 rain days
- Average Annual maxima **170** mm
- December 1st 2015
 - Rainfall is **350** mm (Meenambakkam)
 - Rainfall is **425** mm (Nungambakkam)
- 350 mm is a 166 year return period event
- The design intensity **-39mm/h** (T=2y,D=1h) which is supposed to be more than **50mm/h**



Precipitation Anomalies in Chennai City



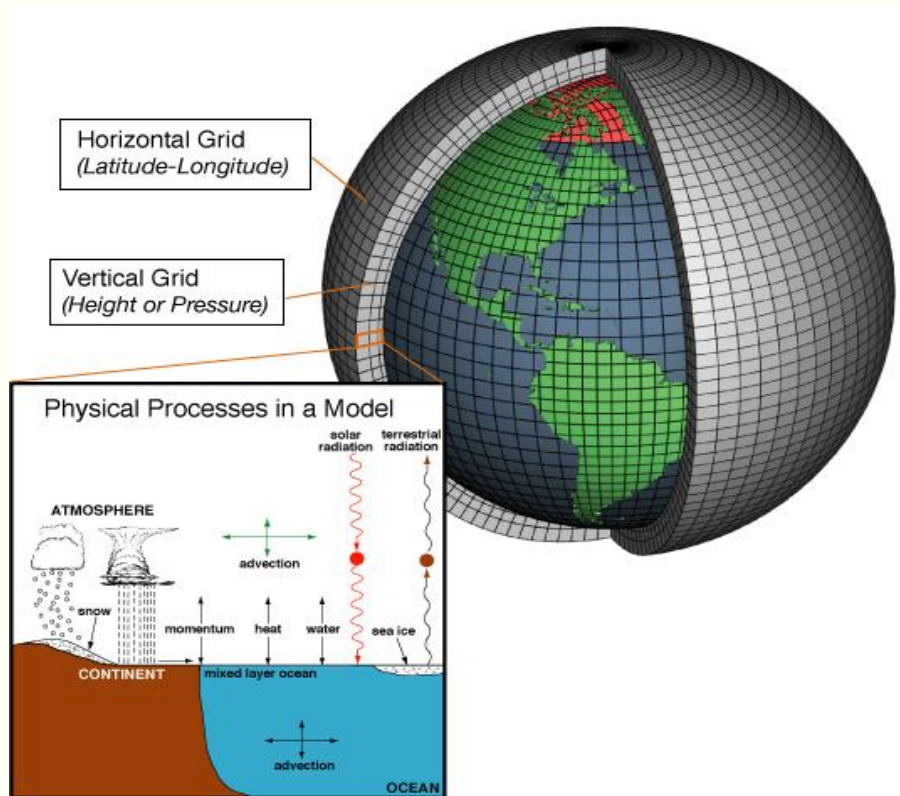
Intergovernmental Panel on Climate Change (IPCC)



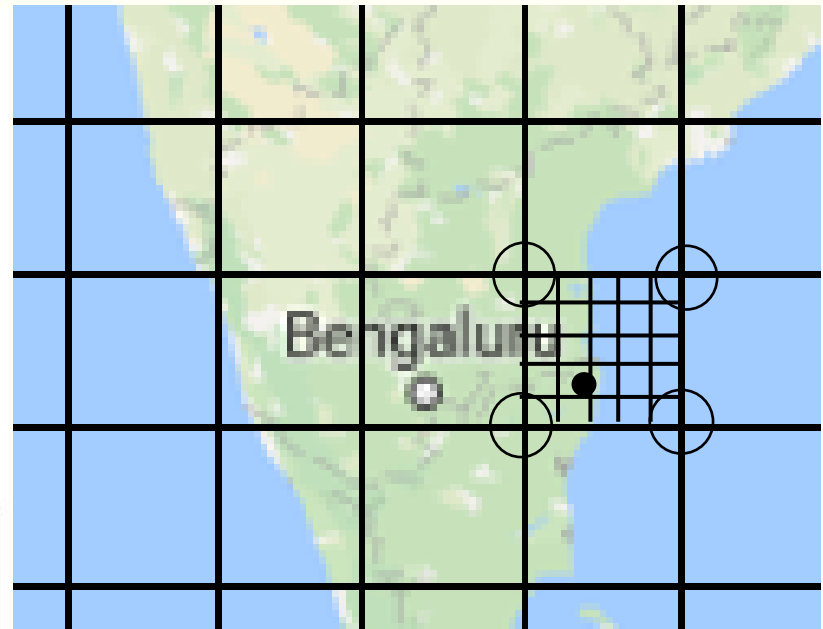
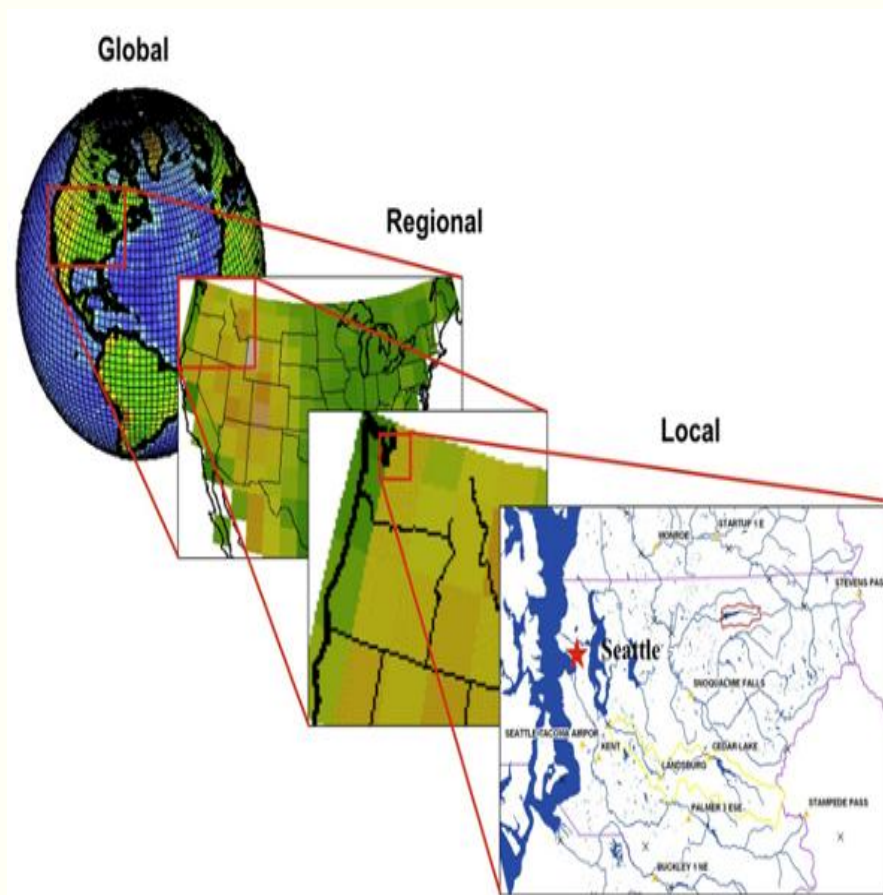
- Gives guidelines for projection of climatic variables.
- The projections are General Circulation Model (GCM) Simulations.
- Emission Scenarios, (RCP2.6, RCP4.5, RCP6.0, RCP8.5)
- The simulations are at global scale
- Downscaling is required.



GCM Projections

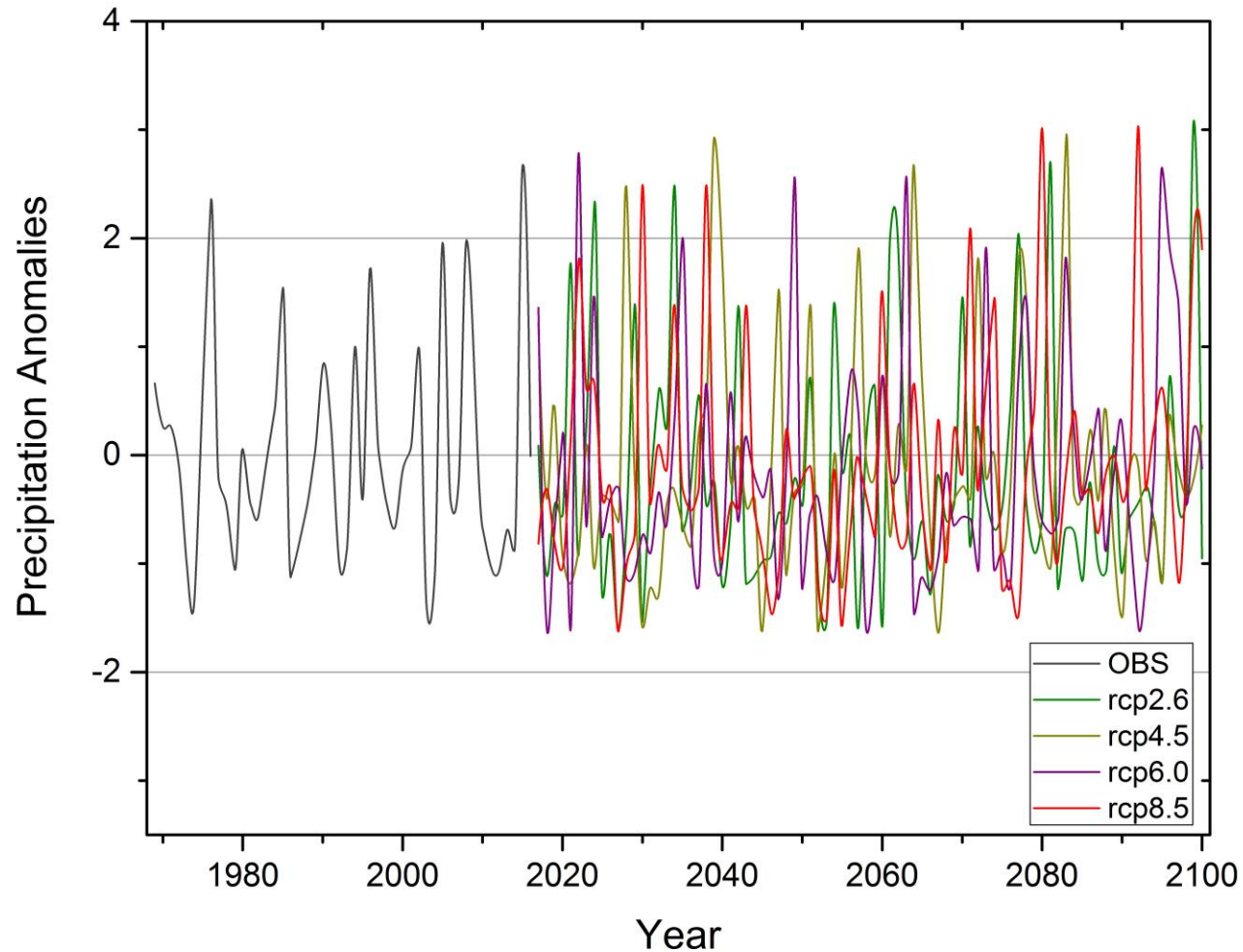


GCM: Numerical models representing physical processes in the atmosphere, ocean, cryosphere and land surface

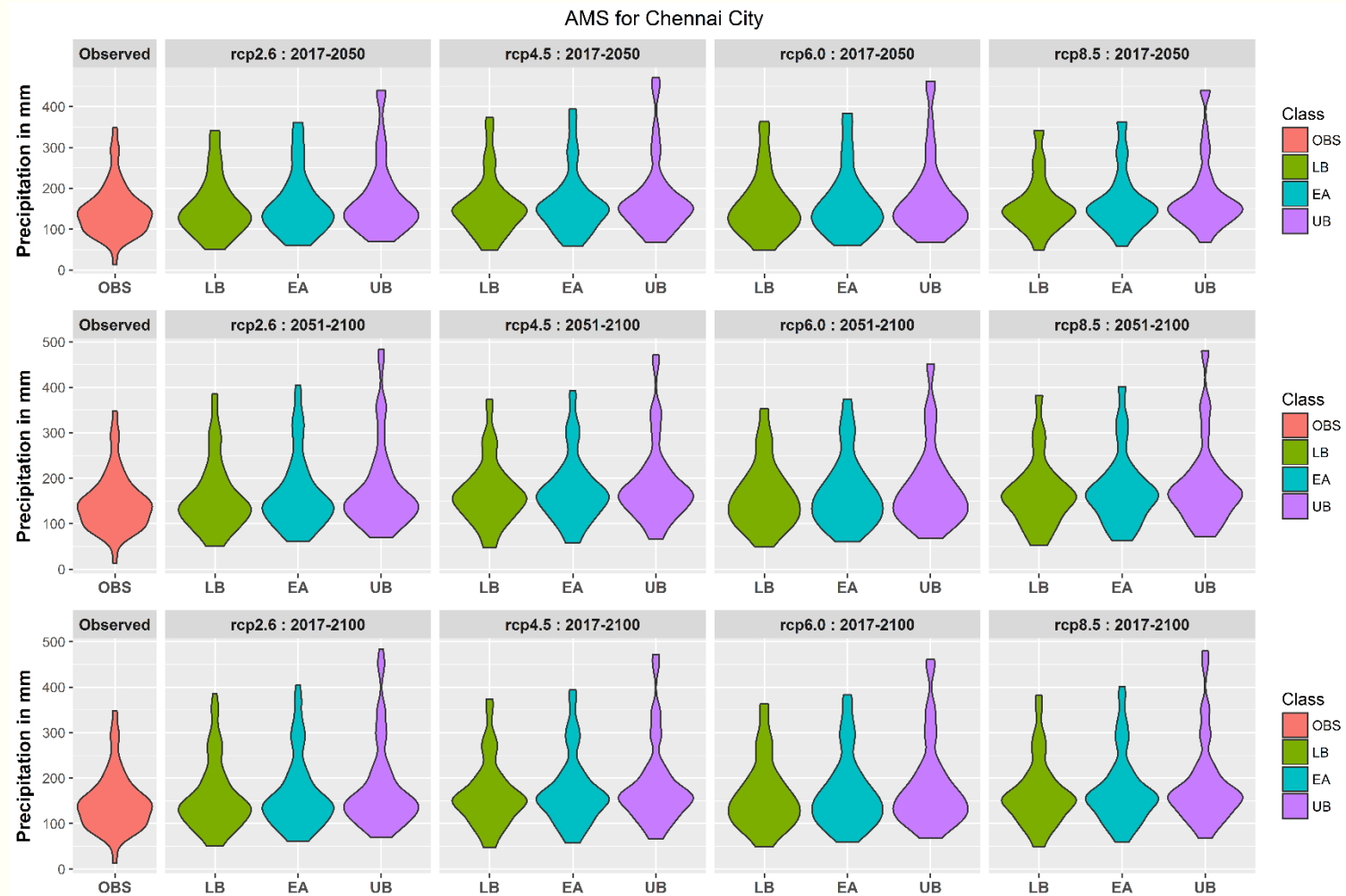


Downscaling: Using information at coarser scale obtaining the information at finer scale

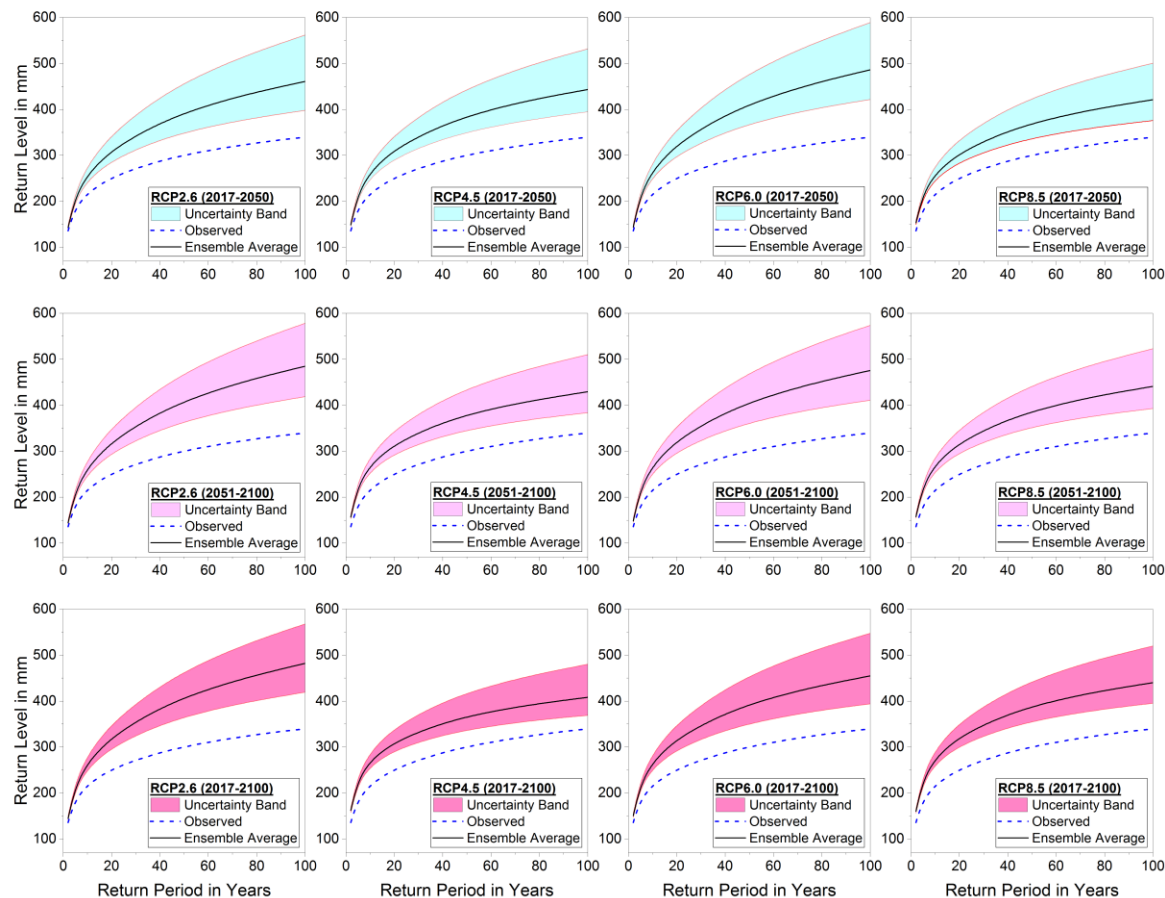
Future Extreme Anomalies



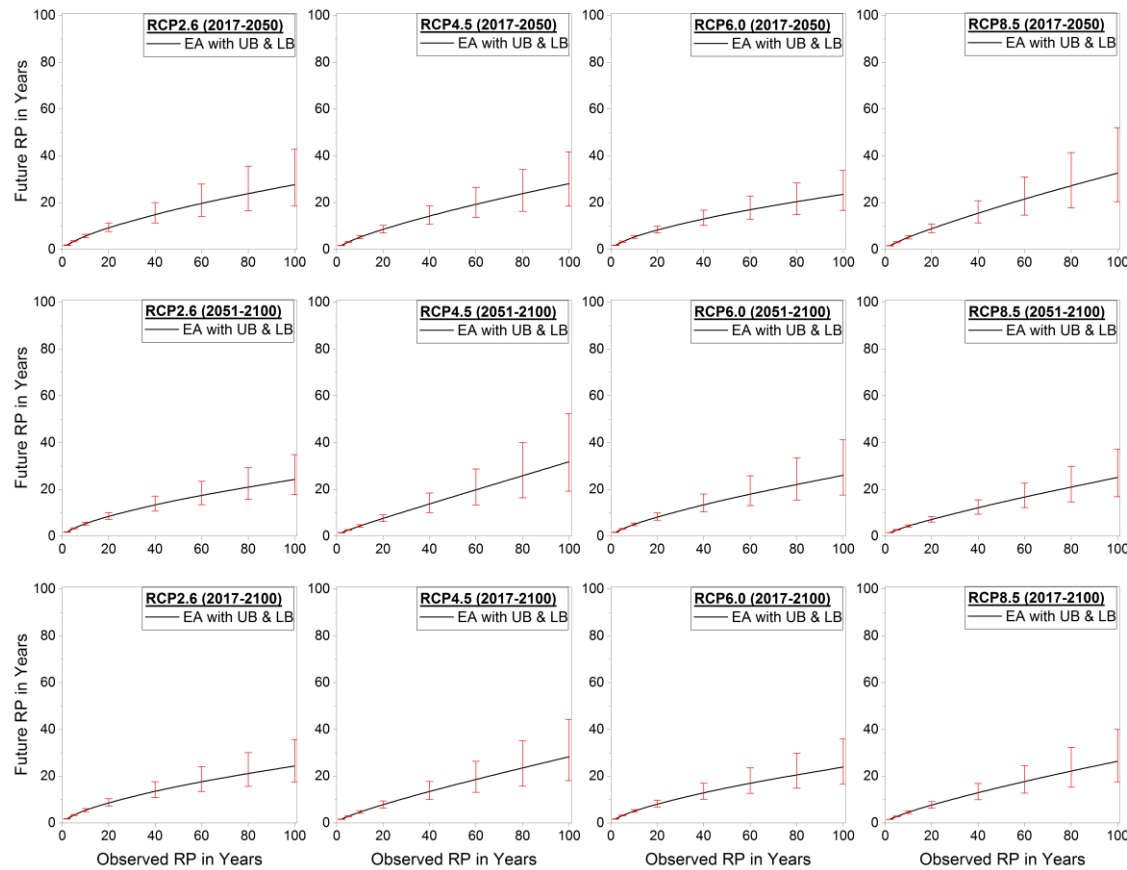
Future Extreme Precipitation Events in Chennai



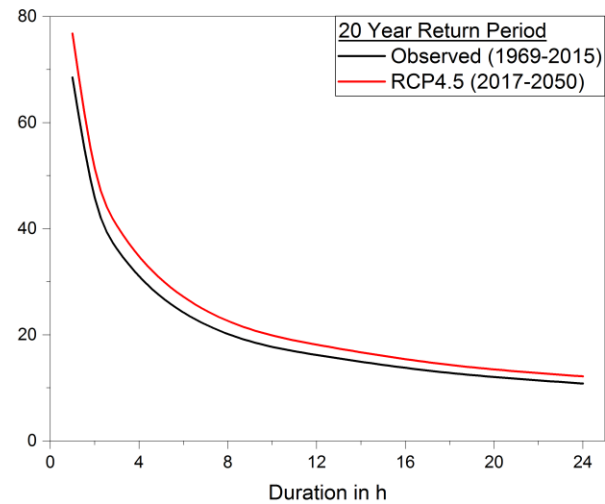
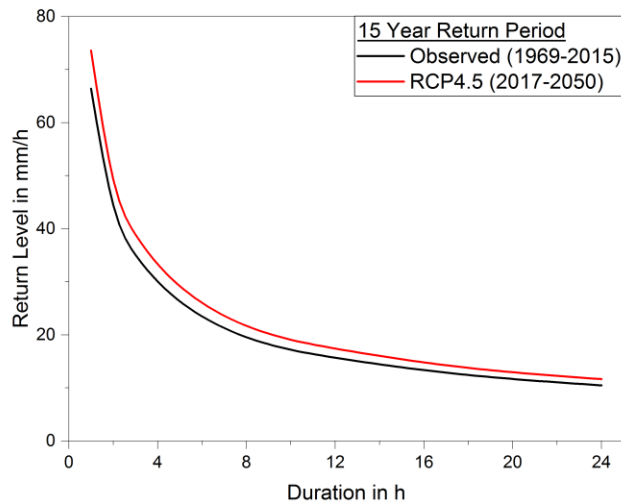
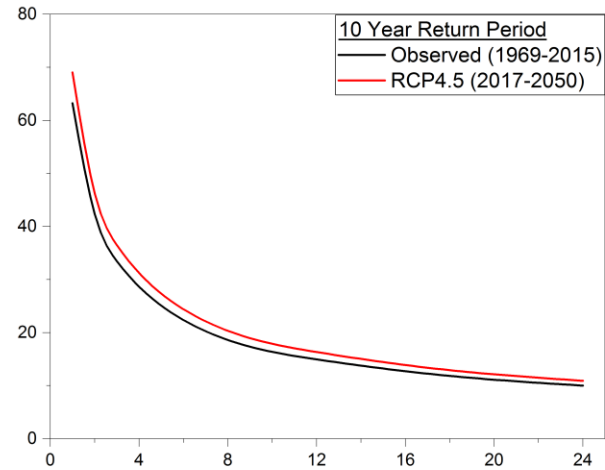
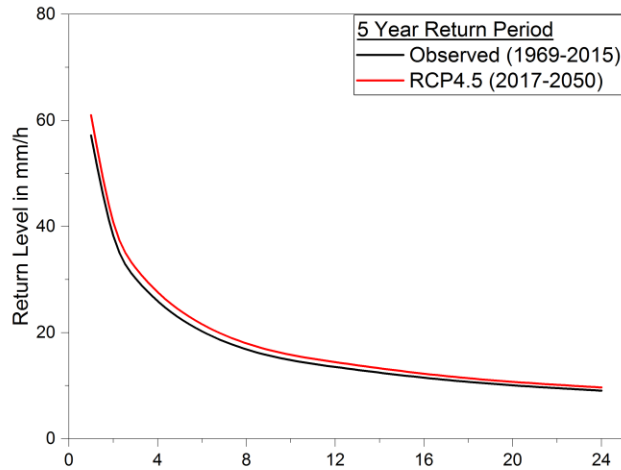
Changes in extreme precipitation magnitudes with respect to return period



Changes in return periods



Future IDF's





Conclusions

- Dec 1st (166 year event) is expected to occur at
30year-rcp2.6,
31year-rcp4.5,
26year-rcp6.0,
37year-rcp8.5.
- The design intensity -39mm/h ($T=2y, D=1h$)
- This designed intensity (39mm/h, $T=2y, D=1h$) is expected to increase to 54 mm/h in the near future under rcp4.5
- There is necessity to revisit the urban drainage design criteria.

