1. Motivation

The southern slope of Tibetan Plateau (SSTP) is one of the rainiest regions in the world and the Tibetan Plateau is sensitive to global climate change. However, current climate models’ spatial resolutions are too coarse to resolve the steep topography and associated topographic convection. Here we use a high-resolution climate model to investigate the elevation-dependence precipitation characteristics and possible future changes over SSTP.

2. Data and Method

- **Satellite observation:** GPM IMERG V06B Level3 daily precipitation data with 0.1° resolution from 2001 to 2008. The GPM data is regridded to the horizontal resolution of model (0.14°) for the approximation by bilinear interpolation.

- **Model simulation:** Non-hydrostatic Icosahedral Atmospheric Model (NICAM) AMIP-type simulation with 14 km horizontal resolution for 1979-2008 and 2075-2104 under A18 scenario.

3. Historical Precipitation from Observation and Model

- **Precipitation over SSTP:** Obviously stands out and there are two precipitation maxima at the southeast of the Tibetan Plateau. The main rainy season over SSTP lasts from June to September.

- **NICAM** can well simulate the precipitation distribution as observation. The maximum summer precipitation over SSTP is 19.8 (24.3) mm/d from GPM (NICAM) and the summer mean precipitation averaged over SSTP is 7.73 (10.48) mm/d (Fig. 1bd).

- NICAM generally underestimates light precipitation probability but overestimates heavy precipitation with intensity larger than ~30 mm/d.

- The heavy precipitation probability over 1-2 km of SSTP is the largest and decreases with elevation while the light precipitation probability generally show the opposite.

4. Future Precipitation Projection

- The precipitation generally decreases with elevation over SSTP.

- Future precipitation will decrease over low-level SSTP (1-2 km) and lower surrounding area but increase over high-level SSTP (2-4 km).

5. Extreme Precipitation Changes

- Extreme precipitation intensity will increase > 8% °C and extreme precipitation probability will increase up to ~50% °C in the future.

- The increases of extreme precipitation probability and intensity over high-level SSTP are more obvious than over low-level SSTP.

6. Circulation Changes

- The upward air flow over SSTP for extreme precipitation days is much stronger than the summer mean.

- The strength of upward air flow over SSTP in the future indicates that dynamic contribution may lead to the significant increase of extreme precipitation over SSTP.

7. Conclusion

- NICAM well reproduces precipitation spatial patterns, seasonal cycle and extreme precipitation belt over SSTP as compared with observations.

- Future mean precipitation over SSTP during the summer will decrease over lower SSTP but increase over higher SSTP from NICAM simulation.

- The projected extreme precipitation will increase along the SSTP topography, especially over higher SSTP, which may be caused by the strength of upward air flow.

8. Reference

Na Y, Lu R, Fu Q, Kodama C. Precipitation characteristics and future changes over the southern slope of Tibetan Plateau simulated by a high-resolution global nonhydrostatic model. Under Review.