Delayed response of the onset of the summer monsoon over the Bay of Bengal to land-sea thermal contrast

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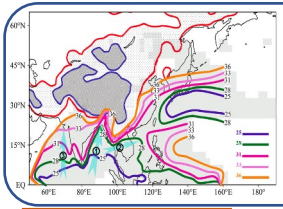
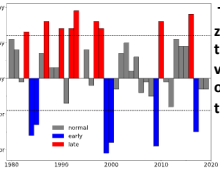
Background



- Bay of Bengal is the first place where the Asian summer monsoon onset(Wu et al. 2013).
- BOB summer monsoon onset (BOBSM) can influence the subsequent summer monsoon and early summer precipitation in the Southwestern China.

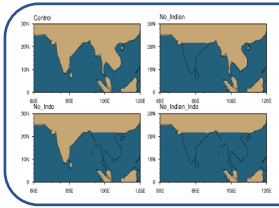
Method – Composite Analysis



The onset date was defined as the zero-day (D0), and then calculated the arithmetical mean of each variable during the onset period over each corresponding day for the time period 1980–2019.

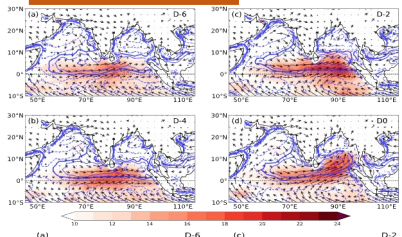
Fig1. BOBSM onset dates

Sensitivity Experiment



We changed the land-sea distribution in CESM2 to see the influence of tropical continent on the BOBSM onset.

Result A – Data Analysis



Low level

Sea-surface sensible heating drives the low level southwesterly establishment.

Fig2. Sea surface wind, relative vorticity (contours) and Sea surface sensible heat flux

Large Scale

Deep convection drives the large scale transition.

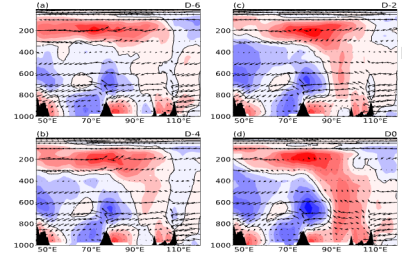


Fig3. Meridional wind (shading), zonal circulation along 10-15°N

Result B – Model Simulation

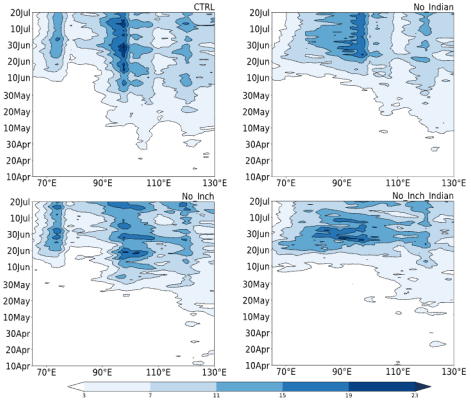
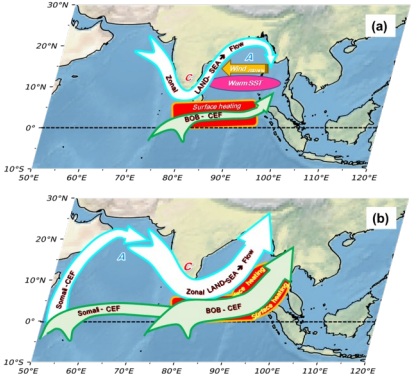


Fig4. Precipitation over 10-20°N in control and sensitivity experiments

Tropical Land-Sea distribution can influence the onset sequence of the summer monsoon over Asian

Result C - Conclusion



Tropical land can promote the establishment of southwest winds and help complete the transformation of monsoon circulation