

Mechanism of the Interaction Between the Indian Monsoon and the SCS Monsoon

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In this work, we study the relationship of the South China Sea (SCS) monsoon with the SCS SST and with the Indian monsoon westerlies. It was shown in some previous studies that the SCS wind speed is positively correlated with the Asian summer monsoon index. Strong wind was shown to cool down the SCS SST. Therefore, we expect that the negative SST anomaly suppresses the SCS monsoon. However, it was reported that the equatorial Indian westerlies intensifies and shifts northward the SCS monsoon. Thus, we are interested in the mechanism of the interaction between the Indian monsoon and the SCS monsoon. We use NCEP reanalysis data for low-level wind, CMAP data for precipitation and ICOADS data for SST. The data is averaged over June-July-August (JJA) of 21 years (1982 – 2002). The model used in this study is GSM T63L40 by Japan Meteorological Agency (JMA) that is run for 5 years as control run and also averaged over JJA. To observe the SCS monsoon sensitivity to the SCS SST, we make an experiment by inserting a positive (negative) SST anomaly 0.5K (-0.5K) over the SCS regions. The model sensitivity experiment shows that the SCS monsoon is sensitive to the SCS SST anomaly. The positive SST induces the Indian monsoon westerlies and increase the airflow convergence over the SCS region. On the other hand, the NCEP data shows that the SCS SST has a negative correlation with the Indian monsoon. This is because the Indian monsoon westerlies enhance the SCS westerlies and reduce the SCS SST. The Indian monsoon enhances the surface evaporation and increases the moisture flux. Another important mechanism which modulates tropical disturbances is the WISHE (Wind-Induced Surface Heating Exchange). The observational and model studies indicate that the Indian monsoon is able to enhance the SCS monsoon through WISHE. Comparing the SST effect and the WISHE effect on the SCS monsoon quantitatively, the WISHE effect is larger than the SST effect. Therefore, the Indian monsoon tends to enhance the SCS monsoon through WISHE. Besides that, we also observe the influence of the SCS monsoon to the Indian monsoon. The model sensitivity experiment shows that the SCS monsoon enhances the Indian monsoon westerlies and precipitation. From the above results, we conclude that the Indian monsoon and the SCS monsoon intensify each other.