

## Annual Variation of the Arabian Sea and South China Sea in Response to Monsoons

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Monsoons are the seasonal changes of winds forced by continent-ocean temperature contrast. Their annual onset, intensity, and retreat vary greatly, and the variation has strong economic and social impacts to a large portion of the world's population. Over land, the consequences of monsoon are, perhaps, well observed, but the breeding ground over the ocean has been insufficiently monitored. Recent availability of spacebased observations of wind vectors, sea surface temperature (SST), precipitable water (PW), and sea level, together help to understand the oceanic response to annual wind variations of the two major Asian monsoon systems, the Indian Monsoon over the Arabian Sea (AS) and the East Asian Monsoon over the South China Sea (SCS).

The most clear signal of the onset of summer monsoon in the northern part of AS and SCS is the sharp jump in PW which occurs in May in SCS and in June in AS. At the onset, there is a sharp increase in wind speed in AS, but not in SCS. The wind direction fluctuate much more in the SCS than in AS during summer, reflecting strong intraseasonal weather activities in SCS. The onset of winter monsoon in SCS in October is clearly reflected in the sharp increase in wind speed and with the steadiness of wind direction from the Northeast. No significant increase in wind speed is found in AS during winter.

There is a northward migration of warm water during summer, but the SST drops slightly with the onset of summer monsoon in both AS and SCS, particularly in AS. There is stronger cooling at the onset of winter monsoon in SCS, but not so strong in AS. There is strong sea level elevation in summer and depression in winter in both AS and SCS, indicating wind driven anticyclonic and cyclonic ocean circulation, following the seasonal change in wind forcing.