Impacts of Arabian Sea SST biases on Indian monsoon precipitation and eastern Mediterranean climate in a coupled GCM

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We investigated impacts of sea surface temperature (SST) biases in the Arabian Sea on Indian summer monsoon precipitation and eastern Mediterranean climate, using a climate model called MIROC6 with two configurations (standard and eddy-permitting ocean model referred to as “Subhires”).
In the Subhires model, resolving the warm water outflow from marginal seas and heat transport by mesoscale eddies reduce mean cold SST biases over the Arabian Sea. Higher SST in the Arabian Sea results in cyclonic atmospheric circulation over the northern Arabian Sea, which increases precipitation in northwestern India during summer. Atmospheric general circulation model (AGCM) sensitivity experiments show that SST differences only in the northern Arabian Sea can lead to atmospheric circulation anomalies and precipitation increase in northwestern India.
It is also found that the Subhires model simulates a teleconnection from the monsoon rainfall better than the standard model. The teleconnection occurs at an interannual time scale between the Indian summer monsoon rainfall variability and descent over the eastern Mediterranean Sea, resulting from a monsoon-desert mechanism. AGCM sensitivity experiments show that higher SST in the northern Arabian Sea enhances descent anomalies in the eastern Mediterranean region, responding to precipitation increase in northwestern India.

Keywords: Arabian Sea, Monsoon-desert mechanism, Mesoscale eddy, Climate model

