Impact of ocean resolution on simulating sea surface temperature in the Arabian Sea and precipitation in the western India

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Abstract

Using MIROC6 (Tatebe et al. 2018) and 0.25° ocean version of MIROC6 (hereinafter, referred to as Subhires) climate simulation, impacts of ocean resolution on simulating sea surface temperature (SST) and precipitation are examined. It is shown that mean cold SST biases in the Arabian Sea are improved in Subhires during the summer monsoon season. Since MIROC6 treats the Red Sea and Persian Gulf as land, there is no outflow of high temperature water towards the Arabian Sea. On the other hands, since Subhires resolves the realistic land-sea topography, high temperature outflow transported by meso-scale eddies is well reproduced, which suppresses the cooling due to coastal upwelling off the coast of southeast Arabian Peninsula. It is also found that higher SST increases water vapor supply and precipitation of the western Indian summer monsoon (ISM).

Impact of resolving the Red Sea and Persian Gulf on the midlatitude climate variability are also examined. Relatively higher correlation between interannual variations of ISM rainfall and descent over the eastern Mediterranean region in Subhires indicates that the "monsoon-desert mechanism" at interannual timescale is captured relatively well in Subhires. Further statistical analysis reveals that the relationship between SST anomalies in the north/southwestern part of the Arabian Sea and descent over the Mediterranean. This implies that strong SST anomalies in the north/southwestern Arabian Sea lead to diabatic heating anomalies in the western India, and thus impact on descent anomalies over the Mediterranean.

References

Tatebe, H., Ogura, T., Nitta, T., Komuro, Y., Ogochi, K., Takemura, T., ... & Chikira, M. (2018). Description and basic evaluation of simulated mean state, internal variability, and climate sensitivity in MIROC6, Geosci. Model Dev. Discuss.