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## The air-sea coupling associated with the Indian Ocean Dipole diagnosed from CMIP3 coupled models

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The performance of 23 WCRP CMIP3 models in the simulation of the Indian Ocean Dipole (IOD) is evaluated and the results show large diversity in the simulated IOD intensity. A detailed diagnosis is carried out to understand the role of the Bjerknes dynamic air-sea feedback and the thermodynamic air-sea coupling in shaping the different model behaviors. The Bjerknes feedback processes include the equatorial zonal wind response to SST, the thermocline response to the equatorial zonal wind, and the ocean subsurface temperature response to the thermocline variation. The thermodynamic feedback examined includes the wind-evaporation-SST and cloud- radiation-SST feedback. A combined Bjerknes and thermodynamic feedback intensity index is introduced. This index well reflects the simulated IOD strength contrast among the strong, moderate and weak model groups. It gives a quantitative measure of the relative contribution of the dynamic and thermodynamic feedback processes. The distinctive features in the dynamic and thermodynamic coupling strength are closely related to the mean state difference in the coupled models. A shallower (deeper) equatorial mean thermocline, a stronger (weaker) background vertical temperature gradient, and a greater (smaller) mean vertical upwelling velocity are found in the strong (weak) IOD simulation group. Thus, the mean state biases greatly affect the air-sea coupling strength on the interannual timescale.