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Interdecadal ENSO and IOD modulation simulated by GFDL-CM2.1

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Interdecadal modulation of the Indian Ocean Dipole (IOD) and El-Niño / Southern Oscillation (ENSO) activities and its relationship with the interdecadal air-sea variability are investigated with the 2000 yr integration of GFDL-CM2.1. First, simulated ENSO (IOD) mode is defined as 1st EOF mode of December-February (September-November) SST anomaly in the tropical Pacific (Indian) Ocean. The each 1st EOF modes capture the variability of Nino-3.4 and Dipole mode indices very well. Then activity of the ENSO and IOD is defined as 20 yr running mean variances. The derived activity has a significant spectrum peak around 60-200yr. In order to investigate the relationship between the activity and background state change, the temporal variation of the ENSO and IOD activity is regressed onto 20- yr low-passed SST and SSH fields. Both (ENSO and IOD) regressed SSH and SST fields exhibit similar spatial pattern; east-west dipole in the tropical Pacific and cold anomaly in the east of Madagascar. For the comparison, EOF and SVD analyses are also executed for the interdecadal (20-yr low-passed) SST and SSH variations. Interestingly, derived 2nd EOF and SVD mode is quite similar to the aforementioned regression pattern. The ratio of 2nd SVD mode is increased up to 22 % while that of 2nd EOF mode is 15 %, which implies that the thermocline feedback is effective in the 2nd mode and it may affect the ENSO and IOD amplitudes.