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Thermodynamics of the simulated ENSO and its decadal modulation

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Using outputs from the SINTEX-F1 coupled GCM, thermodynamics of the ENSO events and its decadal modulation are investigated. Simulated El Nino events are first classified into four groups depending on which season the Nino 3.4 SSTA Index (120-170W, 5S-5N) reaches its peak. Although the heat content of the tropical Pacific decreases for all four types, it loses about twice as much of heat during El Nino that peaks during winter compared with that peaks during summer. The surface heat flux, the southward heat transport at 15S, the vertical heat transport, and the Indonesian Throughflow heat transport contribute constructively to this remarkable seasonal difference, whereas the northward heat transport at 15N contributes destructively. It is shown that differences in the basic state provided by the seasonal cycle causes differences in the atmospheric response to the SSTA associated with the ENSO, which in turn leads to the difference in the surface heat flux and the meridional heat transport anomaly. Since all simulated El Nino events that are followed by another El Nino events peak during boreal spring or summer, and are always characterized by weak or no anomalous heat exports from the tropical Pacific, the decadal modulation in the strength of phase-locking to the annual cycle is the key to the decadal variation in the characteristics of ENSO. The above results are also compared with an assimilation data.