Temperature and Size Variability of Warm Pools in the Global Oceans

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Using advance satellite-derived Sea surface height anomaly, sea surface temperature (SST) data, and heat flux data, we investigate the thermal variability, temperature and size variability of warm pools in the global oceans, the Pacific, the Atlantic, and the Indian Ocean, respectively. Because of the high density and specific heat of seawater, water can store and transport large amounts of heat. High SST has particular influence on global climate system. Furthermore previous studies focused on the global warming or area warming, in this investigation we present results of warm pool SST binned into 1 ˚C interval. Detecting temperature and size variability of warm pools in the global oceans, it suggests that the high SST area (SST ≧ 28˚C) has faster increasing rate than surrounding area (SST 20˚C - 27˚C) in the global oceans, the Pacific, the Atlantic, and the Indian Ocean, respectively. To understand the role of surface heat flux in the tropical SST fluctuation, we analyze the mixed layer heat balance equation. Upper ocean heat budget between the heat advection and heat diffusion term are compared and heat diffusion processes may be a mechanism for transporting excessive amount of heat that the warm pool through enhancing the SST gradient around the edge of the warm pool. In order to find out dominant period components and the relationship of energy-frequency distribution without influenced induced by nonlinear and nonstationary signals, the Hilbert-Huang Transform applied by ensemble empirical mode decomposition is employed. The ensemble empirical mode decomposition analysis indicates that the interannual component has strong influence on the variability of the warm core pool in the Pacific, presumably because of the presence of El Niño phenomenon, while the annual cycle dominates the variability in the Indian and the Atlantic Ocean.

Keywords: warm pool, SST, heat flux

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