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エルニーニョ発生前の西太平洋暖水域における風変動の領域気候モデルによる研究
Regional Climate Modeling Study of Wind Variations over Western Pacific Warm Pool before El Nino Onsets

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Regional climate modeling is an effective way to study on phenomena which found interesting in global GCMs. Regional models can play a complementary role to global models in experimental designs. While global models are free running, but may suffer from biases, regional models are bounded at lateral boundaries and achieve better realism.

Using the data of observations and global models, Hasegawa et al (2009, 2010, 2011) found strong northwesterly surface winds and cold-water upwellings along the northern coast of New Guinea often occur before El Nino onsets. They hypothesized that the cold waters generate positive zonal sea surface temperature (SST) gradient together with high SST east of the warm pool in the Western Pacific Ocean contribute to enhancement of the westerly surface winds, leading to onsets of El Nino events. The goal is to understand this region in an ocean-atmosphere coupled system. As a first step, we have conducted experiments with a regional atmospheric model. The model used in this study is the International Pacific Research Center (IPRC) Regional Atmospheric Model (iRAM) to understand the effects of the cold SST. The model covers the western Pacific Ocean with a horizontal resolution of 0.25 degree. We particularly focused on December 2001 to January 2002, as Hasegawa et al. (2009) did in their diagnostic study. The model well reproduced events of wind westerly surface winds in this region. Experiments show that wind variations near the New Guinea are responsive to local SST. Even when the lateral boundary condition is unchanged, westerly surface wind is weakened when the cold signal by the upwelling is eliminated from the SST field. We also pay attention to the role of the high mountains of New Guinea in shaping climate around this region. An experiment showed the orography of New Guinea causes rising air motion above the mountains. Recent experiments of the coupled ocean-atmospheric model (coupled to the HYbrid Coordinate Ocean Model using the Earth System Modeling Framework) will be also reported.

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