

New Faces in Climate Variability and Their Predictability

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In recent decades, we have observed the increase in abnormal weather events all over the world. Those are linked with complex climate variations under the global warming pressure. One of the most well-known climate modes inducing those climate variations is El Niño/Southern Oscillation (ENSO) in the tropical Pacific. The ENSO phenomenon has more than centennial research history. In 1999, however, another but similar climate mode was catalogued in the tropical Indian Ocean. The phenomenon is now commonly called Indian Ocean Dipole (IOD) based on Saji et al. (1999). The discovery of the ocean-atmosphere coupled phenomenon was rooted in recognition of absence of the fall Yoshida-Wyrtki jet in 1994 (Vinayachandran et al. 1999; Behera et al. 1999). Quite interestingly, we also observed another unusual condition in the tropical Pacific in 1994 and it led us to introduction of another climate mode called ENSO Modoki showing a tripolar SST pattern in longitudes in the tropical Pacific (Ashok et al. 2007, Weng et al. 2007). Recent studies suggest that the current cold phase of the interdecadal ENSO Modoki may be related to the Interdecadal Pacific Oscillation (IPO) explaining the apparent hiatus of the global warming trend since 1998. Those climate modes originated in the tropical oceans have some influences on subtropical climate modes such as the Subtropical Indian Ocean Dipole catalogued in 2001 (Behera and Yamagata, 2001). The most recent discovery of coastal ocean-atmosphere coupled modes as typified by the phenomenon named Ningaloo Niño off the western coast of Australia (Feng et al. 2013; Kataoka et al. 2013) has introduced a new dimension in regional climate research. The predictability skill of those subtropical phenomena depends on the degree to which those may connect with the tropical phenomena at the present stage but efforts to resolve unique regional coupled processes in a seasonal prediction model will eventually improve the situation. In the present lecture, a series of newly catalogued climate modes is reviewed and the predictability of those modes is discussed with the future scope for societal applications.