50-member ensemble simulations for 1997 and 2015 using a global nonhydrostatic model

*Yohei Yamada[1], Chihiro Kodama[1], Masaki Satoh[2,1], Masuo Nakano[1], Tomoe Nasuno[1], Masato Sugi[3]

1. Japan Agency for Marine-Earth Science and Technology, 2. Atmosphere and Ocean Research Institute, The University of Tokyo, 3. Meteorological Research Institute, Japan Meteorological Agency

El Niño influences tropical cyclone (TC) activity in the western North Pacific. Camargo and Sobel (2005) showed that TC lifetime and the number of intense TCs increase during El Niño. In 2015, strong El Niño event was developed. Wang and Chan (2002) showed that intense TCs tend to be formed over the southeastern part of the western North Pacific during El Niño. According to the Regional Specialized Meteorological Center Tokyo best-track data, in the western North Pacific, 10 intense TCs were formed between June and October in 2015, which was the largest number since 1971. In this study, intense TC is defined as TC whose minimum central pressure reached less than 945 hPa.
To evaluate the influence of El Niño on the number of intense TCs, we conducted 50-member ensemble simulations targeting the summers (June-October) of 2015 and 1997 known as development of extreme El Niño event, using a global nonhydrostatic model called NICAM (Satoh et al. 2014) with a horizontal grid interval of 14 km. Clouds were explicitly calculated using a single-moment bulk microphysics scheme without cumulus convection scheme. The sea surface temperature was nudged toward the OISST data (Reynolds et al. 2002) using a slab ocean model.
In the ensemble simulation of 1997, the ensemble-mean of number of intense TCs is 7.0 which is higher than the model’s climatology (5.8) which is derived from an AMIP-type 30-year simulation (Kodama et al. 2015). Moreover, intense TCs tend to be formed over the southeastern part of the western North Pacific and have longer lifetime. Those results indicate that the model response of TC activity to El Niño in 1997 agree with observed response (Wang and Chan 2002; Camargo and Sobel 2005).On the other hand, in the ensemble simulation of 2015, ensemble mean of the number of intense TCs is almost equal to the model’s climatology. Whereas intense TCs simulated in the members with 7 or more intense TCs tend to be formed over the southeastern part of the western North Pacific and have longer lifetime, this feature are not obvious in the other members. These results indicate that the number of intense TCs is not determined only by development of El Nino-type sea surface temperature pattern but is influenced by the internal variation of the atmosphere induced by differences in the sea surface temperature distribution between 1997 and 2015.

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