Geophysical Research Abstracts
Vol. 19, EGU2017-8494, 2017
EGU General Assembly 2017

Modification of ENSO and ENSO-related atmospheric characteristics due to future climate change

Tatiana Matveeva and Daria Gushchina

Lomonosov Moscow State University, Faculty of Geography, Department of Meteorology and Climatology, Moscow, Russian Federation (matania.777@gmail.com)

The El Niño/Southern Oscillation (ENSO) is the strongest natural climate interannual fluctuation in Tropical Pacific, it affects regional and global climate. There are two types of this phenomenon: East Pacific (EP) El Niño characterized by maximum of SST anomalies centered over the eastern tropical Pacific and Central Pacific (CP) El Niño with SST warming in the center of the Pacific Ocean [Ashok et al., 2007; Kug et al., 2009]. The ability of CMIP5 coupled ocean-atmosphere general circulation models (CGCMs) to simulate two flavors of El Niño correctly was estimated using EOF-analysis technique of SST anomalies [Takahashi et al., 2011] in the recent studies [Matveeva and Gushchina, 2016]. It was shown that only several CGCMs were able to reproduce two types of ENSO.

The ENSO-related characteristics can alter due to global climate change. However, scientific community can't be sure whether ENSO activity will be enhanced or damped under global warming. In this study, we choose the 6 "best" CGCMs (BNU-ESM, CCSM4, CNRM-CM5, FIO-ESM, INM-CM4, MIROC5) which simulated spatial and temporal features of the two types of El Niño the most realistic way. To obtain a complete result we analyzed anomalies of complex ENSO-related characteristics (SST, rainfall, vertical movement, atmospheric circulation in the upper and lower troposphere) during two types of El Niño events. We compared the spatial distribution of these anomalies depending future climate scenarios (we took two scenarios with significant differences – RCP 2.6 and RCP 8.5 [Taylor et al., 2012]). It was shown the large difference in model's estimates ENSO-related anomalies' changes for future climate.

The main aspect of this study is the analysis of the ENSO characteristics' modification (frequency, amplitude, the ratio between EP and CP El Niño) under different scenarios of warming. We didn't expect any significant change of frequency for two types of El Nino. It was shown that there was no well-defined relation between the amplitude change and the "rigidity" of scenarios. Whereas at the end of XXI century the ratio between EP and CP El Niño may decrease, i.e. the number of CP El Niño in RCP 8.5 will increase.

The study was supported by the Russian Foundation for Basic Research (grants No.15-05-06693 and No.16-35-00394 mol_a).

References:

1. Ashok, K., Behera, S. K., Rao, S. A.,Weng, H., Yamagata, T., 2007: El Niño Modoki and its possible teleconnection. J. Geophys. Res. 112, C11007.

2. Kug, J.-S., F.-F. Jin, and S.-I. An, 2009: Two types of El Niño events: Cold tongue El Niño and warm pool El Niño. J. Climate, 22, 1499–1515.

3. Matveeva T., Gushchina D., 2016: The Role of Intraseasonal Atmosphere Variability in ENSO Generation in Future Climate. European Geosciences Union General Assembly 2016. Geophysical Research Abstracts, 18, EGU2016–235–2.

4. Takahashi, K., Montecinos, A., Goubanova, K., Dewitte, B., 2011: ENSO regimes: Reinterpreting the canonical and Modoki El Niño. Geophys. Res. Lett. 38, L10704.

5. Taylor, K. E., R. J. Stouffer, and G. A. Meehl, 2012: An overview of CMIP5 and the experiment design. Bull. Am. Meteorol. Soc., 93, 485–498.