UNIVERSITY OF THE PHILIPPINES

Master of Science (Meteorology)

Paul Daniel S. Ang

Characteristics of the El Niño–Southern Oscillation (ENSO) in Climate Forecast System Reanalysis (CFSR) rainfall and temperature in the Philippines

Thesis Adviser:

Gay Jane P. Perez, Ph.D.

Institute of Environmental Science and Meteorology

University of the Philippines Diliman

Thesis Reader:

Nicholas P. Klingaman, Ph.D.

Citadel

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ABSTRACT

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Paul Daniel S. Ang
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Adviser:
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The El Niño–Southern Oscillation (ENSO) is the major source of interannual climate variability over the Philippines, where the El Niño brings drier conditions in the country leading to drought and the La Niña causes wetter conditions that result in flooding. Climate reanalysis datasets offer a comprehensive record of the past climate, convenient for studying ENSO impacts; however, these datasets must be tested first to see if they are applicable for a specific region. In this thesis, the influence of ENSO on the rainfall and temperature in the Philippines was assessed for the Climate Forecast System Reanalysis (CFSR) from 1979 to 2010. The seasonal features of rainfall, temperature, and the surrounding regional climate were assessed with respect to baseline data from observations and climate models. The dominant rainfall and temperature patterns were analyzed using the extended empirical orthogonal function (EEOF) analysis and the most relevant regional climate variables were identified. There was an overall agreement with the ENSO–related rainfall and temperature in CFSR as well as the regional sea surface temperature (SST) and mean sea level pressure (MSLP). ENSO was able to explain around half of the seasonal rainfall variability for the baseline, with slightly less for CFSR, owing mainly to the ENSO–associated convective activity in the surrounding region. During the ENSO peak, both El Niño and La Niña were warmer, with La Niña events showing a weak cooling tendency the season after. The dominant temperature patterns were highly affected by the strong El Niño events, particularly the 1997/98 very strong El Niño. The baseline temperature patterns covaried with regional SST while for CFSR, surface warming and lower tropospheric moisture temperature played a bigger role in the temperature dynamics. By understanding the ENSO impacts and their underlying mechanisms, climate researchers can improve their forecasting systems and the public can be better prepared for the coming ENSO events.

Keywords: El Niño–Southern Oscillation, CFSR, Climate variability, EEOF