“Inland Tropical Cyclone Maintenance and Intensification”

Miguel L. Revilla
Institute of Environmental Science and Meteorology
University of the Philippines Diliman
Quezon City, Philippines 1101
mlrevilla@up.edu.ph

ABSTRACT

Tropical cyclones are synoptic scale systems with a defined axisymmetric circulation and a warm, low-pressure center. These systems form and develop over warm tropical waters, which are necessary for the constant latent heat flux, and are steered over the Earth’s surface by prevailing winds and the Coriolis effect. Should they move inland, tropical cyclones lose their supply of latent heat from the warm tropical waters and their circulation is disrupted due to the increased surface friction, both contributing to the eventual weakening and dissipation of the system. Recent studies, however, have enumerated several tropical cyclones of varying intensities sustaining their strength or even intensifying over land far from any large body of water. This phenomenon of inland maintenance or intensification of tropical cyclones has been dubbed as the “Brown Ocean Effect”. In this candidacy paper, I examine the Brown Ocean Effect in terms of the contributing factors and mechanisms allowing it to take place for certain cyclonic systems. The paper is divided into three parts, beginning with a detailed discussion on the mechanisms and environmental conditions for tropical cyclogenesis, the structure of a mature tropical cyclone, and factors affecting its movement. The second part discusses surface conditions affecting tropical cyclone structure and strength upon its interaction with land. This includes studies on the impact of reduced latent heat flux and increased surface roughness and topography on the cyclonic circulation. Lastly, the paper focuses on the spatiotemporal analysis of the Brown Ocean Effect as well as the necessary favorable environmental conditions for its occurrence. Idealized simulations and reanalysis studies attributing the effect to variations of surface roughness and soil moisture are investigated in this section.