

Impacts of Global Warming on Extreme Rainfall event of Pre-monsoon Low-Pressure System over Sri Lanka

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Pre-monsoonal extreme rainfall events are annual climatological hazards faced by the Bay of Bengal region. This study evaluates the global warming impacts on the potential future low-pressure systems / tropical cyclones (LPS/TC) associated with extreme rainfall around Sri Lanka. The present-day and future climate conditions represented by the HiRAM model under the IPCC's global warming scenario RCP 8.5 were used in the study. In mid-May 2016, Sri Lanka experienced an extreme rainfall event associated with a slow-moving LPS/TC that caused significant socioeconomic damages, particularly in the Colombo metropolitan region of Sri Lanka. The WRF model was used as a downscaling and simulating tool. The study quantitatively assesses the global warming impacts of the extreme rainfall event using the pseudo-global warming approach. Despite the substantial future warming, the LPS/TC shows only a slight increase in magnitude compared to the present-day climate. It is found that the extreme rainfall of this event on average would intensify on regional, Island, and local domains by 14%, 22%, and 32% respectively for mid-century periods, while 20%, 31%, and 41% respectively for end-century periods. Analysis showed the ambient tropospheric moisture levels in present-day climate as well as under warming situations significantly alter the resulting rainfall. It is also found that the global warming impacts can be highly sensitive to local atmospheric settings and can deviate from the general understanding. The projected increases in extreme rainfall pose an additional challenge to a region where springtime flooding and associated disasters already have significant socioeconomic impacts.

Keywords: Climate Change, Pseudo Global Warming, Extreme Rainfall, Natural Disaster, Pre-monsoon