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Are the socioeconomic impacts associated with tropical cyclones in Mexico exacerbated by local vulnerability and ENSO conditions?

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Tropical Cyclones (TCs) are among the most dangerous natural hazards because they can cause severe economic losses and high mortality. Climate risk is defined as a metric that depends on social vulnerability and the occurrence of natural hazards. A social vulnerability index was constructed for this study using two metrics: the degree of local marginalization and the local social gap. The accumulated rainfall and duration of extreme precipitation associated with TC passages are examined as a natural hazard during the period 1981–2017. TC days are depicted as days when TC-related rainfall exceeded the 95th percentile of daily precipitation from May to November, defined as summer precipitation. In this way, changes in climate risk under El Niño–Southern Oscillation (ENSO) conditions are explored to determine regions where both social vulnerability and TC days are high. These changes are useful to find out when disasters have more chances to occur. In the present study, climate risk was found to increase more than 80% from average in southwestern Mexico during strong El Niño years. Under neutral conditions, climate risk values rise to more than 40% than average over northwestern Mexico. Under strong La Niña conditions, climate risk increases by more than 80% from average over the eastern coast of Mexico. Our approach is validated through a comparison between anomalies in climate risk and disaster costs (socioeconomic impacts). Both local vulnerability and ENSO conditions exacerbate socioeconomic impacts associated with TCs, and an analysis of linear trends in TC rainfall and TC days reveals that most of the coastal regions in Mexico have a significant rising trend in both variables. Thus, Mexico should be prepared to face more TC extreme rainfall events. Suggestions for how Mexico can meet the objectives of international risk agendas are discussed.