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Origin of the interannual variability of tropical cyclones activity in the South Pacific

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The Weather Research and Forecast model (WRF, Skamarock *et al.*, 2005) is used at 1/3° (150 km effective) resolution to simulate the statistics of tropical cyclone activity in the South Pacific. Our first aim is to realistically represent the climatological conditions favorable to tropical cyclone genesis, in particular the characteristics of the South Pacific Convergence Zone (SPCZ). This is achieved by selecting a subgrid-scale convective parametrization. In addition to the large-scale conditions, the model is shown to reproduce a wide range of mesoscale convective systems. Tropical cyclones grow from the most intense of these systems formed along SPCZ lines of strengthened convergence and sometimes develop into hurricanes with surface winds of up to 45 $m.s^{-1}$. The 3-dimensional structure of simulated tropical cyclones is in remarkable agreement with dropsondes and satellite observations. The mean seasonal and spatial distributions of tropical cyclone genesis and occurrence are also in relatively good agreement with the Joint Typhoon Warning Center data. We note however that the spatial pattern of tropical cyclone genesis exhibits a similar bias as the large scale forcing.

Previous work have shown that the seasonal frequency of tropical cyclone genesis at any location is closely related to large scale environmental parameters (Gray, 1979; Royer *et al.*, 1998; Camargo *et al.*, 2007). However, large scale conditions are not sufficient and triggering mechanisms are also needed. Indeed, interactions of mesoscale convective systems play a crucial role in tropical cyclone genesis once the large scales have been established (Simpson *et al.*, 1997). Our objective is to estimate the part of tropical cyclone genesis interannual variability that is related to large scale environmental parameters, and the part that is due to mesoscale interactions that are stochastic in nature. We use a 10-member ensemble WRF experiment, genesis indices, and ENSO (El Niño southern oscillation) and SPCZ indices to get such an estimate in the South Pacific.