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Maximization of the precipitation from tropical cyclones over a target area through physically based storm transposition

Mathieu Mure-Ravaud (1), Alain Dib (1), M. Levent Kavvas (1), and Elena Yegorova (2)

(1) UC Davis, Civil and Environmental Engineering, Davis, United States (mmureravaud@ucdavis.edu), (2) U.S. Nuclear Regulatory Commission, Rockville, United States (Elena.Yegorova@nrc.gov)

In this presentation, we introduce a new fully physically based method for the storm transposition of tropical cyclones (TCs). This method uses a regional atmospheric model (RAM) to simulate the intense precipitation field from a TC, thus crucially conserving the mass, momentum and energy in the system. This transposition method is based on the spatial shifting of the initial vortex in the simulation initial conditions. More specifically, the TC at the simulation start date is first separated from its background environment, then shifted, and finally recombined with the background environment. Afterwards, the RAM is run as usual to simulate the TC and its precipitation field. The new storm transposition method was applied to Hurricanes Floyd (1999), Frances (2004), Ivan (2004), and Isaac (2012) in order to maximize the 72-h accumulated precipitation depth over the drainage basin of the city of Asheville, N.C. It was observed that the precipitation fields changed in both intensity and structure after transposition. Moreover, the tracks of the hurricanes were in general very sensitive to changes in the initial conditions, which is expected for a storm system whose dynamics is strongly nonlinear. In particular, a small change in the location of the initial vortex may result in a very different track, allowing the TC to go over the target area.