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Plain Language Summary: Hurricane Joaquin, a notable hurricane over the Atlantic Ocean in 2015, is studied with emphasis on its unique hairpin turn that occurred between 2100 UTC 1 October and 0600 UTC 2 October 2015. A series of mesoscale high-resolution numerical simulations are performed with an advanced research version of the Weather Research and Forecasting (WRF) model. Results indicate that middle- to upper-level steering flows are crucial in influencing Joaquin's track. The middle-level blocking high also plays a vital role in Joaquin's movement. Specifically, the asymmetry and local absolute vorticity tendency over the inner-core region and its vicinity has a strong implication for Joaquin's hairpin turn.

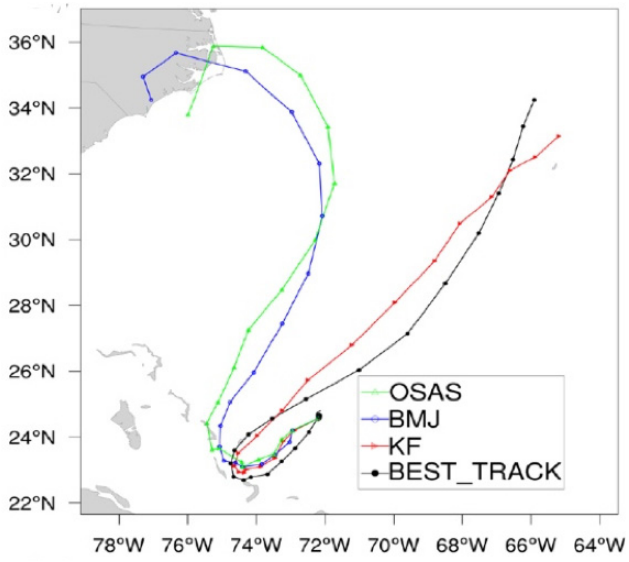

Figure 1. Comparison of WRF model simulated tracks and the best track (black curve) during the 120 h integration (6 h interval) initialized at 1200 UTC 30 Sep 2015. The figure indicated that the WRF simulation is sensitive to the use of cumulus schemes [namely, Old simplified Arakawa-Schubert (OSAS); Betts-Miller-Janjic (BMJ); Kain-Fritch (KF)] within the WRF model.

- The numerical simulation of Hurricane Joaquin's track is highly sensitive to the choice of cumulus scheme in the WRF model.
- The middle- to upper-level steering flows and the middle-level blocking high are crucial in influencing Joaquin's track.
- The asymmetry and local absolute vorticity tendency over the inner-core region and its vicinity has a strong implication for Joaquin's hairpin turn.