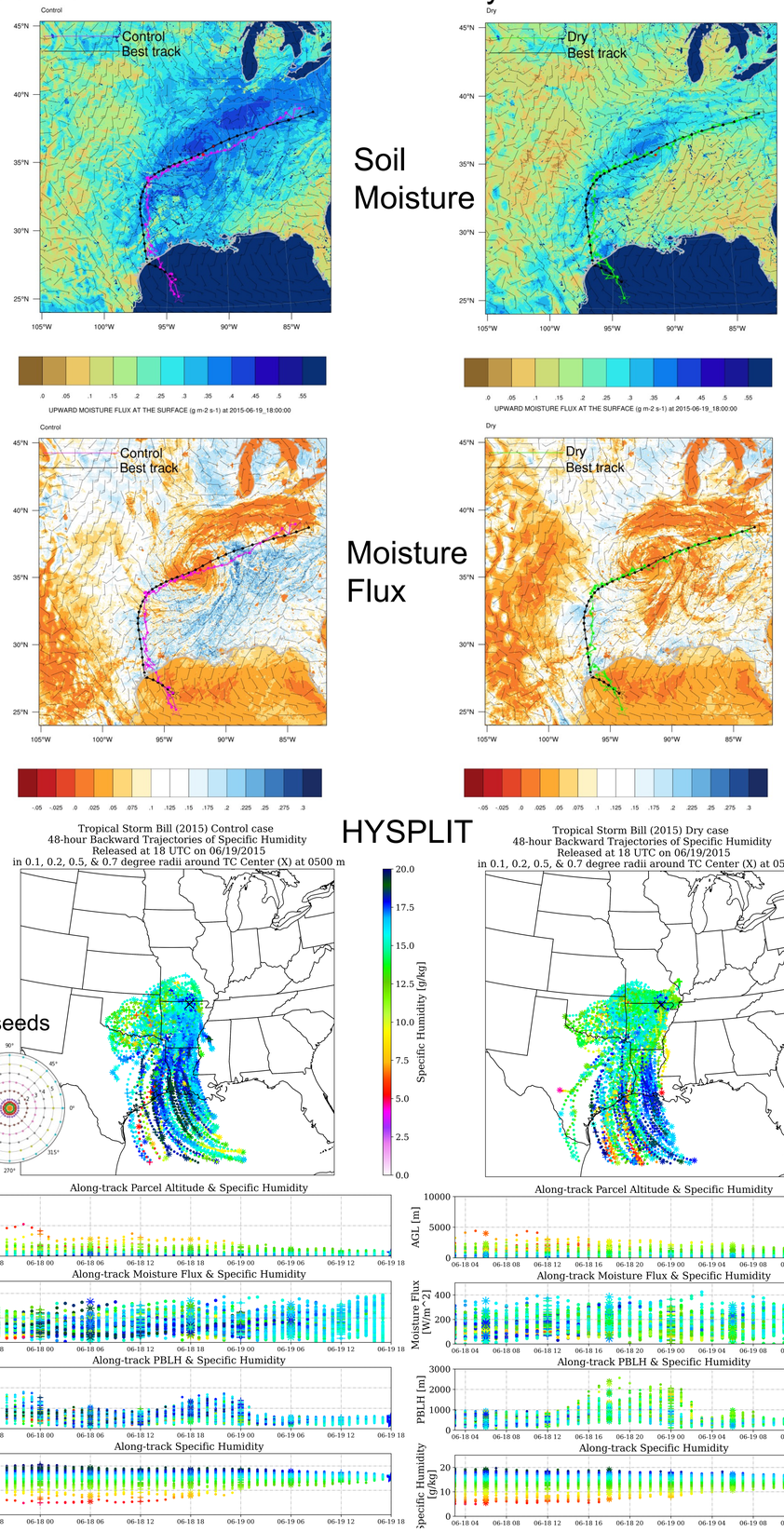
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Understanding Moisture Flow in the Brown Ocean Effect of Tropical Storm Bill (2015)

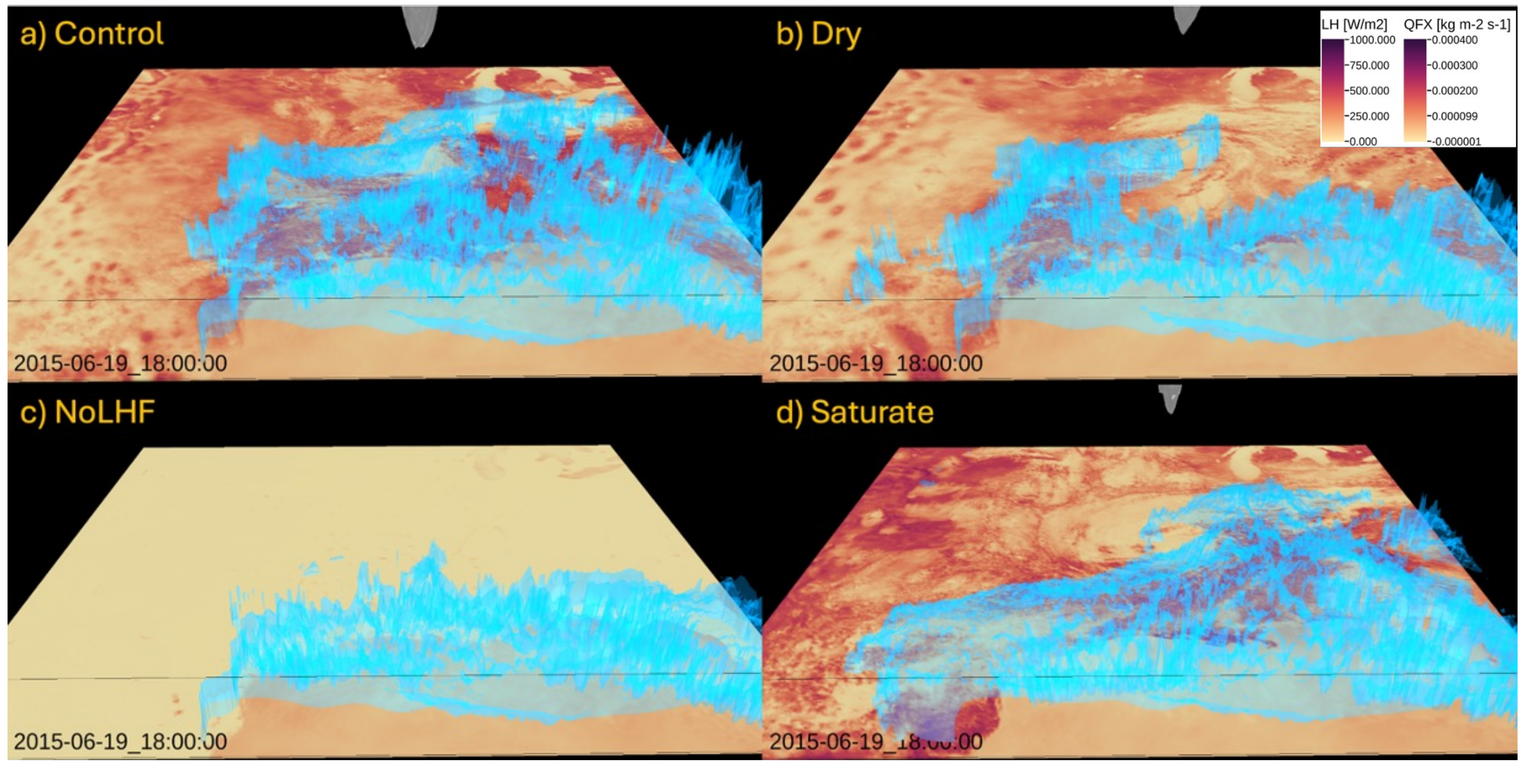
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Control Dry



HYSPLIT

3-D rendering of QVapor (>12 g/kg) superimposed over Latent Heat Flux (LH [W/m2])



Synopsis

- Brown Ocean (BO) effect (Andersen and Shepherd 2014) hypothesized the ability of the abundant land soil moisture to sustain tropical cyclones (TCs) after landfall.
- NASA Unified WRF (NU-WRF; Kumar et al. 2008; Peters-Lidard et al. 2014)(LIS-WRF coupled) simulations in 1 km grid resolution over a 2400 km by 2400 domain
  1) Control : initialized with LIS spinup with anomalously high soil moisture in 2015.
  2) Dry : Identical with Control but initial soil replaced by the driest soil moisture condition during the Control spinup.
  3) NoLHF: Identical with Control but LHF from surface to atmosphere was suppressed.
  4) Saturate : Identical with Control but soil moisture was kept saturated by soil texture types throughout the simulation.
- NOAA HYSPLIT Backward trajectory analysis was applied to the model simulations.

Results and Future Study

- 48 h backward trajectory analysis suggests that the characteristic air flow patterns exist within the TC environment, where surface soil moisture availability (moist vs. dry) played a critical role in the moisture uptakes of the inflows within the TC environment. Control simulation with abnormally wet soil moisture condition kept the air parcels moister over the land compared to the Dry case simulation. Wet land surface was easily able to increase specific humidity of the traced parcels within the PBL, which culminated in the TCMI.
- **The exchange of moisture between land and air within the boundary layer of TS Bill (2015) was crucial for TC Maintenance or Intensification (TCMI) after landfall, particularly along the major inflow channels into the core of the storm.**
- NU-WRF experiments reveal critical land-atmosphere interactions that drive the BO effect, helping quantify and predict how antecedent soil moisture impacts the continuum of TCMI from strong to weak.
- It is warranted to extend the Brown Ocean Effect onto the extreme rainfall and flooding after the landfall of tropical cyclones.

- Our manuscript, **"The Roles of Antecedent Soil Moisture and Land-Atmosphere Interactions in the Inland Intensification of Tropical Storm Bill (2015)"**, was submitted to *Journal of Hydrometeorology* (accepted).

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