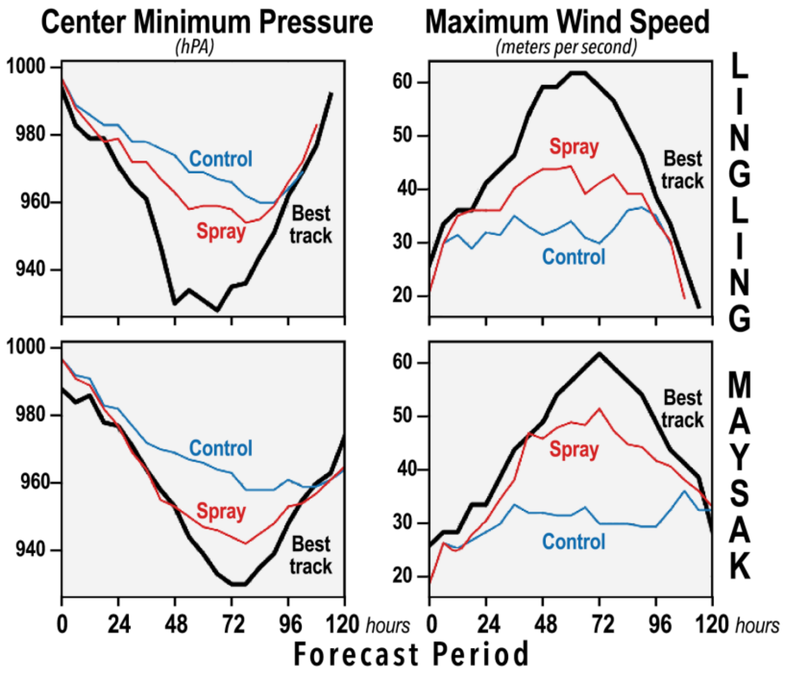
Incorporating Sea Spray Improves Typhoon Prediction

Droplets ejected from breaking waves impact the exchange of heat and moisture above the sea surface.

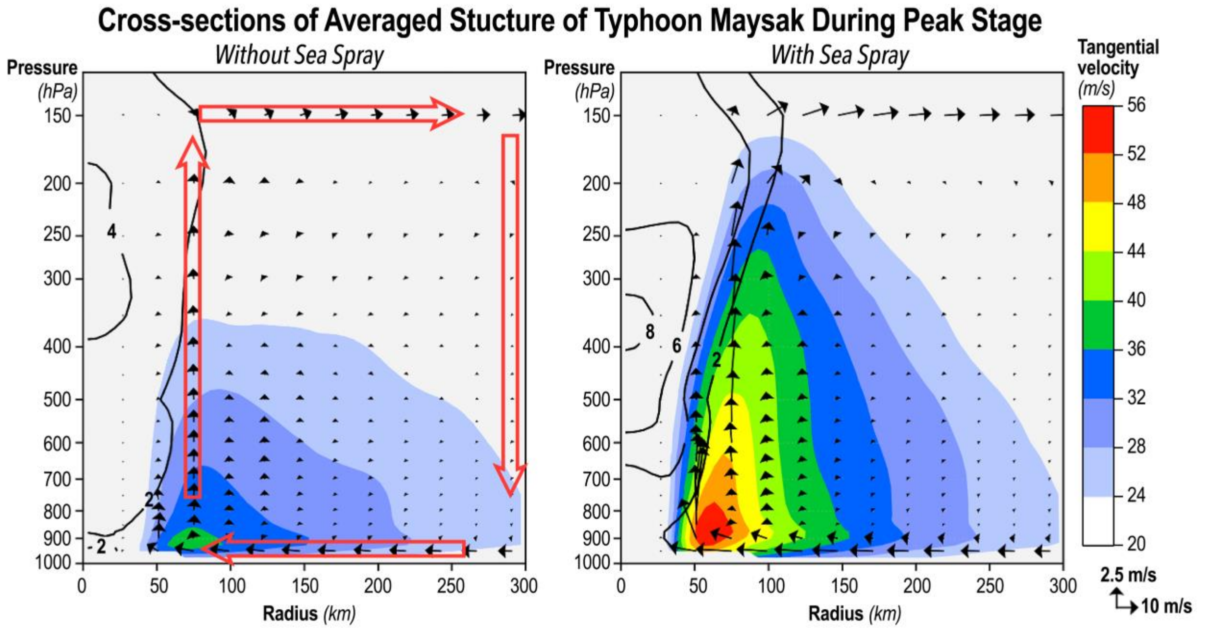
We are continuing to improve modeling of tropical cyclone intensity in very challenging seas. Our main improvement is better surface turbulent fluxes, accounting for changes due to sea spray, which is largely a function of wind. **A key take away is that storm intensity – powered by latent heat, which is lifted by sensible heat – is strongly linked surface wind inflow into the storm.**

Rapid changes in tropical cyclone intensity are difficult to forecast.

The modeled intensity with spray-modified fluxes **(red)** is closer to the observations **(black)** than the intensities in the model without spray **(blue)**.



Modeling of tropical cyclones over seas with shallow layers of warm water is particularly challenging**. Our modeling improves forecasts of both central pressure (left) and surface wind speed (right).**



The modeled storm for the control (left, with business-as-usual surface fluxes) has a much weaker secondary circulation (red arrow outlines) than the storm with spray-modified surface fluxes (right). The increased sensible heat flux is responsible for lifting the moisture-laden water and releasing its energy faster to make the storm more powerful.

Yang, S. et al. (2025) ***Sea spray effects on typhoon prediction in the Yellow and East China Seas: case studies using a coupled atmosphere-ocean-wave model for Lingling (2019) and Maysak (2020)***, *Environ. Res. Lett.*, 20, 054038.

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