Marine Heatwaves and Severe Thunderstorms

**Overall takeaway:** Marine heatwaves in the Gulf of Mexico can provide warm moist air needed for severe thunderstorms inland, though that air needs to travel north for extensive hail or tornadoes to appear.

**Overview:**

Marine heatwaves are defined as periods of anomalously warm (higher than normal) temperatures in the ocean. These warm waters impact ecosystems, communities, and industries that are in or near the water, but those impacts can stretch inland too.

When there are higher than normal temperatures in the Gulf of Mexico, the air above that water also tends to be warmer and, as a result, can hold more moisture. If that air is pushed inland so that it runs into cold air, you can see a rapid rise of warm, moist air that is conducive to severe thunderstorms that can bring hail and/or tornadoes.

There is evidence that high Gulf of Mexico temperatures are associated with more severe thunderstorms and hail east of the Rocky Mountains from March-May [Molina et al. 2016]. The association is particularly clear in the southeastern US in April and is more likely when there are both colder than usual waters in the North Pacific and warmer than usual waters in the Gulf of Mexico (or conditions associated with the La Niña phase of the [ENSO cycle](https://www.climate.gov/news-features/blogs/enso/what-el-ni%C3%B1o%E2%80%93southern-oscillation-enso-nutshell)) [Allen et al. 2015; Chu et al. 2019; Edwards and Weiss 1996]. This is likely because the conditions in the North Pacific can facilitate a northward push of the warm, moist air from the Gulf of Mexico [Chu et al. 2019]. However warm moist air from the Gulf, particularly with dew points above 65℉/18℃ are associated with tornadoes in the fall as well [Evans and Guyer 2006].

What this means is that, while marine heatwaves alone are not enough to cause severe thunderstorms in the southeastern U.S. it is worth being vigilant. When there is a marine heatwave, you know it is worth being particularly watchful of conditions that would push that warm, moist air north, especially in the spring. The higher-than-normal water temperatures, and the hotter and more moist air that comes with them, can provide the energy for severe thunderstorms inland.

**References:**

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