

Diurnal lightning variability over the Gulf Stream

Intended for the session “Lightning Occurrence Relative to Meteorology”

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The Gulf Stream, located in the Atlantic Ocean to the east of the United States, is the strongest western boundary current in the world. Recent observations from the World-Wide Lightning Location Network (WWLLN) indicate a lightning maximum over the warm waters of the Gulf Stream that exhibits distinct diurnal variability. Lightning is most frequent during summer (June-August). During afternoon and early evening, lightning is enhanced just onshore of the coast of the southeastern U.S. due to daytime heating of the land surface and the resulting sea breeze circulations and convection. Near-surface wind observations from the Quick Scatterometer (QuikSCAT) satellite reveal divergence over the Gulf of Mexico and portions of the Gulf Stream at 6 p.m., at which time lightning activity is suppressed there. Lightning frequency exhibits a broad maximum over the Gulf Stream from evening through noon of the following day, and QuikSCAT wind observations at 6 a.m. indicate low-level winds blowing away from the continent and converging over the Gulf Stream. Over the northern Gulf of Mexico, lightning is most frequent from around sunrise through late morning.

Precipitation rates from a three-hourly gridded dataset that incorporates observations from Tropical Rainfall Measuring Mission (TRMM) as well as other satellites exhibit a diurnal cycle over the Gulf Stream that lags the lightning diurnal cycle by several hours.