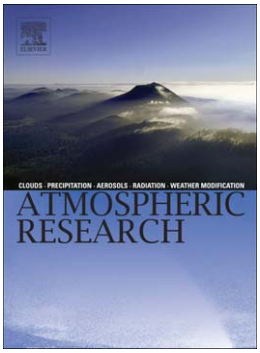

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Seasonal Prediction of Lightning Activity in North Western Venezuela: Large-Scale versus Local Drivers

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Abstract

The Lake Maracaibo Basin in North Western Venezuela has the highest annual lightning rate of any place in the world ($\sim 200\ flashes\ km^{-2}\ yr^{-1}$), whose electrical discharges occasionally impact human and animal lives (e.g., cattle) and frequently affect economic activities like oil and natural gas exploitation. Lightning activity is so common in this region that it has a proper name: *Catatumbo Lightning* (plural). Although short-term lightning forecasts are now common in different parts of the world, to the best of the authors' knowledge, seasonal prediction of lightning activity is still non-existent. This research discusses the relative role of both large-scale and local climate drivers as modulators of lightning activity in the region, and presents a formal predictability study at seasonal scale.

Analysis of the *Catatumbo Lightning Regional Mode*, defined in terms of the second Empirical Orthogonal Function of monthly Lightning Imaging Sensor (LIS-TRMM) and Optical Transient Detector (OTD) satellite data for North Western South America, permits the identification of potential predictors at seasonal scale via a Canonical Correlation Analysis. Lightning activity in North Western Venezuela responds to well defined Sea-Surface Temperature patterns (e.g., El Niño-Southern Oscillation, Atlantic Meridional Mode) and changes in

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