



Thunderstorm Rain Yields in South America

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To contextualized the different thunderstorms types observed in South America, this study uses six years (2012-2017) of continuous lightning measurements from STARNET and precipitation from TRMM-3B42 to depict daily rain yields (kg of rainwater per lightning strokes) at 1 x 1 grid box. This dataset reveals the predominance of four thunderstorm rain yield regimes in South America: continental arid (10^7 kg/strokes), continental (10^8 kg/strokes); continental-maritime (10^9 kg/strokes); and maritime (10^{10} kg/strokes). Furthermore, these regimes present spatial and seasonal dependence that can be summarized as: a) Continental arid regime is found over the Andes mountain range and predominates at all season except winter; b) Continental regimes cover the South American plateau from Argentina until central-northern Brazil and show a latitudinal variation all year long; c) Continental-maritime regimes predominates in northern South America all year long expect in winter (JJA) and spring (SON) in the Amazon basin; d) The maritime regime predominates near the coastline all year long, especially in the Guyana's during fall (MAM). Finally, to understand the physical differences among those thunderstorm regimes, coincident TRMM precipitation radar (PR) measurements were used to build a mean radar reflectivity profile normalized by temperature. As a result, it has been found that the more efficient thunderstorms, i.e., the ones that produce more lightning per kg of water have more super-cooled water droplets and graupel above the -10°C isotherm, while the more rain producers are more likely to have small aggregates.