Environmental conditions associated to convective initiation of extreme convective systems over Southeastern South America

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Many thunderstorms in Southeastern South America (SESA) stand out in satellite observations as being among the strong on Earth in terms of satellite-based convective proxies, such as lightning flash rate per storm, the prevalence for extremely tall, wide convective cores and broad stratiform regions. Knowing when and where strong convection is initiated presenting a great interest because of the close relationship between convective storms and severe weather phenomena. This paper generates a novel methodology to determine convective initiation areas associated with extreme convective systems.

Due to the lack of long records of ground-based radars in the area, Rain Precipitation Features (RPFs) from Global Precipitation Measurement and Tropical Rainfall Measurement Mission are considered to determine extreme convective events, as well as overshooting tops from GOES16 over RELAMPAGO-CACTI field campaign. These different extreme convective events generate a large sample allowing to determine convective initiation areas over SESA during multiple years. All events are tracked backward using an adaptive threshold area-overlapping technique with thermal infrared (IR) channel. It was necessary to consider multiple IR temperature thresholds in order to identify areas of deep convection embedded within larger cloud clusters.

Convective initiation diurnal cycle is analyzed near principal mountain barriers (Sierras de Córdoba, central and Northwestern Argentinean Andes), denoting a strong relationship during the afternoon and early evening hours with convergence at mountain ridges. It is also possible to detect convective initiation areas over flat terrain, revealing with a strong initiation signal on nocturnal times. Key features associated with mesoscale and synoptic scale pre-environmental

conditions are analyzed over different samples considering initiation times and mountain versus the surrounding plains regions.

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