Lightning Parameterization for a Numerical Weather Prediction Model
(Meteorological Applications of Lightning Data)

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The numerical prediction model WRF (Weather Research and Forecasting Model) was employed in several selected cases where thunderstorms were observed in southeast of Brazil. Instead of using the Lightning Potential Index developed by Lynn and Yair (2010) to predict the probability of thunderstorm activity, we have used two different microphysics parameterizations (Tompson and GCE) to analyze the correlation between the different ice species and super-cooled water droplet mixing rations between the 0 and -20°C isotherm and lightning measurements at every 10 minutes . The model was adjusted to have a time step of 30 seconds, with horizontal spacing of 15 km in the lower resolution grid (grid 1) and 5 km resolution (grid 2).The grid 1 was set with 150 x 150 points and grid 2 with 211 x 157 points, for the vertical both grids had 36 sigma levels. GFS/FNL (Global Forecasting System/Final Analysis) at 1.0 degree resolution was used as the initial and boundary conditions.

To inspect the correlation between the ice species and rain/cloud water and lightning activity, sferics measurements from the VLF long range lightning detection network – STARNET were binned at 5 x 5 km grid boxes in the same domain of the WRF simulations at 10 minutes interval. Upon the simulations we begin to analyze the correlation between the lightning area coverage and ice/water areas. It is found that ice and graupel mixing ratios are very well correlated with lightning area, although it depends on the mixing ratio thresholds.

To improve this analysis, the WRF outputs were interpolated in the temperature domain to be able to get profiles of mixing ratios as a function of temperature, thus it will be possible to test the concepts of the non-inductive cloud electrification processes. During the conference, we will present such results in addition of the performance of these new parameterizations in predicting first the thunderstorm activity and later the lightning flashes.