Evaluation of the Potential Lightning Region (PLR) over Southeastern Brazil

Meteorological Applications of Lightning Data

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Identifying reliably regions susceptible to lightning incidence is of great interest for the protection against injuries and hazardous situations. The lightning forecasting method called Potential Lightning Region (PLR) is a result of combining meteorological variables obtained from high-resolution Weather Research and Forecasting (WRF) model simulations to predict probabilities of lightning flash occurrence over a specific region. The present work intends to evaluate the lightning risk indicated by the PLR maps over southeastern Brazil using a total lightning location system (BrasilDAT) as proxy data. The highest incidence of lightning over the domain is during the summer season, so the dataset of this work comprehends the months of December 2012 through March 2013. The methodology of analysis consists in the choice of 25 pointed locations and buffered areas around them to evaluate the precision of PLR with an increasing distance from the center. The buffer radii ranged from 20, 40 and 60 km. The mean PLR value was calculated and the total lightning flashes (intra-cloud and cloud-to-ground) were computed for each buffered area. The procedure was repeated for each one of the three daily PLR maps (15UT, 18UT and 21UT). During the warmer period of the summer, the PLR maps showed higher lightning risks over the observed areas as well as a good correlation with the lightning detected. At the end of the summer season, the lightning risk was reduced over all locations as expected, since the atmosphere tends to become more stable inhibiting the necessary conditions for the occurrence of lightning. The analysis for each buffer size will be showed in order to establish the optimal region of the best PLR behavior. The final consideration will be the influence of intra-cloud and cloud-to-ground lightning data over the PLR hit scores.