Geophysical Research Abstracts
Vol. 15, EGU2013-11409, 2013
EGU General Assembly 2013

An overview of the RAIDEN project: a study of lightning in Portugal

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Atmospheric lightning is an important atmospheric hazard, as cloud-to-ground discharges (CGD) can affect people, can lead to severe damages in buildings, equipment, and can trigger forest fires. The potential damages directly linked to CGD have been increasing as society develops (e.g. due to greater use of electronic equipment). However, an adequate risk assessment requires an analysis in depth of the CGD spatial-temporal distributions. Further, the climate change impacts on the lightning activity still present many uncertainties. Nevertheless, there is a wide agreement in the scientific community that climate change in Europe is likely to impact on frequency, severity and location of extreme events. The Portuguese meteorological office (IPMA) maintains a lightning detection network (LDN) over mainland Portugal since June 2002. Due to the recent and short time period of available data, there are only few studies using this dataset. The RAIDEN project (contract number PTDC/CTE-ATM/101931/2008) - Lightning activity in Portugal: variability patterns and socioeconomic impacts - aims (1) to characterize the spatial-temporal variability of the lightning activity over mainland Portugal and (2) to assess its corresponding risks and socioeconomic impacts. This study is based on data provided by the Portuguese LDN and follows a multidisciplinary approach. As such, the project is focused on a 7-year period (2003-2009) of CGD data and the research program started studying the main climatological aspects of lightning activity, regarding the spatial patterns of the CGD occurrences, as well as their temporal variability at different time scales (inter-annual, seasonal and daily variability). The spatial patterns of the CGD occurrences over Portugal have also been categorized taking into account their spatial spread and strength using a clustering methodology. Furthermore, the dynamical mechanisms underlying the CGD occurrences, including the identification of the main lightning regimes in Portugal, have been studied. In this analysis a number of driving atmospheric parameters have been isolated in order to develop a dynamical-statistical modeling of the CGD occurrences in Portugal, with a direct application to weather forecasting.