



On the relationship between cloud to ground lightning activity over Portugal and Circulation Weather Types during the 2003-2009 period

Alexandre M. Ramos (1), Ricardo Ramos (2), Pedro Sousa (3), Ricardo M. Trigo (3), Marta Janeira (2), and Victor Prior (2)

(1) Ephyslab, Universidad de Vigo, Ourense, Spain (alexramos@uvigo.es), (2) Instituto de Meteorologia, Lisboa, Portugal., (3) CGUL, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal

The Cloud to Ground lightning activity is analyzed for the Portugal mainland during the 2003-2009 period (Ramos et al., 2011). Both inter-annual and intra-annual variability are clearly present, with some individual convective episodes being responsible for an important part of the total lightning strikes detected during the whole period. On a seasonal basis, winter months present much smaller number of Cloud to Ground discharges than the remaining warmer seasons. The highest density of discharges in the colder months is found in the coastal regions. On the contrary, for the remaining seasons, Cloud to Ground discharges tend to occur much more frequently in the interior areas of Portugal. September is the month with highest rate of Cloud to Ground discharges. A diurnal cycle of the Cloud to Ground discharges activity is clearly present in spring, summer and autumn, with maximum activity being found in the afternoon hours, closely related to the enhancement of vertical motions after the hours of maximum daytime heating. The relationship between the Circulation Weather Types and Cloud to Ground discharges allowed us to distinguish which types are frequently associated to lightning activity and also the ones that are favorable to severe lighting episodes. The cyclonic (160 days) and northeasterly (123 days) types are the most remarkable in the number of days with lightning, but the second type presents a much higher rate of Cloud to Ground discharges per event. Moreover, the analysis of additional meteorological fields allowed, at a seasonal scale, to discuss different mechanisms for lighting activity triggering - frontal activity, cut-off lows, and summer thermal lows are the most relevant in the Portugal mainland. A simple case study is also provided for the most notorious event in terms of the total number of Cloud to Ground discharges (10th and 11th of September of 2007).

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