Geophysical Research Abstracts
Vol. 20, EGU2018-15127, 2018
EGU General Assembly 2018

Gamma radiation as a detailed precipitation proxy

Susana Barbosa (1), Pedro Miranda (2), and Eduardo Azevedo (3)

(1) INESC TEC, CSIG, Porto, Portugal (susana.a.barbosa@inesctec.pt), (2) University of Lisbon, Instituto Dom Luiz, Lisboa, Portugal, (3) Center of Climate Meteorology and Global Change, University of the Azores

The short-term variability of gamma radiation is well known to reflect the occurrence of precipitation, which affects ground gamma radiation measurements due to precipitation scavenging of radionuclides inside the cloud and in the air column. However, the association of changes in gamma radiation with the rate, duration, amount, and type of precipitation is far to be well constrained. An obvious hindrance is the lack of detailed meteorological information co-located with the gamma radiation measurements, including in addition to precipitation cloud and aerosols information. Furthermore, temporal changes in gamma radiation are driven by multiple interacting factors, some of which also related to precipitation (e.g. soil water content, atmospheric stability) that need to be disentangled to assess the link between gamma radiation and precipitation.

This contribution addresses the association between the short-term variability of gamma radiation and precipitation based on data from the gamma radiation monitoring campaign at the Eastern North Atlantic (ENA) facility located in the Graciosa island (Azores). The site, in the middle of the North Atlantic ocean, displays typically very low pollution and low aerosol concentration, being far from direct continental sources. Furthermore, the ENA facility provides a very comprehensive and high-resolution dataset of atmospheric variables, including information on clouds and aerosols, which is crucial for understanding the effect of precipitation on the measured gamma radiation. The results show that not only the precipitation intensity, but also the height and thickness of the clouds and the atmospheric concentration of sub-micron aerosols influence the gamma count rate on the ground. Furthermore, the process itself of precipitation formation plays a key role. The slow growth of drops from cloud condensation nuclei favors in-cloud scavenging and increased gamma radiation, while in the case of thermal convective precipitation and fast drop growing by accretion of liquid water the concentration of radionuclides is reduced by dilution.