



## **Radon progeny monitoring at the Eastern North Atlantic (ENA), Graciosa Island ARM facility and a potential earthquake precursory signal**

Susana Barbosa (1), Virgilio B. Mendes (2), and Eduardo B. Azevedo (3)

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

Radon has been considered a promising earthquake precursor, the main rationale being an expected increase in radon exhalation in soil and rocks due to stress associated with the preparatory stages of an earthquake. However, the precursory nature of radon is far from being convincingly demonstrated so far. A major hindrance is the many meteorological and geophysical factors driving radon temporal variability, including the geophysical parameters influencing its emanation (grain size, moisture content, temperature), as well as the meteorological factors (atmospheric pressure, moisture, temperature, winds) influencing its mobility. Despite the challenges, radon remains one of the strongest candidates as a potential earthquake precursor, and it is of crucial importance to investigate the many factors driving its variability and its potential association with seismic events.

Continuous monitoring of radon progeny is performed at the Eastern North Atlantic (ENA) facility located in the Graciosa island (Azores, 39N; 28W), a fixed site of the Atmospheric Radiation Measurement programme (ARM), established and supported by the Department of Energy (DOE) of the United States of America with the collaboration of the local government and University of the Azores. The Azores archipelago is associated with a complex geodynamic setting on the Azores triple junction where the American, Eurasian and African lithospheric plates meet, resulting in significant seismic and volcanic activity. A considerable advantage of the monitoring site is the availability of a comprehensive dataset of concurrent meteorological observations performed at the ENA facility and freely available from the ARM data archive, enabling a detailed analysis of the environmental factors influencing the temporal variability of radon's progeny.

Gamma radiation is being measured continuously every 15 minutes since May 2015. The time series of gamma radiation counts is dominated by sharp peaks lasting a few hours and associated with the occurrence of precipitation. The background level decreases slightly after these discrete events, apparently as a result of rain inhibiting the exhalation of radon from the soil to the atmosphere, but is in general very stable, fluctuating around 50 counts per minute ( $\sim 0.5\%$ ). A notable exception occurred in 26 August 2015, when the background level dropped sharply by  $\sim 200$  counts per minute ( $\sim 2.5\%$  variation). The potential precursory significance of this event, along with the interpretation of the phenomenon and possible association to other ancillary data, such as changes in GPS position components of a nearby continuous station and ionospheric total electron content, are discussed.