



Principal Component Analysis as a tool to characterise the spatial geometry of the Faial (Azores) seismic series (1998-2002)

E. Góngora, (1), **N. Wallenstein** (2), J. Ibáñez, (3), E. Carmona, (3), A. Posadas, (4)

(1) Instituto de Meteorologia – Delegação Regional dos Açores – Rua Mãe de Deus, 9500-321 Ponta Delgada, Portugal, (2) Centro de Vulcanologia e Avaliação de Riscos Geológicos, Rua da Mãe de Deus, Ponta Delgada, Portugal, (3) Instituto Andaluz de Geofísica, Universidad de Granada, Campus de Cartuja, 18071 Granada, España, (4) Departamento de Física, Universidad de Almería, España (eva@notes.uac.pt/+351-296653288)

Due to its geodynamical setting, located at the African, North American and Eurasian lithospheric plates triple junction, the Azores archipelago presents high seismicity rates. On July, 9th, 1998, at 05:19 AM, an $M_L=5.9$ earthquake occurred, with a maximum intensity of VIII (MM-56) and epicentre in the sea, at about 10 km northeast of Horta, the main town of Fayal Island. Nine persons died and a considerable amount of destruction occurred on Faial and on the neighbour islands of Pico and S. Jorge. The main event was followed by more than 15,800 aftershocks, until September 2004, being the first 12,000 registered in the first year, by the SIVISA (Azores Seismological Surveillance System) seismic network. The Gutenberg-Richter parameters ($a=4.92$ and $b=0.84$) indicates that those events were mainly related with tectonic activity. The total radiated seismic energy was of the order of 7×10^{19} ergs.

The main goal of the present work is to characterise spatial geometry of the affected area, applying a multivariate statistical approach known as the Principal Components Analysis (PCA). For the period between July 1998 and September 2002, a selection of 2833 events were relocated using two different 1D velocity models and the PCA applied with the creation of *foci* series subgroups and seeking for Local Rupture Ellipsoids (LRE).

The differences between the applied models were of little significance and a main fracture series trends WNW-ESE (N80-60W), for the first three months, dipping 60°

to 90° to NE was found. In the subsequent seismic series the most significant set of faults, was NE-SW (N30-50E), dipping 50° to 80° to SE.

The obtained directions, WNW-ESE and NE-SW, coincide with some of the main tectonic alignments that can be observed in several islands of the Azores and that were described by many authors.