

1 - Artigos Publicados Com Peer-Review Durante A Tese Doutoramento:

- Belayedi, I., Bezzeghoud, M., **Fontiela, J.** & Nadji, A. (submetido). Sismicité de l'Algérie Nord Occidentale entre 1790 et 2016.

ABSTRACT:

Nous proposons dans cette note, une approche permettant l'établissement d'un catalogue sur la sismicité de l'Algérie nord occidentale, défini par les longitudes $[-2^\circ, 1^\circ]$ et les latitudes $[34^\circ, 37^\circ]$. Les données utilisées dérivent de différents catalogues. Ce travail tiens compte de l'homogénéisation des magnitudes, en M_w , par l'utilisation de certaines relations empiriques. Ce catalogue comprend 1101 événements sismiques et constitue une base de données spécifique pour cette région. Le document proposé couvre une période historique et instrumentale entre 1790 et 2016. Le catalogue établi et présenté dans cette étude est caractérisé par la complétude et l'homogénéisation de l'information propre à la sismicité de l'Algérie nord occidentale.

- Bezzeghoud, M., Ayadi, A., Caldeira, B., **Fontiela, J.**, & Borges J. F., 2017. Los mayores sismos en Argelia en la época moderna: las fallas de El Asnam y Zemmouri-Boumerdès. Física de la Tierra, 29,183-202. <http://dx.doi.org/10.5209/FITE.57618>

ABSTRACT:

Argelia ha experimentado muchos terremotos destructivos en los últimos siglos (e.g., Ayadi and Bezzeghoud, 2015). La ciudad de El Asnam (antes Orléanville, hoy Chelef) sufrió graves daños en 1954 y 1980 por terremotos de magnitud 6,7 y 7,3, respectivamente. El 29 de octubre de 1989, un terremoto de magnitud 5,9 golpeó el Mont Chenoua-Tipasa, zona costera situada a unos 150 km al oeste de Zemmouri, donde ocurrió el terremoto del 21 de mayo de 2003 (M_w 6.8). Muchos otros grandes terremotos históricos e instrumentales causaron graves daños a las ciudades costeras de Argelia durante los últimos siglos (alrededor de Argel, Orán, Mascara, Djidjelli, Constantina y Bejaia). Estos terremotos son pruebas evidentes de una deformación activa del margen, junto con la clara extensión de las fallas activas costeras. Según varios estudios, la principal estructura geológica activa en torno a El Asnam, Argel, Zemmouri y Boumerdes experimentó varios terremotos desastrosos. Muchos otros terremotos ocurrieron en y alrededor de las cuencas de Chelef y Mitidja subrayando la actividad de la zona. En este capítulo se destacarán las principales características de los dos mayores terremotos ocurridos en Argelia en la época moderna: los terremotos de El Asnam del 9 de septiembre de 1954 (M_w 6.7) y del 10 de octubre de 1980 (M_w 7.3), así como el terremoto de Zemmouri-Boumerdes del 21 de mayo de 2003 (M_w 6.8).

- Caldeira, B., **Fontiela, J.**, Borges, J.F., & Bezzeghoud, M., 2017. Grandes terremotos en Azores. Física de la Tierra, 29,29-45. <http://dx.doi.org/10.5209/FITE.57601>

ABSTRACT:

La historia del archipiélago de Azores, desde el descubrimiento y colonización en la primera mitad del siglo XV hasta ahora, está marcada por los impactos sociales y económicos producidos por los terremotos, principalmente los de alta intensidad. La información compilada nos lleva a concluir que en este periodo 33 terremotos han afectado las islas de Azores con una intensidad igual o superior a VII, causando unas 6.300 muertes y la destrucción generalizada en algunas Islas del Archipiélago, principalmente en S. Miguel, Terceira, Graciosa, Faial, S. Jorge y Pico. La acomodación de los movimientos diferenciales que se producen debido al límite entre las placas eurasiática (EA), africana (AF) y norteamericana (NA) y también al volcanismo que ocurre en la región, son los principales responsables de la intensa actividad sísmica que ocurre en este archipiélago. Este trabajo revisa los temas científicos de los terremotos conocidos que han interferido severamente con la vida del pueblo azoreano a lo largo de su historia, a esos terremotos llamamos grandes terremotos.

- **Fontiela, J.,** Bezzeghoud, M., Rosset, P., & Rodrigues, F. C., 2017. Maximum Observed Intensity Map for the Azores Archipelago (Portugal) from 1522 to 2012 Seismic Catalog. *Seismological Research Letters*, 88(4). <https://doi.org/10.1785/0220160159>

ABSTRACT:

The Azores archipelago is a seismically active region composed of nine islands and located at the triple junction of the American, Nubian, and Eurasian plates. Since its settlement in the fifteenth century, 33 earthquakes with intensity higher than VII have been reported. This article shows areas that experienced strong ground shaking using maximum observed intensity (MOI) mapping. For this purpose, 323 records from 167 earthquakes in the period 1522–2012 have been compiled, and MOI values are interpolated on a regular grid of points using the kriging method. The comparison of observed and calculated MOI for four damaging and deadly earthquakes indicates a good calibration of the procedure relative to the available dataset. For the islands of the central group, which comprises Terceira, Graciosa, São Jorge, Pico, and Faial, the highest calculated intensities (XI) are located in the eastern part of São Jorge Island. Intensities (X) are observed on Faial along a northwest–southeast stripe. For Graciosa, Terceira, and Pico, the estimated maximum intensities are IX, VIII, and VII, respectively. For the eastern group of islands, the highest intensities (X) are located in the southeastern part of São Miguel Island, and on Santa Maria Island the maximum intensity of VI is observed in its eastern part. Finally, Flores and Corvo Islands, located on the American plate, have a very low seismicity.

- **Fontiela, J.,** Bezzeghoud, M., Rosset, P., Borges, J. F. and Cota Rodrigues F., 2014. Azores Seismogenic Zones, *Comunicações Geológicas*, 101(1), 29-35. (http://www.lneg.pt/download/9567/69_3003_ART.CG14_ESPECIAL_1.pdf)

ABSTRACT:

One condition to perform seismic hazard analysis is knowledge about seismogenic zones that is an invaluable source of information and play an important role because it is fundamental know the processes and properties that control the seismogenic zone. The aim of this work is distinguishing seismogenic zones in the Azores region applying different parameters such as the earthquake density, b-values, focal mechanism, historical seismicity and all of these conjugated within the geodynamic framework of the Azores. We identified 10 seismogenic zones plus the well known Mid Atlantic Ridge. The 10 zones we identified are over the major tectonic structures of the Archipelago, namely Terceira Rift and Linear Volcanic Ridges.

- Cruz, J.V., **Fontiela, J.,** Prada, S. & Andrade, C., 2014. The chemical status of groundwater and pollution risk in the Azores archipelago (Portugal), *Environmental Earth Sciences*, 73(6), 2763-2777 <http://doi.org/10.1007/s12665-014-3407-2>

ABSTRACT:

Groundwater quality in the Azores archipelago (Portugal) is a major issue for the definition of water policies, as about 98 % of the water supply is supported by aquifers. Therefore, this issue was addressed in the Azores River Basin District Plan made in order to comply with EU Water Framework Directive (WFD), using an approach developed in order to link land use pattern and groundwater chemistry. Monitored groundwater corresponds to cold waters with a pH range between 5.95 and 8.44. A median value of conductivity (188.8 $\mu\text{S}/\text{cm}$) suggests that in general the samples are low mineralized, and are mainly in the range from Na–HCO₃ to Na–Cl type waters. Average content of nitrate ranges between 0.02 and 66.2 mg NO₃/L, and an evaluation of chemical status of groundwater with respect to NO₃ content was made in groundwater bodies in which it was possible to compute arithmetic mean values and the respective confidence limit at 95 %. From the 21 groundwater bodies in which this computation was made possible, only in São Jorge Island a single value exceeds the maximum admissible limit of 45 mg NO₃/L. Therefore, only in this case a groundwater body is in poor chemical status due to non-point pollution sources. Results are consistent with the set of constructed potential pollution risk maps, except in São Jorge where the

area occupied by moderate to very-high-risk areas is higher comparing to other islands. Risk maps were constructed using vulnerability to pollution determined according to the DRASTIC methods, and overlying this index value with land use and net N-pollution load layers. Results show that generally pollution risk is very low to moderate.

2 - Capítulos De Livros Com Peer-Review:

- **Fontiela, J., C.S. Oliveira & P. Rosset, 2018** - Characterization of seismicity of the Azores archipelago: an overview of historical and a detailed analysis of the period 2000-2012, *in* Volcanoes of the Azores, Eds U. Kueppers, C. Beier. Springer. ISBN 978-3-642-32226-6

ABSTRACT:

The Azores Archipelago is located in the Middle Atlantic Ridge, at the Triple Junction formed by the contact of the Euro-Asiatic, the Nubia (African) and the American plates (see also Vogt and Jung, Chapter “The “Azores Geosyncline” and Plate Tectonics: Research History, Synthesis, and Unsolved Puzzles”). Its seismicity rate is very high with earthquakes with relatively low magnitude, defining quite well the contact regions. This chapter gives an overview of the existing historical and instrumental catalogues, describes the seismicity of the region essentially since early 1915, and analyses in more detail the characteristics of the recorded data in the period 2000–2012. The spatial variations of the minimum magnitude of completeness (M_c) as well as the b-value is studied for this period within the stripe of observed seismicity which contains the alignment of the Archipelago islands. A preliminary interpretation of the M_c and b-values is made keeping in mind the geological transition between the Gloria fault to the East and the Mid-Atlantic Region to the West.

- Coutinho, R.M., **J.Fontiela**, P. Freire & J.V. Cruz, 2015 -Hydrogeology of S.Miguel Island, Azores: a review in Volcanic geology of S.Miguel Island (Azores). *in* Volcanic Geology of S. Miguel Island (Azores), Eds. Gaspar, J.L., J.E. Guest, A.M. Duncan & F.Barriga. Geological Society, London, Memoirs, 44, 289-296 (<https://doi.org/10.1144/M44.21>).

ABSTRACT:

Groundwater is the main source of water supply on São Miguel. Groundwater abstraction ($25 \text{ hm}^3 \text{ a}^{-1}$) relies almost exclusively on springs discharging from perched aquifers. A total of 1100 springs (1.5 springs/km^2) are located on São Miguel, mainly in the Água de Pau and the Furnas–Povoação groundwater bodies. Only 26 wells have been drilled, distributed principally in the west-central zone. Specific capacity ranges between 0.49 and 100 l (s m)^{-1} (median= $1.11 \text{ l (s m)}^{-1}$), while transmissivity ranges between 5.98×10^{-4} and $1.22 \times 10^{-1} \text{ m}^2 \text{ s}^{-1}$ (median= $1.35 \times 10^{-3} \text{ m}^2 \text{ s}^{-1}$). Groundwater is predominantly of the Na-Cl and Na-HCO₃ types and electrical conductivity in springs ranges from 36 to $440 \text{ } \mu\text{S cm}^{-1}$ (median= $152 \text{ } \mu\text{S cm}^{-1}$), which is lower than in wells (211 – $9670 \text{ } \mu\text{S cm}^{-1}$; median= $515 \text{ } \mu\text{S cm}^{-1}$). These values result from seawater spray, a CO₂ soil contribution and limited dissolution of primary silicate minerals from volcanic rocks. In the case of wells, seawater intrusion may also influence electrical conductivity. One of the main problems in groundwater quality is total and faecal coliform microbial contamination. A pollution risk map constructed for São Miguel as a whole showed that risk in the majority of the groundwater bodies is only very low to moderate.

- Cruz, J.V., P. Freire, A. Costa, **J. Fontiela**, L. Cabral & R.M. Coutinho, 2015 - Hydrogeochemical characterization of mineral waters in S. Miguel Island, Azores, *in* Volcanic Geology of S. Miguel Island (Azores), Eds. Gaspar, J.L., J.E. Guest, A.M. Duncan & F.Barriga. Geological Society, London, Memoirs, 44, 257-269 (<https://doi.org/10.1144/M44.19>).

ABSTRACT:

A dataset on the chemical composition of mineral water discharges from São Miguel, 76 samples, depicts a large variability of chemical types and dissolved solids content. The distribution of the

discharges shows an association with the three active Quaternary central volcanoes that dominate the geology of São Miguel, namely Furnas, Fogo and Sete Cidades, 74% of which are springs, 13% fumaroles, 12% wells and 1% hand-dug wells. Total dissolved solids (TDS) values are in the range of 159–20 957 mg l⁻¹, discharge temperature varies from 15 to 99.5°C and waters are mainly strongly acid to slightly alkaline (pH ranging between 2.2 and 7.71). Springs discharge mainly from perched-water bodies, corresponding to Na-HCO₃ and Na-HCO₃-Cl-type waters, with a composition influenced by absorption of CO₂ and mixing between meteoric water and boiling waters with a hydrothermal component. Instead the majority of the wells are distributed along the coast and depict chloride enrichment owing to mixture with seawater. The lower pH values are associated with boiling pools at Fogo Volcano with a SO₄-dominated chemistry, resulting from steam-heating of shallow perched-water bodies.

3 - Participação Em Congressos:

- **Fontiela, J.**, Borges, J., Ouyed, M., Bezzeghoud, M., Idres, M., Caldeira, B., Boughacha, M., Carvalho, J., Samai, S., Aissa, S., Benfadda, A., Chimouni, R., Yalaoui, R., & Dias, R., 2017. A seismic hazard overview of the Mitidja Basin (Northern Algeria), Abstract S31B-0811 presented at 2017 Fall Meeting, AGU, New Orleans, Loui., 11-15 Dec. (<https://agu.confex.com/agu/fm17/meetingapp.cgi/Paper/293215>)
- **Fontiela, J.**, M. Bezzeghoud, P. Rosset, J. F. Borges & F. Rodrigues, 2017, Probabilistic seismic hazard assessment of the Eastern and Central groups of the Azores - Portugal, in Geophysical Research Abstracts, vol. 19, EGU2017-16386. (<http://meetingorganizer.copernicus.org/EGU2017/EGU2017-16386.pdf>)
- Belayadi, I., Bezzeghoud, M., **Fontiela, J.**, & Nadji, A., 2017. Empirical relations to convert magnitudes of the earthquake catalogue for the north western of Algeria, in Geophysical Research Abstracts, vol. 19, EGU2017-15179. (<http://meetingorganizer.copernicus.org/EGU2017/EGU2017-15179.pdf>)
- Borges, J., Ouyed, M., Bezzeghoud, M., Idres, M., Caldeira, B., Boughacha, M., Carvalho, J., Samai, S., **Fontiela, J.**, Aissa, S., Benfadda, A., Chimouni, R., Yalaoui, R., & Dias, R., 2017. The MITMOTION Project – A seismic hazard overview of the Mitidja Basin (Northern Algeria), in Geophysical Research Abstracts, vol. 19, EGU2017-8278. (<http://meetingorganizer.copernicus.org/EGU2017/EGU2017-8278.pdf>)
- **Fontiela, J.**, J. Borges, M. Bezzeghoud, P. Rosset & F. Rodrigues, 2016 - Site effects inferred from HVSR methodology in Praia da Vitória city (Portugal). Geophysical Research Abstracts, Vol. 18, EGU2016-17960-5. (<http://meetingorganizer.copernicus.org/EGU2016/EGU2016-17960-5.pdf>)
- Bezzeghoud, M., **J. Fontiela**, C. Ferrão, J. F. Borges & B. Caldeira, 2016 - Seismicity and Seismic Hazard along the Western part of the Eurasia–Nubia plate boundary. Geophysical Research Abstracts, Vol. 18, EGU2016-10219. (<http://meetingorganizer.copernicus.org/EGU2016/EGU2016-10219.pdf>)
- **Fontiela, J.**, M. Bezzeghoud, P. Rosset & F. Rodrigues, 2016 - Mapa de Intensidades máximas observadas nos Açores. Sísmica 2016 (10º Congresso Nacional de Sismologia e Engenharia Sísmica), 20 - 22 April, Ponta Delgada - Portugal, 11p.

ABSTRACT:

Os mapas de intensidade máxima observada (IMO) mostram zonas afectadas, no passado, devido a fortes movimentos do solo. No entanto, não discriminam os efeitos de sítio. Apesar destas limitações, e desde que exista um longo acervo da sismicidade histórica, os mapas IMO podem se aplicar para avaliar o perigo sísmico.

As descrições históricas dos efeitos sísmicos, normalmente, não cobrem todo o território afectado. Para ultrapassar este problema utilizamos o método de interpolação kriging. Este método permite

interpolam pontos desconhecidos a partir de pontos cuja localização e intensidade são conhecidos. Do Catálogo Sísmico da Região dos Açores foram selecionados eventos com $I_0 \geq V$ e foram adicionados 14 sismos históricos com $I_0 \geq VII$ que ocorreram entre 1522 e 1912. Os “clusters” sísmicos associados a erupções vulcânicas (1957/58 e 1964), assim como réplicas, foram removidos para evitar o enviesamento dos resultados.

O mapa IMO mostra que a parte oriental das ilhas de São Jorge e Graciosa tem os valores de IMO mais elevados, XI e IX, respectivamente. Nas ilhas Terceira e Pico, intensidades máximas são VIII e VII, respectivamente, e estão limitadas aos extremos oriental e ocidental. No Faial, uma faixa com direcção NW-SE apresenta os valores de intensidade (X) mais elevada. Em S. Miguel as IMO (VII e X) estão localizadas na parte ocidental, sudeste e norte da ilha. Por fim, só a parte oriental da ilha de Santa Maria apresenta os valores IMO mais elevados (VI). Não são apresentados resultados para as ilhas Flores e Corvo, devido à reduzida sismicidade que não preenche os critérios estabelecidos para a selecção de sismos.

- **Fontiela, J.**, P. Rosset, M. Wyss, M. Bezzeghoud & F. Rodrigues, 2016 - Perdas humanas e danos materiais em futuros sismos na ilha do Faial - Açores. Sísmica 2016 - 10º Congresso Nacional de Sismologia e Engenharia Sísmica, 20 - 22 April, Ponta Delgada - Portugal, 12p.

ABSTRACT:

Para estimar o número de mortos e feridos para futuros sismos na ilha do Faial utilizou-se o QLARM e um conjunto de dados calibrados para as condições locais. Os dados respeitantes à população e parque habitacional deriva do CENSUS 2001 onde constam o tipo de construção e o estado de manutenção. Posteriormente, Os edifícios foram agrupados em classes de vulnerabilidade EMS98. O modelo de atenuação escolhido é o de Munson e Thurber (1997), que melhor se adequa às condições geológicas locais e foi desenvolvido para ambientes geológicos semelhantes aos dos Açores. Para estimar os efeitos de sítio combinaram-se o mapa geológico com os valores de VS30 estimados por Borchardt (1994). O rácio do número de mortos observados e estimados, assim como o rácio do número de feridos para os sismos de 1926 (M_b 5,6) e 1998 (M_w 6,2) estão dentro do factor dois, indicando que as estimativas estão dentro do intervalo de confiança do QLARM. Os cenários desenvolvidos mostram que no futuro, um sismo no Faial com $M7$ poderá causar entre 70 a 300 mortos e 120 a 650 feridos.

- Okada, J., H. Sato, S. Mimatsu, **J. Fontiela** & H. Okada, 2016 - Long run communication support based on diagnostic symptom to the eruption as key roles of volcanologists toward sleeping giant - Case studies from Bandai, Usu and Azores. Cities on Volcanoes 9, 20- 25 November, Puerto Varas - Chile.

ABSTRACT:

Volcanic eruptions can occur after decades-centuries long dormancy as has been seen from the recent examples: Mount St. Helens 1980, Pinatubo 1991, Unzen 1991, Soufrière Hills volcano 1995, Chaitén 2008, and Eyjafjallajökull 2010. Bandai volcano, NE Japan experienced a large scale sector collapse in 1888 which killed 477 people. We study how this catastrophic event is looked back by scientists, government and the local people. During the recent decades, the cultural and educational activities led by the Bandai Volcano Eruption Memorial Museum play an important role in disseminating hazard knowledge to the local people. Many outreach activities have been carried out at schools and/or in the volcano as well as the delivery of the volcanic hazard map. The regional headquarters of JMA in Sendai is in charge of monitoring 18 active volcanoes in Tohoku district. The area has not experienced major eruptions for long time, however the high potentiality for the large-scale eruption above VEI 4-5 is remarked such as Chokai B.C. 466 and Towada 915. The last four eruption crisis of Usu volcano, northern Japan were advised always by a couple of geophysicists and volcanologists through face-to-face communication with local town officers and the residents. Fogo volcano, Azores, shows 452 years of eruption dormancy whereas the recent geophysical studies have revealed repeated intrusion episodes during the last decades. We study

how the information flows from scientific community to the public in case of volcanic crisis. It is a very challenging task how to deal with sleeping giants. Facilitating awareness of volcanic risks by maintaining long run communication among scientists, local authority and residents/tourists is the key for mitigating large volcanic hazards with low probabilities. Scientific support should be aimed at building community where “the local residents could make their own contingency and evacuation plans (Surono, 2013)”.

- Belayadi, I., M. Bezzeghoud, A. Nadji & **J. Fontiela**, 2016 - Catalogue de la sismicité de l'Algérie Nord Occidentale, de 1790 à 2016. Workshop on Earth Sciences, 8 - 10 December, Évora - Portugal, 4p.

ABSTRACT:

Na Argélia existem diversos catálogos sísmicos à escala regional ou nacional, no entanto não existe nenhum inventário para a região NW do país. Para ultrapassar esta lacuna foi criado um catálogo, o mais completo possível, para a região compreendida entre os -2° W e 1° E longitude e entre os 34° N e 37° N de latitude. Os sismos utilizados neste catálogo resultam da compilação de diferentes catálogos sísmicos argelinos e de bases dados internacionais. Numa primeira instância foram compilados todos os eventos sísmicos e posteriormente foram eliminados os eventos duplicados. Após esta etapa, converteram-se as diferentes magnitudes atribuídas, em cada catálogo, em magnitude do momento utilizando relações empíricas. No total estão listados os parâmetros hipocentrais de 997 sismos abrangendo o período 1790 a 2016. Assim, o catálogo caracteriza-se por apresentar a sismicidade do NW da Argélia para uma série temporal longa e homogeneização da magnitude.

- **Fontiela J.**, M. Bezzeghoud, P. Rosset, J. & F.C. Rodrigues, 2015 - Maximum Observed Intensity Map for the Azores (Portugal); Preliminary Results. 26th General Assembly of International Union of Geodesy and Geophysics, IUGG-4428.

ABSTRACT:

The Azores archipelago is a seismic active region including nine inhabited islands. Since its settlement in the XVth century, the archipelago has been stricken by 33 earthquakes with intensity \geq VII. We propose the first maximum observed intensity (MOI) map for this region in order to identify areas where high magnitude events occurred in the past.

The maximum intensity of each event \geq V is selected from the recorded earthquake catalogue (period of the catalogue). Fourteen historical events with intensities \geq VII that occurred between 1522 and 1912 were added. Clustered earthquakes associated with volcanic eruptions (1957/58 and 1964) as well as aftershocks that lasted several months were removed in order to avoid biases. In order to create the MOI map, the kriging method is used to interpolate existing data to a regular grid of point .

The MOI map shows that the eastern part of São Jorge and Graciosa Island have the highest intensity values of XI and IX respectively. In the Terceira Island, intensity VIII are observed in the eastern and western part. In Faial Island, intensity X is in a stripe with direction NW-SE. In Pico, the maximum intensities (VII) are on the eastern and western edges of the island. In São Islands, few zones of high intensities (X and VII) are shown in the western, southeastern and northern parts. In Santa Maria Island, the eastern part has the highest intensity (VI). We do not present results of Flores and Corvo Islands because the seismicity is very low and does not match with our criteria of events with intensity \geq V. Finally, it could noticed that such a map does not discriminate site effects as if it shows areas with highest strong ground motion.

- **Fontiela J.**, M. Bezzeghoud, P. Borges, C.S. Oliveira, P. Rosset, J. Borges, & F.C. Rodrigues, 2014 – Azores Seismogenic Zones. Workshop Early Earthquake Warning – Applications to the Ibero-Maghrebian Region, Madrid, 4-5 February 2013.

ABSTRACT:

Due to location of the Azores archipelago on the triple junction of American, Eurasian and Nubia plates seismicity is high despite low energy radiated. The spatial distribution of earthquakes is inhomogeneous and occurs in clusters. On seismic hazard studies identify seismogenic zones is a requirement. Methods we used to identify seismogenic zones on the Azores were: spatial distribution of earthquakes, frequency magnitude distribution of Gutenberg and Richter (through b and a values), number of earthquakes $M > 5$, energy radiated by earthquakes $M > 4$ and focal mechanisms. Most of the data used to discriminate seismogenic sources are from Earthquake Catalog of the Azores Region (Fontiela et al., in preparation), ISC (2011) and GCMT (Dziewonski et al. (1981), Ekström et al. (2012), and works developed over specific earthquakes. During selection data we found some limitations, especially on the Earthquake Catalogue of the Azores Region due to different magnitude scales reported. To overcome these limitations we restricted data from Earthquake Catalog of the Azores Region to the time span 2000 – 2013.

Analyzing b value of Gutenberg Richter relationship we can discriminate 10 zones where b values varies between minimum of 0.7 to maximum of 1.6. If we analyze seismicity at bigger scale we found that b values between west S.Miguel up to the Middle Atlantic Ridge is 1,28. Between S. Miguel up to the transition of Terceira Rift with Gloria fault b values dropdown to 0,82. This different behavior along major structures of the Archipelago were also obtained by Borges et al., (2007) and Bezzeghoud et al. (2012) namely for the average seismic slip velocity and the total seismic moment tensor of shallow events of the same areas.

It is evident the diversity of stress systems in the archipelago which translate into different levels of seismic activity in adjacent areas. We observe also that the seismogenic zones identified, in this study, fits with the tectonic structures of the archipelago observed by Lourenço (2007)

- **Fontiela J., M. Bezzeghoud, P. Rosset, J. Borges & F.C. Rodrigues, 2014 – Azores Seismogenic Zones. IX Congresso Nacional de Geologia – 2o Congresso de Geologia dos Países de Língua Portuguesa, Porto 18 – 24 Julho 2014.**

ABSTRACT:

One condition to perform seismic hazard analysis is knowledge about seismogenic zones that is an invaluable source of information and play an important role because it is fundamental know the processes and properties that control the seismogenic zone. The aim of this work is distinguishing seismogenic zones in the Azores region applying different parameters such as the earthquake density, b-values, focal mechanism, historical seismicity and all of these conjugated within the geodynamic framework of the Azores. We identified 10 seismogenic zones plus the well known Mid Atlantic Ridge. The 10 zones we identified are over the major tectonic structures of the Archipelago, namely Terceira Rift and Linear Volcanic Ridges.

- **Fontiela J., C.S. Oliveira, M. Bezzeghoud, P. Rosset & F.C. Rodrigues, 2013 – Zonas Sismogénicas nos Açores. III CJIG, LEG 2013 & 6th PGUE - Pólo de Estremoz da UÉvora, 04-08 outubro 2013.**

ABSTRACT:

A sismicidade no arquipélago dos Açores é elevada devido ao contexto geodinâmico, no entanto a distribuição espacial é heterogénea e ocorre em clusters. Assim, é premente identificar as zonas sismogénicas cuja actividade sísmica e orientação dos campos de tensões sejam relativamente uniformes. Devido às limitações do catálogo sísmico só foi possível utilizar um intervalo de 12 anos. A metodologia aplicada permitiu identificar 11 zonas sismogénicas. Os resultados obtidos mostram a diversidade de sistemas de tensões a actuar no arquipélago que se traduzem em níveis diferentes de actividade sísmica em zonas contíguas.

4 - Outras publicações:

- **Fontiela, J.**, 2017 - Breve análise da sismicidade, *in* Vulcão das Sete Cidades - História Natural, Ed. Victor Hugo Forjaz, Observatório Vulcanológico e Geotérmico dos Açores. ISBN 978-989-8164-193

FICHEIRO EM ANEXO (Sete-Cidades_2016)

- **Fontiela J.**, M. Bezzeghoud, J. F.C. Rodrigues & P. Rosset, 2015 - Intensidades máximas observadas nos Açores (Portugal); Resultados preliminares. Workshop em Ciências da Terra e do Espaço, Livro de Actas 2015. Programa Doutoral em Ciências da Terra e do Espaço, Ed. Universidade de Évora.

FICHEIRO EM ANEXO (WCTE_2015)

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