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**INTERNATIONAL ASSOCIATION OF SEISMOLOGY
AND PHYSICS OF THE EARTH INTERIOR
IASPEI**

NATIONAL REPORT

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**PRESENTED TO THE XXVI GENERAL ASSEMBLY
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Coordinated by

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1 – INTRODUCTION

The 2011-2014 was for the Portuguese institutions dedicate to seismic observation and seismological investigation a period for the consolidation of the great improvements in monitoring saw in previous years. All major institutes now transmit data in real time to IPMA (the Portuguese agency responsible for seismic observation) and also to major European and international consortia like ORFEUS and IRIS.

Portuguese researches were very active in all the main European projects like SHARE, NERIES, NERA, EPOS, TOPO-EUROPE, NEAREST, ASTARTE, EMSO and ESONET. As regards national projects we outline the WILAS project that managed to join all institutes into a monitoring project with temporary stations that complemented the Spanish TOPO-IBERIA and European TOPO-EUROPE projects. As a result a comprehensive seismic database was established at IPMA now profiting all the Portuguese researchers. 2011-2014 saw a steady capture of national funds for Seismology research resulting in a notorious number of publications that are presented below for each of the contributing institutes to this report.

One of the major achievements during this period was the successful organization of the Welcome to the first newsletter of the 15th World Conference on Earthquake Engineering where Seismology was one of the main subjects. Portugal also organized two national meetings of the Portuguese Association for Meteorology and Geophysics (in 2011 at Setúbal and in 2013 at Ericeira) and the 9th Congress for Earthquake Engineering and Seismology (Lisbon, 2014). The 8th Portugal and Spain Assembly for Geodesy and Geophysics was held in 2014 at Évora, in a successful organization by the CGE.

2 – IPMA - Division of Geophysics of the Instituto Português do Mar e da Atmosfera

2.1 Introduction

The work developed by the Division of Geophysics of IPMA is compiled in the following paragraphs, where the core activities were related with the development of the seismic monitoring and related services.

2.2 Seismic network

2.2.1. Mainland Portugal

At the beginning of 2011, the seismic network was well established, being composed of 24 stations owned by IPMA. The core of the network is based on a broadband typology, with 15 stations equipped with broadband seismometers (1 STS2 [120sec]; 10 CMG-3ESPc [120sec] and 4 CMG-3T [120]) and strong-motion sensors co-located (1 Episensor; 14 CMG-5T), as well as with 24bits digitizers (1 Q330; 14 CMG-DM24). Some of the short-period stations were upgraded during the reported period, adding new 24bit digitizers and accelerometers co-located. Including this upgrades the mainland network has more 6 extended short-period stations (6 LE3D5sec) with strong-motion sensors co-located (6 CMG-5Tc) and 24bit digitizers (6 CMG-EAM6), 2 short-period stations (LE3D1sec) with 16bit digitizers (Mars88) and 1 strong-motion station (CMG-5T and Geosyg GSD 24bits).

During the reporting period another broadband station was also installed (PSBE), equipped with a CMG-3ESPc broadband sensor, a CMG-5Tc accelerometer and a 24bit digitiser (CMG-EAM6).

This network is complemented with other stations belonging to national and international institutions and agencies.

The data is real-time transmitted to the Data Centre located in Lisbon, using mostly VSAT links but also public Internet (DSL and GPRS) and VPN's.

2.2.2. Madeira archipelago network

At the beginning of the reporting period, the network in Madeira has 5 seismic stations operating: 2 broadband stations equipped with CMG-3ESPc [120sec] seismometers, 2 CMG-5T co-located accelerometers and 2 CMG-DM24 24 bit digitisers; 3 extended short-period stations, based on LE3D 5sec sensors and Mars88 16bits digitisers.

Major problems were faced with one of the BB stations, mostly related to a radio link between the acquisition node (located on a remote place) and the central recording facilities. This was solved in 2013 with a major change in the infrastructures, concentrating all the instrumentation in the acquisition node and moving the transmission from fix DSL to mobile GPRS that became available.

The data is real-time transmitted to the Data Centre located in Lisbon, using 2 VSAT links and public Internet (GPRS) and VPN's.

2.2.3. Azores archipelago network

At the beginning of the reporting period, the network in Azores had some major problems related with energy and communications. In this particular issue, it was necessary to completely deactivate the former radio links and implement different transmission technologies based on IP (mostly VSAT when possible and GPRS).

Major developments during the reporting period were achieved. At the end of 2014 the seismic network in operation was composed of 22 seismic stations owned by IPMA. 6 stations are now equipped with broadband seismometers (6 CMG-3ESPc [120sec] and strong-motion sensors co-located (4 CMG-5T and 2 CMG-5Tc), as well as with 24bits digitisers (4 CMG-DM24 and 2 CMG-EAM6). Some of the short-period stations were upgraded during the reported period, adding new 24bit digitisers and accelerometers co-located and also new transmission systems. A new strong-motion station (CMG-5T and Geosyg GMS+) was installed in Faial Island.

The regional network is complemented by 2 other broadband stations, from the CTBTO and IDA, and 1 short-period station from CTBTO. The 3 mentioned stations are operated and maintained by IPMA.

The data is real-time transmitted to the Data Centers located in Ponta Delgada and Lisbon, using 2 VSAT links and public Internet (GPRS) and VPN's.

2.3. Data processing

The network is equipped with automatic acquisition and data retrieval software, based on the SeiscomP software (Geofon) running on a Linux platform. The automatic detection and analysis is made on a in-house developed platform that uses resources from SEISAN package. The data is automatically analysed and later manually revised.

Madeira and Mainland seismicity is monitored from Lisbon Data Centre. The seismic surveillance of Azores is made locally on a service distributed into 3 observatories.

2.3.1. Seismic surveillance

In case of earthquakes that might be felt, usually the ones for which at least a PGA of 0,1cm/s² is forecasted for the nearest locality, a specific alert is send to the Civil Protection Agencies, usually less than 4 minutes after origin time in the mainland and Madeira, and few minutes more in the Azores.

Also, all the parametric data from earthquakes with local magnitude above 2.0 are reported to the EMSC.

All the phase data for local, regional and distant earthquakes, together with the computed hypocentres, are published in monthly preliminary bulletins, and is available in the Web.

2.3.2. Macroseismic processing

In the reporting period a "did you feel it" questionnaire was implement in the IPMA web page, and become a very useful tool to quickly obtain macroseismic data. An algorithm for automatic evaluation was developed (WEBMINT) and implemented, allowing the annalist on duty to rapidly assess the macroseismic field.

This information is also fed into the shakemap generation procedures.

2.3.3. Shakemaps

The shakemap service was developed during the reporting period and implemented in January 2014, for the moment limited to earthquakes occurring in the Mainland and Madeira areas.

Usually within 5 minutes after the earthquake it is possible to generate maps with the distribution of the macrosismic, peak ground acceleration and peak ground velocity fields. The information is available on the web page of IPMA.

2.3.4. Raw data sharing

Waveform data from five of the broadband stations (PMOZ, ROSA, PFVI, PESTR and PVAQ) is sent to ORFEUS and IRIS/DMC in real-time, where it is made available to the community. There are also some agreements with other institutions granting the access to more stations in real time.

2.4. Geomagnetism

During the reporting period IPMA performed several geomagnetic campaigns in the national territory, surveying a network of repeating stations. The gathered information was used to study the magnetic fields and also to obtain the information that is required by the military and civil aviation.

It was not possible to implement the so needed geomagnetic observatories, mainly in Azores, mostly due to the lack of funds.

2.5. Participation in Projects

CTBTO – Comprehensive Test Ban Treaty Organization – On 1999, the former IM has been chosen by the PTS to be the local partner for the operation and maintenance of two IMS stations: one T-phase hydroacoustic station and one Infrasound array, both in Azores islands. IM, who has performed the site survey for the installation of the T-Phase hydroacoustic station, and was the responsible for its installation, on 2004. This Station was certified in 2005, and since then IM and now IPMA is operating and maintaining it.

IRIS/IDA – Since 1996, the former IM now IPMA is the local responsible for the operation and maintenance of the CMLA station, which belongs to the San Diego University. On 2012, significant improvements have been introduced, namely on the data transfer process which is now done through a stable frame-relay connection between the CRF and the Ponta Delgada Observatory and from there to world through Internet.

GEOFON – Since 1997, former IM now IPMA, has been cooperating with the Potsdam GFZ in the operation of a very broadband station at Manteigas, Portugal, and belonging to the GEOFON network.

Participation in several national projects, mainly funded by the Science and Technology Foundation (FCT): CV-PLUMME – Research on the geometry and deep signature of the mantelic plume in Cape Verde archipelago; WILAS – Lithosphere and Asthenosphere structure below the western Iberia peninsula; SIGMA – Characterization of the seismic action in the Azores archipelago; SQUAREL – Quantification of the earthquakes and internal structure at regional scale: application to Western Iberia; QUAKELOC – Earthquake precise hypocentre determination on Portugal mainland and adjacent area; INSPIRE – Instrumental study of the Portuguese earthquakes between 1900 and 1960;

Participation in international projects, mainly funded by the European Commission: NEAREST – Integrated Observations From NEAR Shore Sources of Tsunamis Towards an Early Warning System; TRIDEC – Collaborative, Complex and Critical Decision-Support in Evolving Crises; NERA – Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation; EPOS-PP – European Plate Observing System, preparatory phase; ASTARTE - Assessment, Strategy and Risk Reduction for Tsunamis in Europe.

2.6. Publications

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3 – IDL – Instituto Dom Luiz

3.1. Introduction

IDL is an Associated Laboratory of the Portuguese Research System, based at the University of Lisbon but integrating researchers from other Portuguese Universities and research institutions. Established in 1853 as the Portuguese pioneer research institution in Meteorology and Geophysics, IDL has evolved into an integrative Earth System research institute, with a mission that is currently defined around the three strategic lines:

- 1) Climate change at the eastern Atlantic boundary, from coupled atmosphere-ocean processes to multiscale variability and extremes;
- 2) Coupled deep Earth and surface processes and their implications for georesources and natural hazards management, with the Iberian-Atlantic region as a prime natural laboratory;

3) Secure and sustainable energy in the 21st century energy transition, incorporating a solid geoscience know-how base into energy strategies and technologies.

IDL is organized in research groups, coordinated by a steering committee, supervised by an international Advisory Committee. IDL research facilities includes state-of-the-art computing, analytical labs and field equipment. At its UL base IDL researchers closely interact with more than 1000 undergraduate students in Earth Science degrees and Energy and Environment.

RG5: Earthquakes, Volcanism and Lithospheric Processes

Research Group 5 (RG5), “Earthquakes, Volcanism and Lithospheric Processes”, results mainly from the merging of two previous IDL groups: “Seismology and Earth Tomography” and “Seismic and Volcanic Hazards”. The first, composed of seismologists, dedicated to imaging the Earth’s inner structure and to understanding Earth’s deep processes. The latter included geologists, volcanologists and seismologists working towards the assessment of earthquake and volcanic hazards. Together, the two groups focused on active tectonic and volcanic processes, mainly based on the natural laboratories of the Iberian-Atlantic and African regions, contributing to improve our knowledge of the Earth’s inner mechanisms and to assess natural hazards.

RG5 operates a number of research infrastructures (RIs). In seismology, IDL runs a network of 4 seismic stations in Portugal, which continuously stream data to national and international data servers (IPMA, IRIS, ORFEUS, <http://idl.ul.pt/node/47>). IDL also led the most important seismic experiment in Portugal of the last decades, densely covering the mainland territory with broadband stations for a period of two years (2010-2012). This experiment was carried out in coordination with the twin project Topolberia, in Spain. IDL continued to develop and maintain its GIS seismotectonics database, whose information was included in the Quaternary Active Faults Database of Iberia (QAFI) (<http://www.igme.es/infoigme/aplicaciones/qafi/>) and used to update the seismic hazard map of Europe (<http://www.share-eu.org>). RG5 is deeply involved with the European Plate Observing System (EPOS, <http://www.epos-eu.org>), the integrated solid Earth sciences research infrastructure included in the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap (http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-roadmap). RG5 members head the national effort to include the Portuguese counterpart of EPOS on the national roadmap, an effort to guarantee long-term sustained funding for its laboratories, field equipment and digital infrastructures.

3.2 Publications

3.2.1 Books/book chapters

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3.2.3 Other papers

Oliveira C.S., E. Coelho, A. Costa, P. Teves-Costa, M. Lopes, R.C. Gomes e R. Bairrão (2013). A Segurança sísmica na reabilitação de edifícios. *Técnica, Revista de Engenharia* 01, 28-33, AEIST (2013)

3.3 Advanced training

3.3.1 PhDs

Iolanda Maria André Cerdeira de Abreu Morais, "Structure of the Crust and Mantle Beneath Iberia and Western Mediterranean from P and S Receiver Functions and SKS Waveforms", *Doutoramento em Ciências Geofísicas e da Geoinformação (Especialidade em Geofísica)*, FCUL, 2012.

Liliana João Pereira de Matos Maia (2012), *Cenários sísmicos em Ponta Delgada*, *Doutoramento em Ciências Geofísicas e da Geoinformação – Especialidade em Geofísica*, Universidade de Lisboa.

Carlos Corela, "Ocean Bottom seismic noise: applications for the crust knowledge, interaction ocean-atmosphere and instrumental behavior" June 2014.

3.4 National and International projects

3.4.1 Coordination

WILAS, Estrutura da litosfera e astenosfera sob a Península Ibérica Ocidental, funded by FCT, PTDC/CTE-GIX/097946/2008, 2010-2013

CV-PLUME, An Investigation on the Geometry and Deep Signature of the Cape Verde Mantle Plume, funded by FCT, PTDC/CTE-GIN/64330/2006, FCT, 2007-2011

Cooperation FCT/DAAD, 2010-2011

INSPIRE - Estudo Instrumental dos Terramotos Portugueses 1900-1960, funded by FCT, PTDC/CTE-GIX/122262/2010, 2012-2014

Zonagem Sísmica das formações superficiais e avaliação da Perigosidade Sísmica no Concelho de Cascais, Câmara Municipal de Cascais, 2011-2013

3.4.2 Participation

AQUAREL - Accurate QUAntification of Regional Earthquakes and Earth structure: application to Western Iberia, funded by FCT, PTDC/CTE-GIX/116819/2010, 2012-2015

CGL2008-03463. MCI, Spain. 2009-11.

Contribution to NERIES Archive of Historical Earthquake Data, Cooperation INGV-MI/UL-IDL, 2010-2012.

Estructura en alta resolución de la corteza y manto superior del Sureste de España. Caracterización sísmica (incluidos terremotos lentos) de la zona de cizalla Béticas-Alborán. Dirección General de Investigación (DGI)/MEyC. Project no. CGL2008-01830, 2008-2011

FINDER (PTDC/CTE-GIX/113866/2009), FCT, 2010-13.

FREEROCK (PTDC/CTE-GIX/100687/2008), FCT, 2009-12.

GeoSIS-Lx (PTDC/ECM/64167/2006), FCT, 2007-11.

LISBOA-02-3207-FEDER-000044, Programa QREN-PORL, 2010-11.

NEAREST - Integrated Observations from Near Shore Sources of Tsunamis: Towards an Early Warning System, EU- Contract GOCE 037110, 2008-2011.

NEFITAG, Movimento sísmicos intensos e efeitos locais na Região do Vale Inferior do Tejo, PTDC/CTE-GIX/102245/2008, FCT, 2010-13.

NERA – Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation, EU Grant agreement no.: 262330, 2011-2014

PALEOSISPOR (PTDC/CTE-GIN/66283/2006), FCT, 2009-11,

PLUME (PTDC/CTE-GIN/64330/2006), FCT, 2007-11.

Scientific and Technological Cooperation FCT/CSIC, Proc 441.00 CSIC, 2010-2011.

SHA-AZORES, Seismic hazard assessment in the Azores through neotectonics and paleoseismology studies, funded by FCT, PTDC/CTE-GIX/108637/2008, 2010-2012.

SiGMA - Caracterização da acção sísmica no Arquipélago dos Açores, funded by FCT, PTDC/CTE-GIX/121957/2010, 2012-2015

TopoMed, Plate re-organization in the western Mediterranean: lithospheric causes and topographic consequences, Topo-Europe EUROCORES Program (ESF/FCT), 2008-2012.

3.5 Outreach

3.5.1. Publications

Batlló J (2013) Los viajes de la Física, *Mètode*, num. 79, 66-73, DOI:7203/metode.79.2638.

Miranda P, Batlló J (2013) A herança do IDL, *Info-Ciências Digital*, 31 October, <https://www.fc.ul.pt/pt/noticia/31-10-2013/heran%C3%A7a-do-idl>.

Oliveira CS, Coelho E, Costa A, Teves-Costa P, Lopes M, Gomes RC, Bairrão R (2013) A Segurança sísmica na reabilitação de edifícios, *Técnica, Revista de Engenharia* 01, 28-33, AEIST.

3.5.2. Projects and activities

Coordination of the national “Seismology at Schools” project and promoted its networking in Europe within the scope of FP7 project NERA (<http://www.nera-eu.org/>)

Presentation of regular talks at schools and museums

Consultants to the civil protection agents as regards the mitigation of seismic risk and risk education.

“Science in summer” dedicated to Seismology, 2013 and 2014.

“Young scientist at the university”, 2014.

The Scientists night, 2014.

3.6 Conference organization

1st International Workshop on Volcano Geology, IAVCEI, Madeira, Portugal, July 7-11, 2014 – organizer, A. B. Silveira.

APMG2011 - 7º Simpósio de Meteorologia e Geofísica da APMG, Setúbal, 28-30 Mars 2011.

Cultural Help 2014 – Cultural Heritage and Loss Prevention. Porto, 6 – 7 October 2014 - Member of the Scientific & Technical Committee, P. Teves-Costa.

Iberfault 2014 - Second Iberian Meeting on Active Faults and Paleoseismology, Lorca (Murcia, Spain; October 22th to 24th). Member of the Organizing and of the Scientific Committies, J. Cabral.

IX Congresso Nacional de Geologia (IX CNG)/2º Congresso de Geologia dos Países de Língua Portuguesa (2º CoGePLiP), 18 a 24 de Julho de 2014, Faculdade de Ciências da Universidade do Porto. Member of the Scientific Committee, J. Cabral.

JPEE2014 – 5as Jornadas Portuguesas de Engenharia de Estruturas & Encontro Nacional de Betão Armado & 9º Congresso Nacional de Sismologia e Engenharia Sísmica. Lisboa (LNEC), 26-28 Novembro 2014 – Members of the Scientific Committee, P. Teves-Costa, L. Matias.

ORFEUS Observatory Coordination Workshop (<http://orfeus-lisbon.ist.utl.pt/>), Lisbon, 25-28 May 2011, G. Silveira, NA Dias, Local Organizing Committee.

VIII Assembleia Luso-Espanhola de Geodesia e Geofísica, Évora, Portugal, 2014. Members of the Scientific Committee, Susana Custodio, Luis Matias, J. Catalão.

XIX Jornades de Meteorología Eduard Fontserè. Barcelona, Spain, 22-24 November 2013, Member of the Organizing Committee, J. Battlo.

4 – CGE - Geophysics Centre of Évora

4.1 Introduction

From 2011 to 2014 the Centro de Geofísica de Évora (CGE) da Universidade de Évora, funded by the FCT, was organized in two main Groups (Projects): FIDAC (Physics and Dynamics of the Atmosphere and Climate), enclosing two Sub-Groups: the Atmospheric Physics and Climate and the Transfer Phenomena in the Geosphere Sub-Groups and SEISMOLITOS (Seismotectonics and processes of lithospheric deformation), attached to the Internal Geophysics and Seismology and to the Dynamics of Geological Processes Sub-Groups. Each of the four Sub-Groups has a scientific coordinator which is elected by the members of the Sub-Group.

At the end of 2011 an internal reorganization was carried out and the two main Groups - FIDAC and SEISMOLITOS' s evolved to a broader approach with respect to its research activities, thus turning out in the Atmosphere and Hydrosphere and Solid Earth Research Lines, respectively. By doing this reorganization the CGE team intends to focus the scientific activities of the Research Lines on the study of the objects of study, in this case the atmosphere and the hydrosphere or the earth, instead of focusing on the different disciplines, such as physics, climatology, meteorology, ecology geophysics, geology or any other, as before.

The first Research Line (Atmosphere and Hydrosphere) comprises three activity centres (Sub-Groups): the Meteorology & Climate (M&C), the Water & Environment & Surface Processes (W&E&SP) and the Energy & Flow Structures (E&FS) Sub-Groups aiming at having a more complete picture of the two Sub-systems of the Climate System (Atmosphere and Hydrosphere), their interactions and their implications in the future of the planet; the second Research Line (Solid Earth) attach three activity centres (Sub-Groups): the Active Tectonics & Risks, the Lithosphere, Mantle & Geological Resources and the Heritage & Archeometry Sub-Groups aiming at having a more complete picture of the Earth's surface and interior and a more understanding of its dynamics.

4.2 Publications in Journals (Reverse Order of Year)

Custódio, S.; Dias, N.; Caldeira, B.; Carrilho, F.; Carvalho, S.; Corela, C.; Díaz, J.; Narciso, J.; Madureira, G.; Matias, L.; Haberland, C., 2014. "Ambient Noise Recorded by a Dense Broadband Seismic Deployment in Western Iberia", Bull. Seism. Soc. Am., 24p, doi: 10.1785/0120140079.

Oliveira, R. J.; Casação, J.; Caldeira, B.; Borges, J. F., 2014. Identificação de deformações em sedimentos finos não consolidados com recurso a georadar (Vale Inferior do Tejo), Geonovas 27, 3-7. ISSN 0870-7375.

Casação, J.; Oliveira, R. J.; Caldeira, B.; Borges, J. F., Carvalho, J., 2014. Prospecção geofísica aplicada à detecção de falhas activas – a falha de Vila Franca de Xira), Geonovas no 27, 7-11. ISSN 0870-7375.

Neves, S., Borges, J. F.; Caldeira, B., 2014. Comparação de fontes sísmicas através de ensaios de refração sísmica e multichannel analysis of surface waves (MASW), Geonovas no 27, 13-20. ISSN 0870-7375.

Neves S., J. F. Borges, J. Casação, B. Caldeira, M. Bezzeghoud, 2014. Velocity model estimated from seismic refraction survey and MASW, at Flamengos site (Faial island Azores). Comunicações Geológicas, 101, Especial I, 365-370, ISBN 978-989-746-061-6

Fontiela J., M. Bezzeghoud, P. Rosset, J.F. Borges, F. Cota Rodrigues, 2014. Azores seismogenic zones, 2014. Velocity model estimated from seismic refraction survey and MASW, at Flamengos site (Faial Island – Azores). Comunicações Geológicas, 101, Especial I, 351-354, ISBN 978-989-746-061-6.

Santos R., B. Caldeira, M. Bezzeghoud, J. F. Borges, 2014. Rupture study of the 2006 Mozambique Earthquake (Mw 7.0) inferred from seismic and SAR data, Comunicações Geológicas, 101, Especial I, 375-379, ISBN 978-989-746-061-6

Le Goff B., J.F. Borges and M. Bezzeghoud, 2014. Intensity-Distance attenuation laws for the Portugal mainland using intensity data points, *Geophysical Journal International*, 199, 2, 1278–1285, <http://dx.doi.org/10.1093/gji/ggu317>

Vilanova Susana P., Eliza S. Nemser, Glenda M. Besana-Ostman, M. Bezzeghoud, José F. Borges, António Brum da Silveira, João Cabral, João Carvalho, Pedro P. Cunha, Ruben P. Dias, José Madeira, Fernando C. Lopes, Carlos S. Oliveira, Hector Perea, Julián García-Mayordomo, Ivan Wong, Ronald Arvidsson, and Joao F. B. D. Fonseca, 2014. Incorporating Descriptive Metadata into Seismic Source Zone Models for Seismic Hazard Assessment: A case study of the Azores-West Iberian region. *Bul. Soc. Seism. America*, 104, 3, pp. 1212–1229, June 2014, <http://dx.doi.org/10.1785/0120130210>

Bezzeghoud., M., C. Adam, E. Buforn, J. F. Borges, B. Caldeira, 2014. Seismicity along the Azores-Gibraltar region and global plate kinematics, *J. Seismol*, 18, 205–220, <http://dx.doi.org/10.1007/s10950-013-9416-x>

Santos R., B. Caldeira, M. Bezzeghoud, J.F. Borges, 2014. The Rupture Process and Location of the 2003 Zemmouri–Boumerdes Earthquake (Mw 6.8) Inferred from Seismic and Geodetic Data. *Pure Appl. Geophys.* published on line, 23 Nov. 2014, <http://dx.doi.org/10.1007/s00024-014-0978-5>

Pro. C., M. Bezzeghoud, E. Buforn, A. Udias, 2014. Reply to Comment on “The earthquakes of 29 July 2003, 12 February 2007, and 17 December 2009 in the region of Cape Saint Vincent (SW Iberia) and their relation with the 1755 Lisbon earthquake” by C. Pro, E. Buforn, M. Bezzeghoud and A. Udías. *Tectonophysics* 628, 246–247, <http://dx.doi.org/10.1016/j.tecto.2014.05.016>

Carvalho, João, Taha Rabehb, Rui Dias, Ruben Dias, Carlos Pinto, Tomás Oliveira, Teresa Cunha, J. F. Borges, 2014. Tectonic and neotectonic implications of a new basement map of the Lower Tagus Valley, Portugal. *Tectonophysics* 617 (2014) 88–100

Pereira N., J. F. Carneiro, A. Araújo, M. Bezzeghoud, J. Borges, 2013. Seismic and structural geology constraints to the selection of CO2 storage sites - the case of the onshore Lusitanian basin, Portugal, *Jour. Of Applied Geophysics*, 102, 21-38, doi:10.1016/j.jappgeo.2013.12.001

Areias P., A. Pinto da Costa, T. Rabczuk, FJM Queirós de Melo, D. Dias-da-Costa, M. Bezzeghoud, 2013. An alternative formulation for quasi-static frictional and cohesive contact problems, *Computational Mechanics*, 54, 4, 807-824, <http://link.springer.com/article/10.1007/s00466-013-0932-x>

Mourabit T. Abou Elenean K. M., Ayadi A., Benouar D., Ben Suleman A., M. Bezzeghoud, Cheddadi A., Chourak M., ElGabry M. N., Harbi A., Hfaiedh M., Hussein H. M., Kacem J., Ksentini A., Jabour N., Magrin A., Maouche S., Meghraoui M., Ousadou F., Panza G.F., Peresan A., Romdhane N., Vaccari F. and Zuccolo E., 2013. Neo-Deterministic Seismic Hazard Assessment in North-Africa, *Journal of Seismology*, 18, 2, 301-318, DOI 10.1007/s10950-013-9375-2

Silva H.G., M. Bezzeghoud, M.M. Oliveira, A.H. Reis, and R.N. Rosa, 2013. A simple statistical procedure for the analysis of radon anomalies associated with seismic activity. *Annals of Geophysics*, 56, 1, R0106, ISSN 2037-416X. <http://www.annalsofgeophysics.eu/index.php/annals/article/view/5570>. doi:10.4401/ag-5570.

Pro C., E. Buforn, A. Udías, M. Bezzeghoud (2013). Sismicidad y Sismotectónica del SW de Iberia. *Mapping*, 22, 160, 38-46.

Pro C, Buforn E., M. Bezzeghoud, Udias A., 2013. The earthquakes of 29 July 2003, 12 February 2007, and 17 December 2009 in the region of Cape Saint Vincent (SW Iberia) and their relation with the 1755 Lisbon earthquake. *Tectonophysics*, 583, 16-27, <http://dx.doi.org/10.1016/j.tecto.2012.10.010>

Areias P., H.G. Silva, N. Van Goethem, M. Bezzeghoud, 2012. Damage based fracture with electro-magnetic coupling. *Computational Mechanics*, 51, 5, 629-640, <http://dx.doi.org/10.1007/s00466-012-0742-6>

Biagi P.F., F. Righetti, T. Maggipinto, L. Schiavulli, T. Ligonzo, A. Ermini, I.A. Moldovan, A.S. Moldovan, H.G. Silva, M. Bezzeghoud, M.E. Contadakis, D.N. Arabelos, T.D. Xenos, and A. Buyuksarac, 2012. Anomalies observed in VLF and LF radio signals on the occasion of the

western Turkey earthquake (Mw5.7) at May 19, 2011, *International Journal of Geosciences*, 3, 856-865, doi:10.4236/ijg.2012.324086

Caldeira B., Silva H.G., J.F. Borges, M. Tlemçani, and M. Bezzeghoud, 2012. Chaotic behavior of seismic mechanisms: experiment and observation. *Annals of Geophysics*, 55, 1, 57-62, <http://dx.doi.org/10.4401/ag-5359>

Silva H.G., M.M. Oliveira, C. Serrano, M. Bezzeghoud, A.H. Reis, R.N. Rosa, and P.F. Biagi, 2012. Influence of seismic activity on the atmospheric electric field in Lisbon (Portugal) from 1955 to 1991. *Annals of Geophysics*, 55, 1, 193-197

Lourenço V., B. Caldeira, J.P. Rocha, M. Bezzeghoud, J.F. Borges, 2011. Aplicação do Radar de Penetração nos Solos (GPR) na detecção de estruturas no âmbito nas Ciências Forenses. *Gazeta da Física*, ISSN 0396-3561, 34, 3-4, 813

Bezzeghoud M., 2011. Hadj Benhallou 19372011. *Journal of Seismology*. 16, 3, DOI 10.1007/s10950011-9265-4

Bezzeghoud M., J.F. Borges and B. Caldeira, 2011. Ground Motion Simulations of the SW Iberia Margin: Rupture Directivity and Earth Structure Effects. *Natural Hazard*, 69, 2, 1229-1245, DOI 10.1007/s11069-011-9925-2

Silva H. G., M. Bezzeghoud, A. H. Reis, R. N. Rosa, M. Tlemçani, A. A. Araújo, C. Serrano, J. F. Borges, B. Caldeira, and P. F. Biagi, 2011. Atmospheric electrical field decrease during the M4.1 Sousel earthquake (Portugal). *Nat. Hazards Earth Syst. Sci.*, 11, 987–991

Silva, H. G., Bezzeghoud, M., Rocha, J. P., Biagi, P. F., Tlemçani, M., Rosa, R. N., Salgueiro da Silva, M. A., Borges, J. F., Caldeira, B., Reis, A. H., and Manso, M., 2011. Seismoelectromagnetic phenomena in the western part of the EurasiaNubia plate boundary, *Nat. Hazards Earth Syst. Sci.*, 11, 241248

4.3 Books & Book Chapters (Reverse Order of Year)

Bezzeghoud M., J.F. Borges, B. Caldeira, 2013. Sismotectónica ao longo da fronteira de placas tectónicas Núbia e Euro- asiática. In *Geodinâmica e Tectónica global; a Importância da Cartografia Geológica Livro de actas da 9a Conferência Anual do GGET-SGP*, Eds. N. Moreira, R. Dias, A. Araújo, 63-66, ISBN: 978-989-95398-3-9

Le Goff B., M. Bezzeghoud, J.F. Borges, D. Fitzenz, 2013. Optimal representation of our knowledge about seismic sources for PSHA in low deformation areas. *Workshop em Ciências da Terra e do Espaço*, Livro de actas. Ed. M. Bezzeghoud, Universidade de Évora. Fev. 2013, 59-68, ISBN: 978-989-98196-2-7

Santos R., Caldeira B., J.F. Borges, M. Bezzeghoud, 2013. Estudo da fonte do sismo do Haiti de 12 de janeiro de 2010 a partir de combinação de dados sísmicos e geodésicos. *Workshop em Ciências da Terra e do Espaço*, Livro de actas. Ed. M. Bezzeghoud, Universidade de Évora. Fev. 2013, 69-84, ISBN: 978-989-98196-2-7

Bezzeghoud M., 2012. Viagem ao Interior da Terra. In “Two decades of earth science research”, A. M. Silva, A. A. Araújo, A. H. Reis, M. Morais, M. Bezzeghoud (eds), Universidade de Évora, Nov. 2012, ISBN: 978-972-592-364-1, p. 41-61.

Borges J. F., M. Bezzeghoud, B. Caldeira, 2012. Seismicity of Azores and Geodynamic implications. In “Two decades of earth science research”, A. M. Silva, A. A. Araújo, A. H. Reis, M. Morais, M. Bezzeghoud (eds), Universidade de Évora, Nov. 2012, ISBN: 978-972-592-364-1, p. 79-92.

Silva H., M. Bezzeghoud, 2012. Physics of Seismo-Electromagnetic Phenomena: Twenty Years After. In “Two decades of earth science research”, A. M. Silva, A. A. Araújo, A. H. Reis, M. Morais, M. Bezzeghoud (eds), Universidade de Évora, Nov. 2012, ISBN: 978-972-592-364-1, p. 69-77.

Bezzeghoud M., J.F. Borges e B. Caldeira, 2012. Fontes sísmicas ao longo da fronteira de placas tectónicas entre os Açores e a Argélia: um modelo sismotectónico. In: R. Dias, A. Araújo, P. Terrinha, J.C. Kullberg (Eds), *Geologia de Portugal*, Escolar Editora, vol. 2, 747-790, ISBN: 978-972-592-364-1, p. 747-790.

4.4 Other Publications

Pro C., E. Buforn, A. Udias, M. Bezzeghoud, 2012. Sismicidad y Sismotectonica del SW de Iberia. X Congreso TOPCART 2012 – I Congreso Iberoamericano de Geomática y C.C. de la Tierra, Universidad Tecnológica Metropolitana, Madrid, 2012. 6 p.

Buforn E. M. Carranza, A. Udias, J. Martín Dávila, A. Pazos, X. Goula, Y. Colom, A. Roca, A. Zollo, L. Lozano, C. Prod. F. Carrilho, W. Hanka, R. Madariaga, M. Bezzeghoud, M. Harnafi, 2012. The ALERTS-ES Project: an Earthquake Early Warning System for S. Iberia. 15th World Congress in Earthquake Engineering, Lisbon, Sep. 2012, 9 p.

Rocha J.P., Bezzeghoud M, Caldeira B., Borges J.F., Dias N., Matias L., Araújo A., 2012. Microseismicity in the Algarve region (southern Portugal) and its seismotectonic implications. 7o Simposio de Meteorologia e Geofísica da APMG, Previsão e modelação em Ciências Geofísicas. ISBN: 978-989-95660-0-2, 63-67.

Caldeira B., Bushenkov V., Borges J.F., Smirnov. G., Bezzeghoud M., 2012. On the determination of space-time slip distribution with a regularized constraints inversion algorithm. 7o Simposio de Meteorologia e Geofísica da APMG, Previsão e modelação em Ciências Geofísicas. ISBN: 978-989-95660-0-2, 52-57.

Bezzeghoud M., J.F. Borges, B. Caldeira, J.P. Rocha, 2009. Sismos e Tsunamis: o caso de Sumatra. Regi, Planeamento e Desenvolvimento Regional, EIM. http://www.alentejolitoral.pt/PortalAmbiente/RiscosAmbientais/Riscos%20sismicos/Paginas/Arde_sismicadoCentrodeGeofisicadeEvora.aspx

Bezzeghoud M., J.F. Borges e H. Silva, 2011. Os super-enxames (superswarms) e o sismo de Tohoku de 9 de Março de 2011(Japão). MALEO, Sociedade Portuguesa de Portugal, Junho 2011, 2 (n.s.), 2-7. http://www.socgeol.org/documents/type_8/MALEO_2__ns_.pdf

4.5 Conferences: Scientific or/and Organizing Committee (Member, Convener, Chairperson)

4.5.1 International

2014 April-May: Session convener “Large earthquake and tsunami activity”, European Geosciences Union (EGU) General Assembly, Vienna, Austria, 27 April-02 May 2014

2014 April-May: Session convener “Earthquake ground-motion - Source and path effects”, European Geosciences Union (EGU) General Assembly, Vienna, Austria, 27 April-02 May 2014

2014 February: Scientific Committee - Workshop on "Earthquake Early Warning System: Applications to the Ibero-Maghrerbian region. University Complutense of Madrid, Spain, 4-5 February 2014.

2014 January: Organizing and Scientific Committee - 8ª Assembleia Luso-Espanhola de Geodesia e Geofísica. University of Évora, Portugal, 29-31 January 2014

2013 June: Scientific Committee - International Symposium - Earthquakes & Tsunami Hazard. Algerian Network for Marine Sciences and Coastal Hazard and Risk Group. Algiers, Algeria, 08-09 June 2013

2013 May: Scientific Committee - International Symposium – The large Mediterranean earthquakes: from past to present. CRAAG, Algiers, Algeria, 21-23 May 2013

2013 April: Session convener “Large earthquake and tsunami activity”, European Geosciences Union (EGU) General Assembly, Vienna, Austria, 07-12 April 2013

2013 April: Session convener “Earthquake ground-motion - Source and path effects”, European Geosciences Union (EGU) General Assembly, Vienna, Austria, 07-12 April 2013

2012 September: Scientific Committee of the 15th World Conference on Earthquake Engineering, Lisbon.

2012 April: Session convener “Large earthquake and tsunami activity”, European Geosciences Union (EGU) General Assembly, Vienna, Austria, 22-27/04/ 2012

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2011 April: Convener of session SM2.1/GD2.12/TS8.6 “New developments and Results on Seismotectonics” EGU 2011 European Geosciences Union General Assembly, Vienna, Austria, 0408 April 2011

2011 April: Convener of session SM1.8/G3.7/GD1.10/NH4.9/TS8.4 “Recent Large Earthquake and Tsunami Activity” EGU 2011 European Geosciences Union General Assembly, Vienna, Austria, 04-08 April 2011

2011 July: Organizing Committee - Global of the Conference on Global Warming-2011 (GCGW2011), at FCG, Lisbon, 11-14 de July 2011

2011 April: Chairperson EGU 2011 - Vienna, Austria, April 2011.

2011 May: Invited conference and Chairperson –Workshop Global Earthquake Model (GEM) North Africa, Rabat (Morocco)

4.5.2 National

2014 July: Scientific Committee - IX Nacional Congress of Geology – Univ. Porto, 18-24 July 2014.

2014 November: Scientific Committee – 5th Portuguese Conference on Structural Engineering (JPPE) and 9th National Congress of Seismology and Earthquake Engineering, LNEG, Lisbon, 25-28 November 2014

2012 November: Organizing Committee - Workshop Celebrações dos 20 anos do Centro de Geofísica de Évora – Universidade de Évora (23 November 2012)

2011 March: Scientific Committee of 6^o Symposium of Meteorology and Geophysics, APMG and the 12.^o Meeting Luso-Espanhol de Meteorologia, Setúbal, Portugal

2011 March: Chairperson, 7^o Symposia APMG, Setubal, Portugal

4.6 Projects

LTV-SourceMod4PSHA: Construction of a seismic source model for the Lower Tagus Valley to use in future probabilistic seismic hazard assessment, FCT, PTDC/CTE-GIX/101852/2008

SIRAS - Sistema de Informação de uma Rede Adaptativa e Autoconfigurável de Sensores. Funded by QREN N.º 5497, 22/SI/2008 (co-promotor)

MEDYNA - Maghreb-EU research staff exchange on geodynamics, geohazards, and applied geology in North-West Africa, Marie Curie, FP7-People, PIREG-GA-2013-612572, 2014-2017

Electric and acoustic coupling in rocks during mechanical action, PTDC/GEO-FIQ/4178/2012, Fundação para a Ciência e Tecnologia (FCT) – Ministério para a Ciência, Tecnologia e do Ensino Superior (Portugal), 2012.

QuakeLoc-PT - Precise earthquake locations in mainland Portugal and adjacent offshore, PTDC/GEO-FIQ/3522/2012, Fundação para a Ciência e Tecnologia (FCT) – Ministério para a Ciência, Tecnologia e do Ensino Superior (Portugal), 2012.

SiGMA - Strong ground motion for Azores, PTDC/CTEGIX/121957/2010. Fundação para a Ciência e Tecnologia (FCT) – Ministério para a Ciência, Tecnologia e do Ensino Superior (Portugal), 2010.

LCTTAE - Laboratório de Ciência e Tecnologias da Terra, Atmosfera e Energia, QREN, ALENT-15-2011-01 – Eixo 1 - Competitividade, Inovação e Conhecimento “Sistema de Apoio a Infra-estruturas Científicas e Tecnológicas, Ctr. Nr. ALENT-07-0262-FEDER-001876, 2013-2014.

APOLO - Archaeological and Physical On-site Laboratory – Lifting Outputs. IMAGOS Programme -Innovative Methodologies in Archaeology, Archaeometry and Geophysics – Optimizing Strategies, QREN, 2013-2014.

FREEROCK - FRacture Evolution and Solid-Fluid Interaction in Igneous Rocks at Atlantic Volcanic Edifices, PTDC/CTEGIX/100687/2008, Fundação para a Ciência e Tecnologia (FCT) – Ministério para a Ciência, Tecnologia e do Ensino Superior (Portugal), 2008.

ALERT-ES - Sistema de Alerta Sísmica Temprana: Aplicación al Sur de España. U. Complutense de Madrid, Real Instituto y Observatorio de la Armada (INSOB), Instituto Geológico de Cataluña (IGC), Centro de Geofísica de Évora/U. Évora, Instituto de Meteorologia (IM, Lisboa). Financiado pelo Ministério de Ciência e Inovação (Spain).

IGCP Project 601, Seismotectonics and seismic hazards in Africa, (2011 - 2014). UNESCO

Géodésie spatiale en méditerranée occidentale: Risque sismique et géodynamique. Projets de Coopération scientifique interuniversitaire (PCSI), Agence Universitaire de la Francophonie. 8 / 40 2010 (Univ. de Évora, Portugal with the following institutions: U. Toulouse-France, UCMadridSpain, CNRST-Rabat-Morocco, U. 7Novembre- Carthage- Tunisia)

EPOS - European Plate Observing System; FP7-INFRA-2010-2.2.2.

NERA - Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation; FP7-INFRA-2010-1.1.27.

4.7 Awards

The CGE was awarded with 12 Integration Research Grants in the areas of atmospheric and solid earth research.

Hugo Silva and the CGE were awarded in 2011 with the Gulbenkian Prize “Research Stimulus” -

Noel Moreira and the CGE were awarded in 2012 with the Gulbenkian Prize “Research Stimulus”

Mourad Bezzeghoud was Elected in 2012 Science Officer for “Earthquake Characteristics and Processes” (Division on Seismology), European Geosciences Union.

4.8 Outreach

Ocupação científica dos jovens nas férias (scientific occupancy for young in holidays: Geophysics and Astronomy), ID2748/ID2723/ID2533. 1) Na companhia de Geofísicos; 2) Campanha de estudos sísmicos na região do Vale Inferior do Tejo; 3) Dos Planetas Extra-Solares ao Planeta Terra: do observatório de Fronteira ao Centro Ciência Viva de Estremoz. Agencia Nacional para a Cultura Científica e Tecnológica, June-July 2012.

Ocupação científica das jovens nas férias (scientific occupancy for young in holidays: Geophysics), ID2532. 1) Digressão na companhia de Geofísicos; 2) Campanha de estudos sísmicos na região do Vale Inferior do Tejo. Agencia Nacional para a Cultura Científica e Tecnológica, July 2011.

5 - CERENA - Centre for Natural Resources and the Environment

5.1 Introduction

CERENA-Centre for Natural Resources and the Environment was created in 2006, from the merging of three experienced research centres and groups of IST that were developing separately their activities in the areas of natural resources and the environment. The motivation to merge these complementary groups was related to the strong affinity in their research domains and to join synergies that lead to relevant improvements in the research conditions and on the increase of their relative performance. In 2013, CERENA decided to focus its strategy on the enlargement of the group in order to become a reference centre in the three main areas of Energy, Raw Materials and Environment.

Hence, CERENA experienced a new expansion that resulted from the affinity and complementary competences of other Centres and groups of researchers, namely: CEPGIST (Centro de Petrologia e Geoquímica, IST/ULisboa), CPQ (Centro de Processos Químicos, IST/ULisboa), IBB (Instituto de Biotecnologia e Bioengenharia, IST/ULisboa) and CIGAR (Centro de Geo-Ambiente e Recursos, FEUP) and also a Seismology Group of ICIST (Instituto de Engenharia de Estruturas, Território e Construção do IST/ULisboa). All these R&D units were closed and this extinction will come into effect from January 2015, with the exception of ICIST.

The IST Seismology Lab has two main lines of activity, Seismic monitoring and Hazard assessment. The lab is a research infrastructure of C4G – Collaboratory for Geosciences, a consortium included in the National Roadmap of Research Infrastructures of Strategic Interest. The lab is listed on RIDE, the research infrastructure database of EPOS – the European Plate Observing System.

The IST Seismology Lab operates a very-broadband seismographic network –NAVIGATORS – and a broadband seismographic network – TAGUSNET, both equipped with real time telemetry.

The aim of the NAVIGATORS network is to improve the seismic coverage of the south-western region of Iberia and the Azores Gibraltar plate boundary. The NAVIGATORS network is composed of four seismic stations, two located in Mainland Portugal, one in South Morocco and one in Madeira Island. The stations are equipped with STS-2 seismometers and Quanterra Q330 data loggers.

The aim of the TAGUSNET Network is to contribute to the real-time monitoring of the Lower Tagus Valley Region, near Lisbon. The TAGUSNET Network is composed of 5 stations, equipped with Guralp CMG-40T sensors and Guralp DM24 data loggers. The data centre of the Seismology Laboratory is equipped with a Dell server (2 Quad-Core Intel Xeon Processors 5400 series) with storage capacity of 146 GB. The power sources include Standard 670 Watt hot-plug power supply and a redundant 670 Watt power supply.

IST Seismology Lab adheres to the principles of free distribution of data in real time advocated by the Federation of Digital Seismographic Networks. The data are transmitted in real-time in the Seismology laboratory and forwarded to the ORFEUS international data centre.

The IST Seismology Lab has led seismic hazard assessment of Portugal through a series of research projects, both national and European. Presently it hosts the Line of Excellence project SEICHE – Seismicity of Plate Interiors and Challenges to Hazard Assessment. Volcanic risk mitigation and volcanic hazard assessment have also been contemplated through research projects at national and European level, and contract work.

5.2 Publications in ISI Journals

Fonseca, J.F.B.D., and Vilanova, S.P. (2011). Comment on Sousa, M.L. and Costa, A. C., "Ground motion scenarios consistent with probabilistic seismic hazard disaggregation analysis. Application to Mainland Portugal. Bull Earthquake Eng." DOI: 10.1007/s10518-011-9279-x.

Fonseca, J.F.B.D., and Vilanova, S.P. (2011). The April 23, 1909 Benavente (Portugal) M6.3 Earthquake. Seismol. Res. Lett., 81, 534-536.

Vilanova, S.P., Fonseca, J.F.D.B., and Oliveira, C.S. (2012). Ground-Motion Models for Seismic-Hazard Assessment in Western Iberia: Constraints from Instrumental Data and Intensity Observations. Bulletin of the Seismological Society of America, 112, 1, 169-184.

Bensana-Ostman, G., Vilanova, S.P., Nemser, E.S., Falcao-Flor, A., Heleno, S. Ferreira, H., and Fonseca, J.F.D.B. (2012). Large Holocene Earthquakes in the Lower Tagus Valley Fault Zone, Central Portugal. Seismological Research Letters, 83, 1, 67-76.

M. Stucchi, A. Rovida, A.A. Gomez Capera, P. Alexandre, T. Camelbeeck, M.B. Demircioglu, V. Kouskouna, P. Gasperini, R.M.W. Musson, M. Radulian, K. Sesetyan, S.P. Vilanova, D. Baumont, D. Faeh, W. Lenhardt, J.M. Martinez Solares O. Scotti, M. Zivcic, P. Albin, J. Batllo, C. Papaioannou, R. Tatevossian, M. Locati, C. Meletti, D. Viganò and D. Giardini. The SHARE European Earthquake Catalogue (SHEEC) 1000-1899. Journal of Seismology, doi:10.1007/s10950-012-9335-2.

Faria, B. and Fonseca, J.F.B.D., (2013). Investigating volcanic hazard in Cape Verde Islands through geophysical monitoring: network description and first results, Nat. Hazards Earth Syst. Sci., 1, 4997-5032

Fonseca, J.F.B.D., B. V. E. Faria, J. Trindade, G. Cruz, A. Chambel, F. M. Silva, R. L. Pereira, and T. Vazao (2013). "Last mile" challenges to in situ volcanic data transmission, Nat. Hazards Earth Syst. Sci., 1, 4037-4062

Fonseca, J.F.B.D., J. Chamussa, A. Domingues, G. Helffrich, E. Antunesa, G. van Aswegen, L. V. Pinto, S. Custodio e V. J. Manhica(2013). MOZART: A Seismological Investigation of the East African Rift in Central Mozambique, *Seismological Research Letters*, 85 no. 1 p. 108-111

5.3 Database Publication

Basili R., Kastelic V., Demircioglu M. B., Garcia Moreno D., Nemser E. S., Petricca P., Sboras S. P., Besana-Ostman G. M., Cabral J., Camelbeeck T., Caputo R., Danciu L., Domac H., Fonseca J., García-Mayordomo J., Giardini D., Glavatovic B., Gulen L., Ince Y., Pavlides S., Sesetyan K., Tarabusi G., Tiberti M. M., Utkucu M., Valensise G., Vanneste K., Vilanova S., Wössner J. (2013). The European Database of Seismogenic Faults (EDSF) compiled in the framework of the Project SHARE. <http://diss.rm.ingv.it/share-edsf/>, doi: 10.6092/INGV.IT-SHARE-EDSF.

D. Giardini, J. Woessner, L. Danciu, G. Valensise, G. Grünthal, F. Cotton, S. Akkar, R. Basili, M. Stucchi, A. Rovida, D. Stromeyer, R. Arvidsson, F. Meletti, R. Musson, R., K. Sesetyan, M. B. Demircioglu, H. Crowley, R. Pinho, K. Pitilakis, J. Douglas, J. Fonseca, M. Erdik, A. Campos-Costa, B. Glavatovic, K. Makropoulos, C. Lindholm, T. Cameelbeeck, Seismic Hazard Harmonization in Europe (SHARE): Online Data Resource, doi: 10.12686/SED-00000001-SHARE, 2013.

5.4 Conference Organization

15th World Conference on Earthquake Engineering, Lisbon, Portugal, 2012. Local advisory committee.

Lisbon in Motion, September 20-23, 2012, Lisboa, Portugal (Organizing Commission)

5.5 Research Projects

5.5.1 Coordination

SCENE: Site Condition Evaluation for National Seismic Hazard Estimation, funding by FCT, PTDC/CTE-GIX/103032/2008, 2010 – 2013

SEICHE (SEismicity of plate Interiors - Challenges for Hazard Evaluation), funded by FCT, 2012-2015.

MOZART, Mozambique Rift Tomography, funded by FCT, PTDC/CTE-GIX/103249/2008, 2010-2014.

5.5.2 Participation

FINDER, Fault INvestigation with LiDAR for Earthquake Reassessment”, funded by FCT, 2011-2014.

WILAS – West Iberia Lithosphere and Asthenosphere Structure, funding by FCT, PTDC/CTE-GIX/097946/2008, 2010 – 2013

SHARE, Seismic Hazard Harmonization for Europe, funded by EU, 2011-2014.

EPOS - European Plate Observing System, funding by EU, FP7-INFRA-2010-2.2.2.

NERA - Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation, funding by EU, FP7-INFRA-2010-1.1.27., 2012-2015

6 – CGUC Geophysics Centre of Coimbra University

6.1 Introduction

During this period GCUC established (in cooperation) a new continuously recording seismic station (PCAL) and upgraded the Coimbra station (COI) that is of its own responsibility. Both stations have the data transmitted in real time to IPMA (the Portuguese institution responsible for seismic monitoring) and also to ORFEUS and IRIS at the International level. GCUC has been also an active partner on the EPOS European initiative.

The Coimbra station is also one of the oldest that has been operating in Portugal. The paper recordings are being digitalized and will be soon available to the whole scientific community. Also the old instruments were recovered and are now at display at the GCUC facilities in Coimbra.

6.2 Publications in ISI Journals

Domingues, A. L. N. A. S., S. Custódio, and S. Cesca (2012), Waveform inversion of small to moderate earthquakes located offshore southwest Iberia. *Geophysics Journal International*.

Twardzik, C., R. Madariaga, S. Das and S. Custódio (2012). Kinematic inversion of the Mw 6.0 28th September 2004 Parkfield, California, earthquake based on elliptical sub-fault approximation. *Geophysics Journal International*.

Custódio, S., J. Battló, D. Martins, F. Antunes, J. Narciso, S. Carvalho, V. Lima, F. Lopes, P. Ribeiro, R. Sleeman, E. I. Alves and C. R. Gomes (2012). Station COI: Undusting an old seismic station. *Seismological Research Letters*.

Zahradník, J. and S. Custódio (2012), Moment tensor resolvability: Application to southwest Iberia. *Bulletin of the Seismological Society of America*.

Custódio, S., S. Cesca and S. Heimann (2012). Fast Kinematic Waveform Inversion and Robustness Analysis: Application to the 2007 Mw 5.9 Horseshoe Abyssal Plain, offshore SW Iberia, Earthquake, *Bulletin of the Seismological Society of America*, 102 (1), doi:10.1785/0120110125.

6.3 Conference Organization

15th World Conference on Earthquake Engineering, Lisbon, Portugal, 2012. Local advisory committee.

VII Assembleia Luso-Espanhola de Geodesia e Geofísica, Donostia-San Sebastian, Espanha, 2012. Scientific Commission.

7o Simpósio da Associação Portuguesa de Meteorologia e Geofísica, Setúbal, Portugal, Março 28–30, 2011. Scientific Commission.

GeoCPLP2012, Coimbra, Portugal, 2012. Scientific revision.

6.4 Research Projects

6.4.1 Coordination

ART-SEIS – Automated Real-Time broad band SEISmology in the azores-gibraltar region, funding by EU, Marie Curie (FP7), PIRG03-GA-2008-230922, 2009 – 2014

6.4.2 Participation

INSPIRE – Estudo Instrumental dos Terramotos Portugueses: 1900-1960, Funding by FCT, PTDC/CTE-GIX/122262/2010, 2012 – 2014.

AQUAREL - Quantificação de Sismos e da Estrutura Interna Terrestre à Escala Regional: Aplicação à Península Ibérica Ocidental, funding by FCT, PTDC/CTE-GIX/116819/2010, 2012 – 2014

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SCENE: Site Condition Evaluation for National Seismic Hazard Estimation, funding by FCT, PTDC/CTE-GIX/103032/2008, 2010 – 2013

WILAS – West Iberia Lithosphere and Asthenosphere Structure, funding by FCT, PTDC/CTE-GIX/097946/2008, 2010 – 2013

EPOS - European Plate Observing System, funding by EU, FP7-INFRA-2010-2.2.2.

NERA - Network of European Research Infrastructures for Earthquake Risk Assessment and Mitigation, funding by EU, FP7-INFRA-2010-1.1.27., 2012-2015

6.5 Outreach

Coordinator of the “Seismology Club” at the Coimbra University.

Numerous talks were presented at high-schools.

High-school teachers course on “O Ensino da Sismologia: Outra Perspectiva”, 2012.

Science in family session: “À descoberta dos sismos”, Science Museum of Coimbra University, 2011.

V Science Fair at the Science Alive Center of Viva de Vila do Conde, 2011.

Coordinator of the school and general public visits to the seismic station of Coimbra University, 2011.

Congress for young geoscientists, Earth Sciences Department, Coimbra University, 2011.