



ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

il Direttore

**Istituto Nazionale di Geofisica
e Vulcanologia**

AOO INGV

Protocollo Generale - U

N. 0000724

del 20/01/2020



Gestione WEB

Al Dott. Massimo COCCO

Alla Dott.ssa Carmela FREDA

Al Dott. Gilberto SACCOROTTI

Al Dott. Alexander GARCIA

Alla Dott.ssa Agata SANGIANANTONI

All'Ufficio Gestione Dati

Ai Direttori di Dipartimento

Ai Direttori di Sezione

Al Direttore della Direzione Centrale Affari Generali e Bilancio

Al Responsabile del Centro Servizi Contabilità e Bilancio

All'Ufficio Bilancio

Alla Segreteria della Presidenza

Oggetto: Pubblicità atti

Si notifica in copia l'allegata Delibera n. 263/2019 del 27/11/2019 – Allegato R al Verbale n. 10/2019
concernente: Anthropogenic Hazards TCS Supplier Letter.

Dott. Giovanni TORRE



Delibera n. 263/2019

Allegato R al Verbale n. 10/2019

Oggetto: Anthropogenic Hazards TCS Supplier Letter.

IL CONSIGLIO DI AMMINISTRAZIONE

- **VISTO** il Decreto legislativo 29 settembre 1999, n. 381, concernente la costituzione dell'Istituto Nazionale di Geofisica e Vulcanologia (INGV);
- **VISTO** il Decreto legislativo 25 novembre 2016, n. 218, recante "Semplificazione delle attività degli enti pubblici di ricerca ai sensi dell'articolo 13 della legge 7 agosto 2015, n. 124";
- **VISTO** lo Statuto dell'Istituto Nazionale di Geofisica e Vulcanologia, approvato con Delibera del Consiglio di Amministrazione n. 372/2017 del 9 giugno 2017, come modificato con Delibere del Consiglio di Amministrazione n. 424/2017 del 15 settembre 2017 e n. 501/2017 del 21.12.2017, e pubblicato sul Sito WEB Istituzionale (Avviso di emanazione pubblicato sulla Gazzetta Ufficiale della Repubblica Italiana – Serie generale – n. 27 del 2 febbraio 2018), in particolare, l'art. 2, comma 5;
- **VISTO** il Regolamento di Organizzazione e Funzionamento dell'Istituto Nazionale di Geofisica e Vulcanologia emanato con Decreto del Presidente n. 45 del 21.02.2018, pubblicato sul sito istituzionale;
- **VISTO** il Regolamento di Amministrazione, Contabilità e Finanza emanato con Decreto del Presidente n. 119/2018 del 14.05.2018, pubblicato sul sito web istituzionale;
- **VISTA** la decisione di esecuzione (UE) n. 2018/1732 della Commissione Europea, del 30 Ottobre 2018 relativa all'istituzione del Sistema di osservazione della placca tettonica europea - Consorzio per un'infrastruttura europea di ricerca (ERIC EPOS), notificata con il numero C(2018) 7011;
- **VISTO** il Decreto Ministeriale per il riparto del Fondo ordinario per gli Enti e le Istituzioni di ricerca, con il quale il MIUR ripartisce i finanziamenti necessari per la partecipazione italiana agli ERIC sotto la voce «attività di ricerca valenza internazionale» e, in particolare, l'art. 1, comma 3 che prevede testualmente *"I contributi per la partecipazione agli ERIC, o ai progetti da questi realizzati, sia nella forma in-kind sia di contributi finanziari a valere sul FOE, questi ultimi come determinati nella relativa tabella riferita alle "Attività di ricerca a valenza internazionale" costituiscono a tutti gli effetti quota di entrata dei bilanci dei medesimi ERIC, anche mediante eventuale trasferimento diretto"*;
- **VISTO** lo schema della Supplier Letter e le disposizioni in essa contenute;
- **VALUTATE** le esigenze scientifiche e tecnologiche dell'Istituto;
- **VISTO** il parere dell'Ufficio Gestione Dati reso con nota prot. n. 2713 del 25/11/2019;
- **SENTITO** il Collegio dei Revisori dei Conti in corso di seduta;
- Su proposta del Presidente,

DELIBERA

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E' approvato lo schema della Supplier Letter EPOS Anthropogenic Hazards TCS allegato alla presente Delibera, della quale costituisce parte integrante e sostanziale.

Viene dato mandato al Presidente alla sottoscrizione definitiva degli atti.

Letto, approvato e sottoscritto seduta stante.

Roma, 27/11/2019

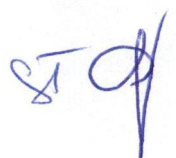
La segretaria verbalizzante
(Sig.ra Silvana TUCCI)

Silvana Tucci

IL PRESIDENTE
(Prof. Carlo DOGLIONI)

SUPPLIER LETTER

1. In accordance with the EPOS Data Policy, which is available at <https://www.epos-ip.org/>, the “Istituto Nazionale di Geofisica e Vulcanologica” (INGV) Data Policy, which is available at <https://data.ingv.it/docs/>, and in accordance with TCS AH Data Policy, which is available at <https://tcs.ah-epos.eu>; Istituto Nazionale di Geofisica e Vulcanologia allows EPOS-ERIC and/or Institute of Geophysics Polish Academy of Sciences and/or Academic Computer Centre CYFRONET of the University of Science and Technology in Cracow to distribute the data and/or data products and/or software and/or services, hereinafter referred to as “DDSS”, identified in the **Annex A**.
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 - c. To the best of its knowledge and belief, the release of the DDSS in accordance with the terms of this Supplier Letter does not and will not contravene any laws;
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4. The Supplier may benefit from EPOS Users authentication system’s feedback, in order to be informed about its DDSS usage.



Place, Date, Name, Signature, Stamp

Roma,

(Prof. Carlo Doglioni)

Annex A

List of contributed Data (Episodes) and Software (Applications)

A.1 Episodes:

- VAL D'AGRI: water reservoir
- VAL D'AGRI FIELD: conventional hydrocarbon extraction
- EMILIA ROMAGNA: conventional hydrocarbon extraction and fluid injection

A.2 Applications:

- Waveform-based seismic event location
- Coda Wave Interferometry detection of velocity changes
- MERGER: Dynamic risk analysis using a bow-tie approach

Description

A.1 Episodes

Episode VAL D'AGRI (water reservoir)

Low magnitude earthquakes recorded by an experiment-specific temporary network deployed around the Pertusillo Lake impoundment. During the one-year survey the INGV network recorded an intense microseismicity that appears correlated in time and space to severe seasonal oscillations of the artificial lake level. Main objective is to provide seismic data to be analyzed for a better understanding of the mechanisms of protracted Reservoir-Induced Seismicity (RIS) and of physical properties of the carbonate rocks where seismicity occurs.

The episode includes following data:

SEISMIC

a) Catalog: 1620 events from 11/05/2005 to 12/06/2006, magnitude ML range: -0.3 to 2.7

b) Seismic Stations: Locations and parameters of INGV seismic stations that operated for about 1 year between 2005 and 2006 in region of southern Apennines, Italy.

c) Events' related waveforms: Waveforms from INGV stations are available for events of the Catalog.

INDUSTRIAL

a) Water Level: Time series of Pertusillo Lake water level (source: digitised from the data published in Valoroso et al., 2009).

GEODATA

a) Velocity Model: Seismic velocity model of Pertusillo Lake area (source: INGV).

Notes:

The data from this episode is embargoed till **2019/12/31**

Episode integrated in the framework of EPOS IP project, European Plate Observing System Implementation Phase. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 676564

Episode VAL D'AGRI FIELD (conventional hydrocarbon extraction)

Seismic monitoring of the initial stage of wastewater injection into a disposal well of the Val d'Agri oil field. The monitoring unraveled a low magnitude swarm induced by disposal operations that initiated just a few hours after the beginning of injection. Main objective is to provide seismic data to be analyzed with advanced techniques for a better understanding of the mechanisms of injection-linked seismicity and of physical properties of the reservoir.

The episode includes following data:

SEISMIC

- a) Catalog:** 69 events from 02/06/2006 to 11/06/2006, magnitude ML range: 0.0 to 1.8
- b) Seismic Stations:** Locations and parameters of INGV seismic stations at Val d'Agri oil field.
- c) Events' related waveforms:** Waveforms from INGV stations are available for events of the Catalog.

INDUSTRIAL

- a) Injection Volume:** Injection volume in well at Val d'Agri oil field (source: digitised from data published in Improta et al. 2015).
- b) Wellhead Pressure.** Wellhead pressure in well at Val d'Agri oil field (source: digitised from data published in Improta et al. 2015).

GEODATA

- a) Velocity Model.** Seismic velocity model of Val d'Agri oil field (source: INGV).

Notes:

The data from this episode is embargoed till **2019/12/31**

Episode integrated in the framework of EPOS IP project, European Plate Observing System Implementation Phase. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 676564

Episode EMILIA ROMAGNA (Suspected - conventional hydrocarbon extraction and fluid injection)

This episode consists of data sets from the Emilia Romagna (ER) region (Northern Italy): earthquake locations, waveforms, network inventory and industrial data from oil and gas production. Since the ER region is seismically active and has also a long history of oil/gas extraction, the “2012 Emilia sequence” has been the focus of a debate looking for possible links between that sequence and the hydrocarbon extraction activities in the area (mainly in the Cavone oil field, which is the closest production zone).

The episode includes the following data:

SEISMIC

a) Catalogs:

- 1) 205 events from 13/07/1985 to 22/09/2009
- 2) Events from June 2005 until December 2012 for magnitudes greater than 1.6.

b) Seismic Stations: Locations and parameters of the permanent and temporary seismic stations in the ER area.

c) Events' related waveforms: Waveforms are available for most events of the Catalogs.

INDUSTRIAL:

a) Natural Gas Production. Monthly natural gas production of the Cavone oil and gas field (source: data made available for the EPOS project by the Italian Ministry of Economic Development, MISE):

- Volume of gas produced per month from 05/1979 to 10/2010
- Volume of gas produced per month per well from 11/2010 to 05/2012

b) Oil Production. Monthly oil production of the Cavone oil and gas field (source: data made available for the EPOS project by the Italian Ministry of Economic Development, MISE):

- Total volume of oil produced per month - measured from 05.1979 to 10.2010
- Volume of oil produced per month per well - measured from 11.2010 to 05.2012

c) Water Production. Monthly water production of the Cavone oil and gas field (source: data made available for the EPOS project by the Italian Ministry of Economic Development, MISE):

- Total Volume of water produced per month from 05/1979 to 10/2010.

Notes:

Episode integrated in the framework of EPOS IP project, European Plate Observing System Implementation Phase. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 676564

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A.2 Applications:

Application: Waveform-based seismic event location

This application implements a location procedure which allows imaging the distribution of seismic sources in both time and space. First, a characteristic function (CF; in this case, the STA/LTA ratio) is calculated at all the vertical-component seismograms from the selected stations. The user then defines a volume likely containing the source(s), and a number of grid nodes along the two horizontal (NS-EW) and vertical coordinates for discretising this volume. For each grid node located at the arbitrary location (x,y,z), the predicted arrival times are calculated at all the stations, and the different CFs are time-shifted consequently. By stacking these time-shifted CFs one obtains a time-dependent Brightness function associated with that particular grid node. The procedure is iterated over all the grid nodes of the source volume; at the end of the process, the maximum (maxima) of the Brightness function will provide an estimate of the source location and origin time. The main advantage of this procedure is that it exploits waveform information (both arrival times and relative amplitudes) without the need of pre-assembled phase-picking data. The method, therefore, is particularly well-suited for emergent signals and/or for real-time applications. The technique has been largely inspired by the previous works from Kao and Shan (2004), Grigoli et al. (2013, 2014), Langet et al., (2014), to which the reader is referred for a more comprehensive description of the methodology.

AUTHOR: Gilberto Saccorotti, INGV, within EPOS IP project

Application: Coda Wave Interferometry detection of velocity changes

This application calculates possible velocity changes using the Coda Wave Interferometry Techniques. The application calculates the delay time between the coda waves of a pair of seismograms by applying cross-correlation at subsequent lapse times. Requires SAC format seismograms from different earthquakes recorded by the same component of the same station. For any given pair of seismograms which passed the correlation threshold selection, the output consists of percent velocity changes (and associated uncertainties) which occurred in between the two earthquakes. This can be combined with industrial data (e.g., rate of extraction / injection, front advance, etc.) to ascertain if the propagation medium suffered any significant variation of elastic properties.

AUTHOR: Gilberto Saccorotti, INGV, within EPOS IP project

Application: MERGER: Dynamic risk analysis using a bow-tie approach

MERGER, a simulator for multi-hazard risk assessment in ExploRation/exploitation of GeoResources, is a tool for performing dynamic risk analyses using a bow-tie approach. The methodology implemented in this tool is suitable for performing highly specialized dynamic risk analyses using state-of-the-art knowledge and is characterised by (i) the bow-tie logic structure coupled with a wide range of probabilistic models flexible enough to consider different typologies of phenomena; (ii) a Bayesian implementation for data assimilation, allowing the user to update assessments as new data becomes available; and (iii) the handling and propagation of modelling uncertainties.

AUTHOR: Alexander Garcia, INGV, within EPOS-IP project

References

Valoroso, Luisa and Improta, Luigi and Chiaraluce, L. and Di Stefano, R. and Ferranti, L. and Govoni, A. and Chiarabba, Claudio (2009) Active faults and induced seismicity in the Val d'Agri area (Southern Apennines, Italy). *Geophysical Journal International*, 178 (1). pp. 488-502. DOI: <https://doi.org/10.1111/j.1365-246X.2009.04166.x>

Improta, Luigi and Valoroso, Luisa and Piccinini, Davide and Chiarabba, Claudio (2015) A detailed analysis of wastewater-induced seismicity in the Val d'Agri oil field (Italy). *Geophysical Research Letters*, 42 (8). pp. 2682-2690. DOI: <https://doi.org/10.1002/2015GL063369>

MISE (Ministero dello Sviluppo Economico), Georesources section. Web site: <https://unmig.mise.gov.it/index.php/it/dati/ricerca-e-coltivazione-di-idrocarburi> (in Italian, last accessed: December 2019)

51