

## PROGRESS REPORT

**on realization of the large infrastructure for research,  
experimental development and innovation project (LI)  
for the period from the project start until 31. 12. 2016**

LI's Code:	<b>LM2015079</b>
Name - Acronym:	<b>CzechGeo/EPOS</b>
Full Name of LI:	Distributed System of Permanent Observatory Measurements and Temporary Monitoring of Geophysical Fields
Recipient:	Institute of Geophysics of the CAS, v. v.i.
Another Participant(s) of LI:	Czech Geological Survey Masaryk University Charles University Institute of Geonics of the CAS, v.v.i. Institute of Rock Structure and Mechanics of the CAS, v.v.i. Research Institute of Geodesy, Topography and Cartography, v.v.i.
Responsible Person:	RNDr. Pavel Hejda, CSc.

The recipient hereby declares that this report contains truthful publishable entries and data only, modified to provide full overview on carrying out of the project and results achieved without imposing the risk onto the licence commitments of recipient or onto recipient's rights to publish the results, copyrights, rights to legally protect them, commercially utilize them or make them public in other way. At the same time the recipient gives a consent to present this report to peer-review evaluators for the purposes of supervision or evaluation.

In Praha

Date: 12 January 2017

Name of Responsible Person: Pavel Hejda

Signature of Responsible Person:

**Annex:**

Solemn Declaration

## 1. Description of project realization in 2016; evaluation of project progression for the past year

### Section of seismology

Two new seismic stations Komorní Hůrka (HUC) and Chlum svaté Máří (MAC) were erected within the WEBNET network. Both stations are equipped with the broadband Guralp CMG-3ESPC sensors, Nanometrics data acquisition system and online data transfer. Station Plesná (PLED) which was damaged earlier was completely repaired.

Twenty MOBNET stations were employed in the passive seismic experiment AlpArray aimed at the study of the lithosphere and upper mantle structure within the orogenic system of Alps ([www.alparray.ethz.ch](http://www.alparray.ethz.ch)).

Two regular visits of the PSLNET seismic stations in Greece were realized in 2016. The purpose was checking the state of the stations and software upgrade. Satellite telemetry was replaced by the cheaper GPRS data transfer at two stations. The only seismic station Prodromos is working in autonomous regime due to lacking the mobile signal coverage. National Observatory of Athens (NOA), who is our partner in Athens established a new data portal which is feeded also by our data.

The CarboNet network was extended by two new stations, Dolní Částkov and Hartoušov2, resp. The pressure, fluid flow, temperature and water level are monitored in the well and in the moffete.

### Section of Geodynamics of the Crust

Within SLOPENET network several measuring devices were installed both on existing as well as on newly established locations. Instrumentation includes, e.g., automatic rain gauges, extensometers, groundwater level loggers, inclinometer and crackmeters with temperature sensors. Within TECNET network several new sites were instrumented. New device for 3-D fault displacement monitoring is tested, based on detection of magnetic field changes.

### Section of geomagnetism

Set of Quarz Bobrov variometers was equipped by photosensors with a feed-back and put in permanent operation.

### Section of Geological and Geophysical Databases

Available data resources including their description were inventoried and their accessibility was improved. The preparatory work on the implementation of the INSPIRE Directive was performed. The team contributed actively to the creation of the EGDI (European Geological data Infrastructure) which can serve also for other infrastructures as EPOS, GEOSS etc.

## 2. List of results achieved by project team and the most significant results achieved by external users of LI (10 at maximum)

### Papers in impacted journals with participation of project team members

Doubravová, J., Wiszniowski, J. & Horálek, J. (2016). Single Layer Recurrent Neural Network for detection of swarm-like earthquakes in W-Bohemia/Vogtland - the method. *Computers and Geosciences*, **93**, 138–149, ISSN 0098-3004. doi:10.1016/j.cageo.2016.05.011.

Douša J., Dick G., Kačmařík M., Brožková R., Zus F., Brenot H., Stoycheva A., Möller G. & Kaplon J. (2016). Benchmark campaign and case study episode in central Europe for development and assessment of advanced GNSS tropospheric models and products. *Atmos. Meas. Tech.*, **9**, 2989–3008, doi: 10.5194/amt-9-2989-2016.

- Fischer, T., Matyska, C. & Heinicke, J. (2016). Earthquake-enhanced permeability - evidence from carbon dioxide release following the M<sub>L</sub> 3.5 earthquake in West Bohemia. *Earth Planet. Sci. Lett.*, doi: 10.1016/j.epsl.2016.12.001.
- Hartvich, F., Blahut, J. & Stemberk, J. (2016). Rock avalanche and rock glacier: A compound landform study from Hornsund, Svalbard. *Geomorphology*, **276**, 244-256.
- Plomerová, J., Munzarová, V., Vecsey, L., Kissling, E., Achauer, U. & Babuška, V., 2016. High-resolution P- and S-velocity tomography of the upper mantle beneath western Bohemian Massif and a role of mantle sutures in Cenozoic volcanism. *Geochem. Geophys. Geosyst.*, **17**, doi:10.1002/2016GC006318.
- Sokos, E., Zahradník, J., Gallovič, F., Serpentsidaki, A., Plicka, V. & Kiratzi, A. (2016). Asperity break after 12 years: The Mw6.4 2015 Lefkada (Greece) earthquake. *Geophys. Res. Lett.*, **43**, 6137–6145; doi:10.1002/2016GL069427.

#### Papers in impacted journals published by external users

- Rowberry, M.D., Kriegner, D., Holý, V., Frontera, C., Llull, M., Olejník, K. & Martí, X. (2016). The instrumental resolution of a moire extensometer in light of its recent automatisation. *Measurement*, **91**, 258-265, ISSN 0263-2241.
- Silvennoinen, H., Kozlovskaya, E. and Kissling, E. (2016). POLENET/LAPNET teleseismic P wave travel time tomography model of the upper mantle beneath northern Fennoscandia. *Solid Earth*, **7**, 425-439.
- Zábranová, E. & Matyska, C. (2016). Low-Frequency Centroid Moment Tensor Inversion of the 2015 Illapel Earthquake from Superconducting-Gravimeter Data, *Pure Appl. Geophys.*, **173**, 1021–1027.
- Zikmund, A., Janošek, M., Ulvr, M., Kupec, J. (2016). Precise calibration method for triaxial magnetometers not requiring Earth's field compensation. *IEEE Transactions on Instrumentation and Measurement*, **64**, 1250-1255, ISSN 0018-9456.

### 3. **Additional information relevant to the project realization**

(e.g. justification of changes in personnel of project team, justification of changes in financial resources allocation etc.)

#### **Czech Geological Survey – transfer of 220 000 CZK from the Membership fee to the Personal Costs**

The proposed fee as a contribution to the European Geological Data Infrastructure (EGDI) initiative has not been accepted yet. It has been agreed to provide the co-financing in form of an in-kind contribution. CGS participated remarkably on the creation of the EGDI system, particularly by the creation of the metadata catalogue. For this reason the allocated amount of 220 000 CZK has been transferred to the Personal Costs.

#### **Charles University**

Dr. Gallovič has substituted to Dr. Bucha in the system administration of the Seismological software centre. The reason for this is a large workload of Dr. Bucha on other projects.

#### **Institute of Rock Structure and Mechanics – transfer of 40 000 CZK from the Membership fee to the Operating Costs**

Originally the amount of 50 000 CZK was allocated for covering the membership fee in ICL (International Consortium on Landslides) and IAEG (International Association of Engineering Geology). But the Institute obtained a subsidy in the framework of the INGO II project LG15007 which already included the ICL membership fee. For that reason the ICL

membership fee was covered using INGO II financial resources and only 10 000 CZK from the CzechGeo project was used for covering the IAEG membership.

**Research Institute of Geodesy, Topography and Cartography – transfer of 350 000 CZK from Personal Costs to Operating Costs**

Funding of the project LM2015079 was confirmed in December 2015, consequently the tender for a new employee was announced in January 2016 and the particular researcher was employed in April. Moreover some other workers were involved in the project even later during 2016. But more defects occurred on different measuring devices which had to be fixed urgently. For these reasons the amount of 350 000 CZK was transferred from Personal Costs to Operating Costs.

**4. Information on calls for tenders pursuant the Act. No. 137/2006 Coll., contracts concluded with suppliers, and modifications in contracts performances**

IG CAS: Repair of interior of registration hut at Budkov Observatory, Company Margita Dragounová, Vlachovo Březí, 99 276 CZK.

RIGTC: Repair of seismometer – replacement of faulty parts. Based on the order No. 24-056/2015 dated April 1, 2015 was carried out by Guralp Systems Limites, Reading, UK, for the amount 3610,59 EUR.

RIGTC: Repair of coldhead SN 3TE08013C – a part of superconducting gravimeter. Based on the order No. 24-046/2016 dated April 11, 2016 was carried out by Sumitomo (SHI) Cryogenics of Europe GmbH, Darmstadt, Německo, for the amount 3860 EUR.

RIGTC: Repair of azimuth driver of radiometr of water vapour. Based on the order No. 24-047/2016 dated April 5, 2016 was carried out by TRG – Representation of Radiometrics Corp., USA, Meckenheim, Německo, for the amount 6000 EUR (including transport to the USA and back).

RIGTC: Repair of coldhead SN 3TE06002C – a part of superconducting gravimeter. Based on the order No. 24-170/2016 dated September 8, 2016 was carried out by Sumitomo (SHI) Cryogenics of Europe GmbH, Darmstadt, Německo, for the amount 3860 EUR.

CGS: Analysis of feasibility of of migration Oracle Portal, SEFIRA spol. s r.o., 107 690 CZK

CGS: Hardware supply, company Jan Heran, 213 147 CZK.