Advances in Geosciences

Preface: Improving seismic networks performances: from site selection to data integration (EGU2014 SM1.2/GI3.7 session)

D. Pesaresi[1], J. Clinton[2], and H. Pedersen[3]

[1]OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Trieste, Italy
[2]ETHZ, Zurich, Switzerland
[3]RESIF, Grenoble, France

Correspondence: D. Pesaresi (dpesaresi@inogs.it)

Abstract. The number and quality of seismic stations and networks in Europe continually improves, nevertheless there is always scope to optimize their performance. In this EGU2014 SM1.2/GI3.7 session we welcomed contributions from all aspects of seismic network installation, operation and management. This includes site selection; equipment testing and installation; planning and implementing communication paths; policies for redundancy in data acquisition, processing and archiving; and integration of different datasets including GPS and OBS.

1 Introduction

The history of seismic networks sessions at European Geosciences Union (EGU) General Assemblies started in 2010 with the SM1.3 "Seismic Centers Data Acquisition" session (Pesaresi, 2011), where the Convener Damiano Pesaresi supported by the Orfeus Data Center (ODC) Director Co-Convener Reinoud Sleeman chaired a session of 7 oral and 16 posters. A similar session was later the same year held at the XXXII European Seismological Commission (ESC) General Assembly: "SD1, 3 Seismic centers data acquisition", conveners D. Pesaresi and R. Sleeman, with 15 oral presentations.

The history continued in 2011 with the EGU2011 SM1.3/G3.8/GD3.7/GI-19/TS8.7 "Improving seismic networks performances: from site selection to data integration" session (EGU2011 SM1.3/G3.8/GD3.7/GI-19/TS8.7 Improving seismic networks performances: from site selection to data integration, 2011) where the Convener Damiano Pesaresi supported by the Co-Conveners John Clinton and Robert Busby chaired a session of 9 oral and 20 posters, in 2012 with the EGU2012 SM1.3/GI1.7 "Improving seismic

networks performances: from site selection to data integration" session (Pesaresi and Vernon, 2013) where the Convener Damiano Pesaresi supported by the Co-Convener Frank Vernon chaired a session of 6 oral and 22 posters, and in 2013 with the SM1.4/GI1.6 "Improving seismic networks performances: from site selection to data integration" session (Pesaresi and Busby, 2013) where the Convener Damiano Pesaresi supported by the Co-Convener Robert Busby chaired a session of 6 oral and 13 posters.

2 The EGU2014 SM1.2/GI3.7 session

In the EGU2014 SM1.2/GI3.7 "Improving seismic networks performances: from site selection to data integration" session (EGU2014 SM1.2/GI3.7 Improving seismic networks performances: from site selection to data integration, 2014) the Convener Damiano Pesaresi supported by the Co-Conveners John Clinton and Helle Pedersen chaired a session (Fig. 1) of 12 oral (Table 1) and 27 posters (Table 2).

The 39 presentations come from 16 countries (USA, Norway, Germany, France, Canada, Italy, Poland, Finland, Taiwan, Austria, Romania, Malta, Spain, Algeria, Switzerland, UK) from 4 different continents (North America, Europe, Asia, and Africa), which well fits the goals of the European Geosciences Union.

Solicited presentations in this session were:

i. "Improvements in Data Quality, Integration and Reliability: New Developments at the IRIS DMC" by Tim Ahern, Rick Benson, Rob Casey, Chad Trabant, and Bruce Weertman (Ahern et al., 2014);

ii. "Seismic Sensor orientation by complex linear least squares" by Francesco Grigoli, Simone Cesca, Lars Krieger, Manuel Olcay, Carlos Tassara,
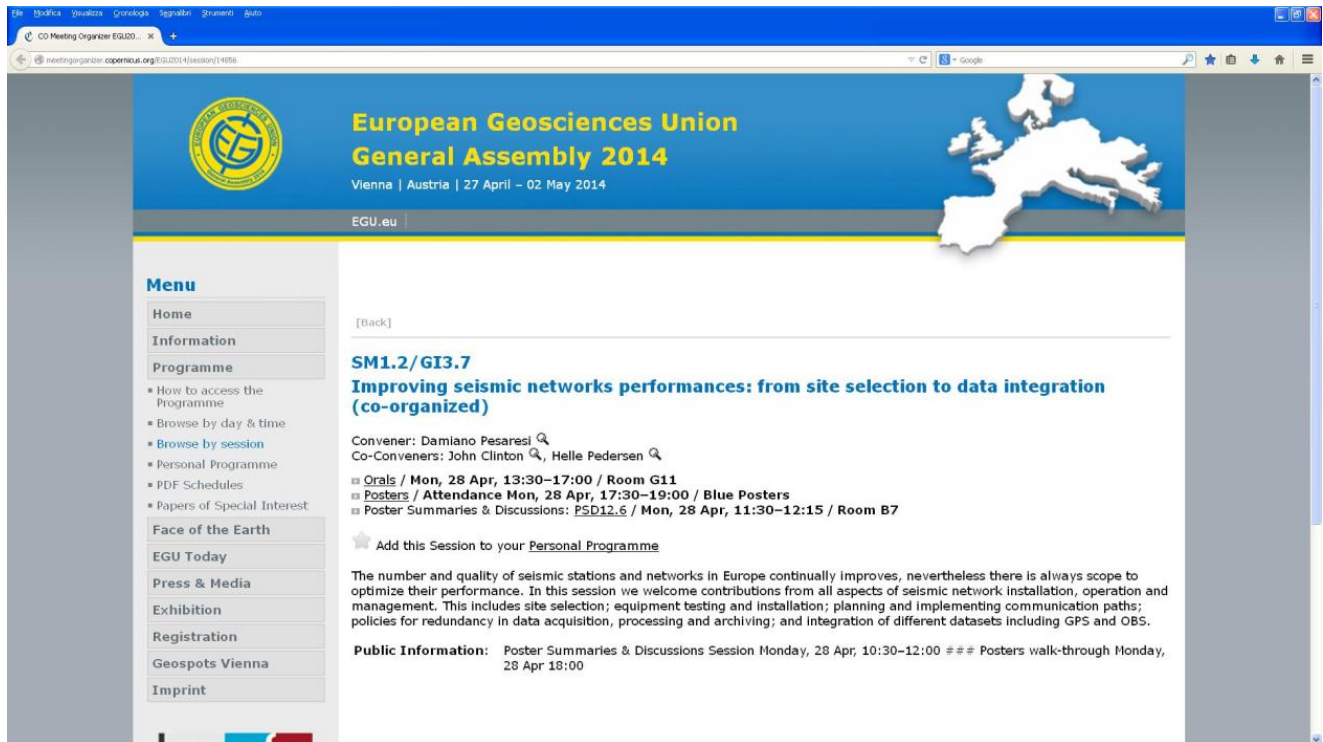
Figure 1. EGU2014 SM1.2/GI3.7 session (from EGU2014 homepage).

Monika Sobiesiak, and Torsten Dahm (Grigoli et al., 2014);

iii. "Detecting and locating teleseismic events with using USArray as a big antenna" by Lise Retailleau, Nikolaï Shapiro, Jocelyn Guilbert, Michel Campillo, and Philippe Roux (Retailleau et al., 2014);

iv. "A high-resolution ambient seismic noise model for Europe", by Toni Kraft (Kraft, 2014);

v. "Improving Station Performance by Building Isolation Walls in the Tunnel", by Yan Jia, Nikolaus Horn, and Roman Leohardt (Jia et al., 2014);

vi. "Romanian Data Center: A modern way for seismic monitoring", by Cristian Neagoe, Liviu Marius Manea, and Constantin Ionescu (Neagoe et al., 2014);

vii. "Comparison Study Between Vault Seismometers and Posthole Seismometers", by Neil Spriggs, Geoffrey Bainbridge, and Wesley Greig (Spriggs et al., 2014);

viii. "RESIF national datacentre: new features and upcoming evolutions", by Pierre Volcke, Catherine Pequegnat, Benjamin Brichet-Billet, Albanne Lecointre, David Wolyniec, and Philippe Guéguen (Volcke et al., 2014);

ix. "Testing various modes of installation for permanent broadband stations in open field environment", by Jérôme Vergne, Olivier Charade, Benoît Arnold, and Thierry Louis-Xavier (Vergne et al., 2014);

x. "Data Quality Control of the French Permanent Broadband Network in the RESIF Framework", by Marc Grunberg, Sophie Lambotte, Fabien Engels, Remi Dretzen, and Alain Hernandez (Grunberg et al., 2014);

xi. "Enhancement of Network Performance through Integration of Borehole Stations", by Edith Korger, Katrin Plenkers, John Clinton, Toni Kraft, Tobias Diehl, Stephan Husen, and Michael Schnellmann (Korger et al., 2014);

xii. "Testing the Lower Thresholds of Broadband Seismometers", by Nathan Pearce, Cansun Guralp, Murray Mcgowan, and Horst Rademacher (Pearce et al., 2014).

The papers published in these proceedings of the EGU2014 SM1.2/GI3.7 session are:

I. "Integration of onshore and offshore seismic stations to study the seismicity of the Calabrian Region: a two steps automatic procedure for the identification of the best stations geometry" by A. D'Alessandro, I. Guerra,

Table 1. Oral programme EGU2014 SM1.2/GI3.7 session.

EGU abstract ref.	Title	Authors
EGU2014-1576	Improvements in Data Quality, Integration and Reliability: New Developments at the IRIS DMC	Tim Ahern, Rick Benson, Rob Casey, Chad Trabant, and Bruce Weertman
EGU2014-2030	Combination of High Rate, Real-time GNSS and Accelerometer Observations – Preliminary Results Using a Shake Table and Historic Earthquake Events	Michael Jackson, Paul Passmore, Leonid Zimakov, and Jared Raczka
EGU2014-2136	Noise and detection levels for the Norwegian National Seismic Network	Andrea Demuth and Lars Ottemoller
EGU2014-2282	Seismic Sensor orientation by complex linear least squares	Francesco Grigoli, Simone Cesca, Lars Krieger, Manuel Olcay, Carlos Tassara, Monika Sobiesiak, and Torsten Dahm
EGU2014-5850	Detecting and locating teleseismic events with using USArray as a big antenna	Lise Retailleau, Nikolaï Shapiro, Jocelyn Guilbert, Michel Campillo, and Philippe Roux
EGU2014-6361	Microseismic Network Performance Estimation: Comparing Predictions to an Earthquake Catalogue	Wesley Greig and Nick Ackerley
EGU2014-6735	Improvements of the Regional Seismic network of Northwestern Italy in the framework of ALCoTra program activities	Fabrizio Bosco
EGU2014-8497	"13 BB star" – broadband seismic array at the edge of East European Craton in Poland	Marcin Polkowski, Marek Grad, Monika Wilde-Piórko, Jerzy Suchcicki, and Tadeusz Arant
EGU2014-11707	Northern Finland Seismological Network: a tool to analyse long-period seismological signals	Elena Kozlovskaya and Riitta Hurskainen
EGU2014-12407	A high-resolution ambient seismic noise model for Europe	Toni Kraft
EGU2014-13054	Testing the "PRESTo" early warning algorithm with OGS, ARSO and ZAMG seismic data: first results	Luca Elia, Andrej Gosar, Wolfgang Lenhardt, Marco Mucciarelli, Damiano Pesaresi, Matteo Picozzi, Mladen Živčić, and Aldo Zollo
EGU2014-13735	VADASE: a new approach for real-time fast displacement detection – First application to Taiwan High-Rate GNSS Network	Huang-Kai Hung, Ruey-Juin Rau, Gabriele Colosimo, Elisa Benedetti, Mara Branzanti, Mattia Crespi, and Augusto Mazzoni

Table 2. Poster programme EGU2014 SM1.2/GI3.7 session.

EGU abstract ref.	Title	Authors
EGU2014-3312	Improving Station Performance by Building Isolation Walls in the Tunnel	Yan Jia, Nikolaus Horn, and Roman Leohardt
EGU2014-3320	Romanian Data Center: a modern way for seismic monitoring	Cristian Neagoe, Liviu Marius Manea, and Constantin Ionescu
EGU2014-3622	Implementation of a new picking procedure in the Antelope software	Lara Tiberi, Giovanni Costa, and Daniele Spallarossa
EGU2014-4793	An improved real-time seismic network in the Central Mediterranean	Matthew Agius, Pauline Galea, and Sebastiano D'Amico
EGU2014-4953	The performance of the stations of the Romanian seismic network in monitoring the local seismic activity	Luminita Angela Ardeleanu and Cristian Neagoe
EGU2014-5066	Small instrument to volcanic seismic signals	Normandino Carreras, Spartacus Gomariz, and Antoni Manuel
EGU2014-5571	A multiple-criteria network optimization	Anna Tramelli, Giuseppe De Natale, Claudia Troise, and Massimo Orazi
EGU2013-7906	Borehole prototype for seismic high-resolution exploration	Rüdiger Giese, Katrin Jaksch, Felix Krauß, Kay Krüger, Marco Groh, and Andreas Jurczyk
EGU2014-5971	"SeismoSAT" project state of the art: connecting seismic data centres via satellite	Damiano Pesaresi, Wolfgang Lenhardt, Markus Rauch, Mladen Zivcic, Rudolf Steiner, and Michele Bertoni
EGU2014-6441	Comparison Study Between Vault Seismometers and Posthole Seismometers	Neil Spriggs, Geoffrey Bainbridge, and Wesley Greig
EGU2014-6547	Data quality control of ADSN Broadband stations	Azouaou Alili, Abd el karim Yelles-chaouche, Toufik Allili, and Walid Messemen
EGU2014-9623	Using Antelope and Seiscomp in the framework of the Romanian Seismic Network	George Marius Craiu, Andreea Craiu, Alexandru Marmureanu, and Cristian Neagoe
EGU2014-9750	The 2013 Earthquake Series in the Southern Vienna Basin: Location	Maria-Theresia Apoloner, Irene Bianchi, Götz Bokelmann, Ewald Brückl, Helmut Hausmann, Stefan Mertl, and Rita Meurers

Table 2. Continued.

EGU abstract ref.	Title	Authors
EGU2014-9931	Retrieve Ocean Bottom and Downhole Seismic sensors orientation using integrated low cost gyroscope and direct rotation measurements	Antonino D'Alessandro and Giuseppe D'Anna
EGU2014-10064	Urban MEMS based seismic network for post-earthquakes rapid disaster assessment	Antonino D'Alessandro, Dario Luzio, and Giuseppe D'Anna
EGU2014-10230	Investigating active faults in SE Iberia: borehole and surface seismic monitoring	Maria Jose Jurado, Jose Crespo, Teresa Teixido, and Carlos Viñolo
EGU2014-12270	RESIF national datacentre: new features and upcoming evolutions	Pierre Volcke, Catherine Pequegnat, Benjamin Brichet-Billet, Albanne Lecointre, David Wolyniec, and Philippe Guéguen
EGU2014-12337	Testing various modes of installation for permanent broadband stations in open field environment	Jérôme Vergne, Olivier Charade, Benoît Arnold, and Thierry Louis-Xavier
EGU2014-13911	The Central and Eastern European Earthquake Research Network – CE3RN	Pier Luigi Bragato, Giovanni Costa, Antonella Gallo, Andrej Gosar, Nikolaus Horn, Wolfgang Lenhardt, Marco Mucciarelli, Damiano Pesaresi, Rudolf Steiner, Peter Suhadolc, Lara Tiberi, Mladen Živčić, and Giuliana Zoppé
EGU2014-14138	Data Quality Control of the French Permanent Broadband Network in the RESIF Framework	Marc Grunberg, Sophie Lambotte, Fabien Engels, Remi Dretzen, and Alain Hernandez
EGU2014-14311	The Italian Strong Motion Network (RAN)	Giovanni Costa, Alfredo Ammirati, Rita de Nardis, Luisa Filippi, Antonella Gallo, Giusy Lavecchia, Sebastiano Sirignano, Elisa Zambonelli, and Mario Nicoletti
EGU2014-14529	Enhancement of Network Performance through Integration of Borehole Stations	Edith Korger, Katrin Plenkers, John Clinton, Toni Kraft, Tobias Diehl, Stephan Husen, and Michael Schnellmann
EGU2014-14796	How to create a very-low cost, very-low-power, credit-card-sized and real-time ready datalogger	Maxime Bès de Berc, Marc Grunberg, and Fabien Engels

Table 2. Continued.

EGU abstract ref.	Title	Authors
EGU2014-14918	Seismic catalog condensation with applications to multifractal analysis of South Californian seismicity	Yavor Kamer, Guy Ouillon, Didier Sornette, and Jochen Wössner
EGU2014-14987	Significant breakthroughs in monitoring networks of the volcanological and seismological French observatories	Arnaud Lemarchand, André Anglade, Jean-Marie Saurel and the arnaudl@ipgp.fr Team
EGU2014-15285	Testing the Lower Thresholds of Broadband Seismometers	Nathan Pearce, Cansun Guralp, Murray Mcgowan, and Horst Rademacher
EGU2014-15311	A new Shallow Water Cabled OBS System off California	Horst Rademacher, Chris Pearcey, Giorgio Mangano, Cansun Guralp, and Nathan Pearce
EGU2014-15722	Integration of onshore and offshore seismological data to study the seismicity of the Calabrian Region	Antonino D'Alessandro, Ignazio Guerra, Giuseppe D'Anna, Anna Gervasi, Paolo Harabaglia, Dario Luzio, and Gilda Stellato

G. D'Anna, A. Gervasi, P. Harabaglia, D. Luzio, and G. Stellato;

II. "The 2013 Earthquake Series in the Southern Vienna Basin: Location" by M.-T. Apoloner, I. Bianchi, G. Bokelmann, E. Brückl, H. Hausmann, S. Mertl, and R. Meurers;

III. "Urban MEMS based seismic network for post-earthquakes rapid disaster assessment" by A. D'Alessandro, D. Luzio, and G. D'Anna, which shows the usage of the new MEMS low dimensions-low cost devices in monitoring urban areas;

IV. "Retrieve Ocean Bottom and Downhole Seismic sensors orientation using integrated MEMS gyroscope and direct rotation measurements" by A. D'Alessandro and G. D'Anna, which again shows the usage of the new MEMS low dimensions-low cost devices, here remote sensors orientation;

V. "Detecting and locating seismic events using US-Array as a large antenna", by L. R. Retailleau, N. M. S. Shapiro, J. G. Guilbert, M. C. Campillo, and P. R. Roux;

VI. "Significant breakthroughs in monitoring networks of the volcanological and seismological French observatories", by A. A. Anglade, A. L. Lemarchand, and J. M. S. Saurel;

VII. "How to create a very-low cost, very-low-power, credit-card-sized and real-time ready datalogger", by M. Bès de Berc, M. Grunberg, and F. Engels;

VIII. "SeismoSAT project state of the art: connecting seismic data centres via satellite" by D. Pesaresi, W. Lenhardt, M. Rauch, M. Živčić, R. Steiner, and M. Bertoni;

IX. "Improvements in Data Quality, Integration and Reliability: New Developments at the IRIS DMC", by T. Ahern, R. Benson, R. Casey, C. Trabant, and B. Weertman;

X. "Trans-National Earthquake Early Warning (EEW) in North-Eastern Italy, Slovenia and Austria: First Experience with PRESTo at the CE3RN Network", by M. Picozzi, L. Elia, D. Pesaresi, A. Zollo, M. Mucciarelli, A. Gosar, W. Lenhardt, and M. Živčić.

3   Conclusions

The quality and quantity of presentations made at the EGU2014 SM1.2/GI3.7 session well satisfied the expectations of the Convener and Co-Conveners, and well fitted the goals of the European Geosciences Union.

The increasing number of presentations at such yearly seismic networks sessions encourage the conveners that the path they followed in organizing such sessions is a valid one, and that there is need in the seismological community worldwide to present and discuss different solutions to common problems in running seismic networks.

References

Ahern, T., Benson, R., Casey, R., Trabant, C., and Weertman, B.: Improvements in Data Quality, Integration and Reliability: New Developments at the IRIS DMC, EGU General Assembly, EGU2014-1576, 27 April–2 May 2014, Vienna, Austria, 2014.

EGU2011 SM1.3/G3.8/GD3.7/GI-19/TS8.7 Improving seismic networks performances: from site selection to data integration, http://meetingorganizer.copernicus.org/EGU2011/session/7340 (last access: 8 August 2014), 2011.

EGU2014 SM1.2/GI3.7 Improving seismic networks performances: from site selection to data integration, http://meetingorganizer.copernicus.org/EGU2014/session/14856, last access: 8 August 2014.

Grigoli, F., Cesca, S., Krieger, L., Olcay, M., Tassara, C., Sobiesiak, M., and Dahm, T.: Seismic Sensor orientation by complex linear least squares, EGU General Assembly, EGU2014-2282, 27 April–2 May 2014, Vienna, Austria, 2014.

Grunberg, M., Lambotte, S., Engels, F., Dretzen, R., and Hernandez, A.: Data Quality Control of the French Permanent Broadband Network in the RESIF Framework, EGU General Assembly, EGU2014-14138, 27 April–2 May 2014, Vienna, Austria, 2014.

Jia, Y., Horn, N., and Leohardt, R.: Improving Station Performance by Building Isolation Walls in the Tunnel, EGU General Assembly, EGU2014-3312, 27 April–2 May 2014, Vienna, Austria, 2014.

Korger, E., Plenkers, K., Clinton, J., Kraft, T., Diehl, T., Husen, S., and Schnellmann, M.: Enhancement of Network Performance through Integration of Borehole Stations, EGU General Assembly, EGU2014-14529, 27 April–2 May 2014, Vienna, Austria, 2014.

Kraft, T.: A high-resolution ambient seismic noise model for Europe, EGU General Assembly, EGU2014-2282, 27 April–2 May 2014, Vienna, Austria, 2014.

Neagoe, C., Manea, L. M., and Ionescu, C.: Romanian Data Center: A modern way for seismic monitoring, EGU General Assembly, EGU2014-3320, 27 April–2 May 2014, Vienna, Austria, 2014.

Pearce, N., Guralp, C., Mcgowan, M., and Rademacher, H.: Testing the Lower Thresholds of Broadband Seismometers, EGU General Assembly, EGU2014-15285, 27 April–2 May 2014, Vienna, Austria, 2014.

Pesaresi, D.: The EGU2010 SM1.3 Seismic Centers Data Acquisition session: an introduction to Antelope, EarthWorm and SeisComP, and their use around the World, Ann. Geophys., 54, 1–7, https://doi.org/10.4401/ag-4972, 2011.

Pesaresi, D. and Busby, R.: EGU2013 SM1.4/GI1.6 session: "Improving seismic networks performances: from site selection to data integration", Adv. Geosci., 36, 1–5, https://doi.org/10.5194/adgeo-36-1-2013, 2013.

Pesaresi, D. and Vernon, F.: EGU2012 SM1.3/GI1.7 session: "Improving seismic networks performances: from site selection to data integration", Adv. Geosci., 34, 1–4, https://doi.org/10.5194/adgeo-34-1-2013, 2013.

Retailleau, L., Shapiro, N., Guilbert, J., Campillo, M., and Roux, P.: Detecting and locating teleseismic events with using USArray as a big antenna, EGU General Assembly, EGU2014-5850, 27 April–2 May 2014, Vienna, Austria, 2014.

Spriggs, N., Bainbridge, G., and Greig, W.: Comparison Study Between Vault Seismometers and Posthole Seismometers, EGU General Assembly, EGU2014-6441, 27 April–2 May 2014, Vienna, Austria, 2014.

Vergne, J., Charade, O., Arnold, B., and Louis-Xavier, T.: Testing various modes of installation for permanent broadband stations in open field environment, EGU General Assembly, EGU2014-12337, 27 April–2 May 2014, Vienna, Austria, 2014.

Volcke, P., Pequegnat, C., Brichet-Billet, B., Lecointre, A., Wolyniec, D., and Guéguen, P.: RESIF national datacentre : new features and upcoming evolutions, EGU General Assembly, EGU2014-12270, 27 April–2 May 2014, Vienna, Austria, 2014.