

Final Minutes of the
« Service National d'Observation en Sismologie » Scientific Committee meeting
Tuesday 31 May 2011, CNRS Paris

Participants:

Jacques Deverchere, Donat Fäh, Bruno Feigner, Jean Virieux, Aldo Zollo, Philippe Gueguen, Tony Monfret, Eleonore Stutzmann, Helle Pedersen, Michel Cara, Isabelle Lecomte, Remy Bossu, Sebastien Chevrot, Jérôme Vergne, Jean-Paul Montagner

Excused: Michel Campillo, Barbara Romanowicz, Torild Van Eck

Members of the Scientific Committee: R.Bossu, M.Campillo, S.Chevrot, D. Fäh, I. Lecomte, T.Monfret, J-P.Montagner, B.Romanowicz, T. Van Eck, A.Zollo

**09:00-12:15: Meeting of the Seismology SNO scientific committee with the services directors
General Welcome, introduction and overview of the SNOs**

The meeting is introduced by Jean Virieux (CNRS/INSU, Commission des Services Nationaux d'Observation) who has warmly welcomed the participants and provided them with a detailed presentation of the scope and objectives of the "Commission des services nationaux d'observation" with its long-term strategy, expectations for data availability and financial support.

In his presentation Jean Virieux pointed out that the National Services of Observation in France are aimed at surveying and supervising the long-term deployment of national Earth Observation infrastructures with the general aim of a better understanding and management of our planet. After the illustration of scopes and activities of the different services, he outlined the actions which are expected to be undertaken, which include top-down and bottom-up interactions among researchers and direction offices, a dynamic interaction between research and observation, the integration of the national monitoring system and research projects in a worldwide strategy of observation of the planet.

Among the long-term objectives of these integrated action there should be the continuous technology upgrading and modernization of terrestrial monitoring infrastructures, facilitate the access to data through an unique and simplified web portal, improvement of the space and time resolution of monitoring systems to make them evolving toward the 4D monitoring. To facilitate and increase the data diffusion and availability at any level of the National Services organization is the first and most important priority of the Commission.

Finally Jean Virieux clarified the role of the Scientific Commissions of SNO, that is to evaluate the scientific activity of SNO, to recommend on the missions and strategies of SNO and to provide scientific perspectives in the European and international research framework. In particular, it is expected to analyze and evaluate the propositions for INSU-labeled instrumented sites, which are large observational infrastructures devoted to the monitoring of specific earth geological and geophysical phenomena complementing the SNOs.

Chair of the Committee

Aldo Zollo is designated as the President of the Scientific Committee of Seismology SNO and he proceeded as acting chairperson of this committee.

Presentations of the observational activities of the Seismology SNO

The RESIF/EPOS project and FOSFORE portal (Helle Pedersen, LGIT, Grenoble)

RESIF is a project for the implementation of a large-scale, French research infrastructure for the observation of Earth deformation. It was originally designed as a seismological program, aimed at filling the lack of broad-band seismological observations in France. It is closely linked to the EU infrastructure program EPOS – European Plate Observing System, in the ESFRI map, with the principal objectives of collecting and distributing data and methodologies.

The present RESIF program foresees the implementation of dense seismological and geodetic observing systems. As for seismology, it will integrate the broad-band (BB) network (25+220 stations), the national strong motion network (167 stations) and the mobile BB network (100 + 50 stations). The RESIF geodetic network will include GNSS stations (45), mobile GPS (50 + 50), mobile gravity (2 FG5 absolute meters, relative portable gravity meters) and the superconducting gravimeter observatory.

Within 2013 the data access will be provided by a coordinated information system while future integrations are under discussion/preparation as the extension of the networks to French west Indies and Reunion, links to the worldwide seismological network GEOSCOPE, the seaward extension of seismic observations (OBS's ...) and satellite geodesy.

Helle Pedersen has therefore illustrated the research and investigation goals of RESIF along with the different scientific challenges: Seismic hazard evaluation in metropolitan France, improve the resolution of micro-seismicity location for the accurate fault mapping and delineation, investigate and determine the Earth lithospheric and crustal structure beneath France extending the use of noise correlation measurement and receiver functions, increment the mobile seismic monitoring system, possibly in joint cooperation with EU partners ...

RESIF will be a research infrastructure, not devoted to provide services like alerts. Finally the structure of the RESIF Consortium of which INSU is a partner, and the organization chart have been presented.

The Fosfore (Fédération de l'Observation Sismologique Française) is a portal providing the access to data from French seismological networks (permanent and temporary). The Fosfore portal provides a set of tools to facilitate the access to the seismological data: NetDC, a web-service (developed by IRIS-DMC) that allows users to request seismological information from multiple data centers through a single request; Stations, gives to the user the possibility to select networks and to display the corresponding stations on the maps; Seismicity, based on the IRIS seismicity catalog, offers the possibility to display earthquakes on a map depending on the criteria selected (period, magnitude, location, etc..).

Helle Pedersen illustrated the structure and the organization of the FOSFORE portal, pointing out that the future RESIF Web Portal may be based on the present Fosfore portal.

In conclusion a number of relevant open questions on RESIF/FOSFORE have been raised by Pedersen, concerning a/ the uncertainty of the financial plan, b/ the difficulty to re-organize the complex, multiple systems of observations in France in an unique research facility, c/ evolution from FOSFORE portal to RESIF information system.

The discussion following the presentation focused on the potential for merging land stations and ocean bottom stations and how to manage the complex governance of the RESIF consortium with many players.

GEOSCOPE (Eleonore Stutzmann, IPG, Paris)

The GEOSCOPE Observatory is a global network of 31 BB seismic stations. These stations are recording continuously the ground motion and data from 24 stations are arriving in real-

time to the GEOSCOPE Data Center which distributes real time data to earthquake detection and tsunami warning centers and validated data after a delay to the scientific community. The GEOSCOPE Network also provides data for magnitude 6.3 and greater earthquakes. The network is managed by two institutions IGP in Paris EOST in Strasbourg in close collaboration with IRD, CEA/DASE, CNES, IPEV and international institutions abroad. Most of scientific targets of the research done using GEOSCOPE data are related to the investigation and understanding of the dynamics of the Earth at a global scale. Since the birth of GEOSCOPE in 1982, more than 1000 articles have been published on the referred literature using GEOSCOPE data, corresponding to about 50 papers per year. Study examples have been presented by Eleonore Stutzmann on the imaging of the rupture of the Maule, 2010 earthquake and application of seismic noise measurements for the study of evolution of the sea ice.

One principal task is the maintenance of the GEOSCOPE network addressed to maintain a high standard of data quality and instrument operation. GEOSCOPE will integrate RESIF as a node A and the preservation of its visibility is a major issue to consider. Eleonore Stutzmann has stressed the need of recruiting permanent personnel who specifically work at the data validation task.

Networks ReNaSS and RLBP (Jerome Vergne, EOST, Strasbourg)

ReNaSS (Reseau National de Surveillance Sismique) and RLBP (Reseau Large Bande Permanent) are two velocimetric networks deployed in France metropolitan. RENASS is the historical seismic monitoring network, born in 1981 as a federation of regional networks and has the tasks of earthquake detection and computation of the main source parameters (location, depth and local magnitude). The network control center is in Strasbourg, 11 people are involved for its maintenance all over France with the large part of financial support coming from INSU. ReNaSS is an old-style, short-period network equipped with velocity sensors, half of them only vertical component. In the last years we assist to a slow degrading of the network quality and decrease of operating stations, which is also testified by the anomalous decrease of detected events per year. Since 2010, ReNaSS has no duty on alert which is now demanded to LDG.

RLBP started in 2007 and now include 34 stations. The main objective is to extend the frequency and spatial coverage of ReNaSS. A large number of stations are located at the France borders since their installation has been co-financed by European funding. Data from RLBP are used for many scientific applications (i.e., earthquake source parameters by waveform inversion) and different data centers (EOST and EOST-OCA) manage their collection and distribution with different data formats. Data are also made available to ORFEUS and FOSFORE. Projects are ongoing to improve the data quality through advanced site conditioning protocols and uniformity of data quality analysis .

Jerome Vergne analyzed the strong and weak points of short-period and BB network development of France. It is positive to see an increase of BB observation in France, moving from the off-line to real-time data release. The ReNaSS bulletin is an excellent product and a reference research outcome for many institutions. On the other hand , the short-period network is slowly dying, due to old equipments and difficult maintenance, the broadband network still presents important spatial gaps (to be filled by RESIF?), and more important, few scientific studies use ReNaSS and RLBP data.

The implementation of RESIF will represent a key milestone for ReNaSS and RLBP, the latter representing the backbone of RESIF for its best recording sites.

RAP (Reseau Accelerometrique Permanent) (Philippe Gueguen, LGIT, GrenobleGueguen)

The RAP is the French permanent accelerometric network aiming at monitoring and recording the strong ground motion generated by moderate to large earthquakes occurring in France Metropolitan. It consists of 147 three-component stations, equipped with a 24 bit data logger and EST FBA sensors.

The main objective of RAP is therefore to set up and maintain an advanced monitoring infrastructure, providing open access data, which can be used to the large variety of end-users, dealing with and managing the seismic hazard and risk in France.

Philippe Gueguen illustrated the scientific objectives of RAP and the recent scientific production. Data from RAP are used for investigation of site effects, determination of earthquake source parameters and rupture models, estimation of ground motion prediction equations, and vulnerability analyses. For a part of this scientific activity RAP receives complementary financial supports from ANR.

The presentation of the organization with data acquisition, data archiving and data distribution showed that RAP is not only a national service but also a research consortium (GIS-RAP) for promoting scientific activities with specific calls for projects aimed at the analysis and modeling of seismic data acquired by RAP.

The consortium is involved in a number of integrated, multi-disciplinary projects (ANR (ARVISE, BELLEPLAINE, SLAM, URBASIS), EU (NERIES, NERA), INTERREG,...) and coordinates the scientific activities in several pilot test sites in France.

BCSF (Bureau central sismologique francais) (Michel Cara, EOST, Strasbourg)

This service does not involve instrumental data acquisition and station management, but it is aimed at collecting, archiving and distributing the earthquake data from different sources in France. BCSF performs scientific activities related to the estimation of earthquake effects through the macroseismic activity and ensures the reporting on earthquake intensity for insurance companies. Both LDG and all other seismological observatories are contributing with data which are currently archived, published and distributed by BCSF catalogue. Michel Cara pointed out the importance of a continuous support to GIM, the group of rapid intervention after an earthquake for macroseismic intensity survey.

BCSF is a small service with only one person working full-time and another part-time, mostly working at the analysis of macroseismic data and relationship with peak ground motion parameters (PGA, PGV).

The Committee acknowledged the different speakers for their interesting presentations.

13:15-17:30: Meeting of the Scientific Committee of the Seismology SNO

The afternoon session was devoted to discussions, comments and recommendations of members of the scientific committee to be given to INSU and to the persons in charge of the different observational activities.

The discussion was initially pointing out the complexity of the system of seismological observation in France as historically developed through different approaches and instrumental strategies, and via different institutions. It comes out now the need to integrate and optimize the various monitoring infrastructures, by setting up a long-term plan for a/ the continuous upgrading and maintenance of hardware, b/ a centralized system for data collection,

archiving, distribution and publication and c/ observational system developments according to advancements in the scientific research in Earth processes observation.

Merging and integrating the different seismological networks should be a primary objective of the SNO in France since modern technologies for sensors and data loggers allows to use instruments for different purposes. A clear example of this possible integration is the joint use of acceleration and velocity meters for inferring the source parameters of moderate size events or even to analyze the microearthquake activity.

Several comments from the Committee members have addressed the problem of homogenization of the national services of seismological observation and proposed to take the RAP system of data management and distribution as a possible model for newer services. But the whole work done internationally by very broadband networks coordinated by FDSN (Federation of Digital Seismograph Networks) is also a good example of collaborations, data management and distribution between various institutions (IRIS/DMC, ORFEUS, GEOSCOPE, GEOFON...) around the world, by implementing an original way to access and exchange BB data through various tools (such as NetDC).

RESIF is actually a project and not an operational service. But if it is approved and adequately supported, it may evolve to become the global network infrastructure for seismology in France, coordinating the various services at all levels, from the technology development and management, to the data collection and distribution, and to research coordination.

The Committee agreed that the distributed nature of the services is a strength for the station maintenance. However, a distributed system is not the most efficient in terms of manpower for a service development, operation, maintenance and evaluation. RESIF might be an opportunity to revise the procedures to optimise the available resources.

As concerning the appropriateness of node A / node B structure proposed within RESIF, the Scientific Committee raised the issue of creating a further level of complexity which may hamper the system sustainability in the long term. This is a potential difficulty that INSU should carefully consider and monitor on all along the process of system development.

The strategy of deploying within RESIF 200 BB stations rather than a mix of BB and intermediate -period sensors within the new network has been also discussed and commented. It is the opinion of the Committee that intermediate-period (possibly real-time) stations could usefully integrate the BB network in more seismic active regions thus providing with more details and a higher resolution on microseismicity location and source parameters.

The committee has recognized the existence of different seismic networks operating in France metropolitan during the past decades. The clarification that now CEA/DASE/LDG is in charge of the seismic warning for civil protection is welcome while seismic networks operated by University teams (some of them integrated with ReNaSS) are essentially devoted to research investigations.

The committee will certainly appreciate that, with the new opportunity of RESIF, a more visible structure of the seismic observation for research, seismic warning and early warning should be promoted and implemented. What will be the link between LDG and RESIF? What are the inputs coming from LDG that will improve the operability of RESIF? What will be the feedback of the dense RESIF station deployment on LDG and its own objectives? All these issues must be addressed during the future development of RESIF in strict interaction and cooperation with LDG.

It has been also pointed out the need for a unique earthquake parametric catalogue in France, merging the instrumental data from current networks with macroseismic observations, and combining the historical and instrumental catalogues. This should include a collection of all available historical and macroseismic information. Along this direction, setting the objective of a minimum completeness magnitude reachable by the seismological observation systems in France is encouraged.

Finally, the committee discussed about the importance for the seismological services in France to move from a basically off-line to a continuous, possibly real or near-real-time, data streaming, this without restriction of use, following the last decade technological developments in many seismic regions of the world. Providing continuous, high-quality seismic recordings for earthquakes occurring in France and elsewhere should be a target of the French seismological services to be achieved in the next years, given the relevance these data can have for most of the planned research objectives in Earth deformation, seismic hazard assessment and seismic monitoring, as well as for real-time products such as shakemaps and tools for early-warning.

Recommendations

Recommendation A: The Committee recommends that future strategies for technology upgrading and system developments in seismological observations include the possibility of continuous data streaming and real-time distribution.

Recommendation B: One present difficulty stands on the evaluation of resources in relation to scientific targets and expected deliverables. The Committee recommends that specific actions are undertaken at the different levels of SNO organization to a/ definition of the scientific goals of the different services b/ identification of next decade scientific challenges to pursue through seismic network improvements and integration and c/ definition of evaluation criteria for assessing the objective achievement and quality of distributed data.

Recommendation C: The Committee shares the opinion that the RESIF project must evolve in a unique French Global Seismological infrastructure, e.g., a coordinating structure for data management and diffusion from individual data centers related through web services. The Committee recommends that future actions must be directed toward the integration of different seismic networks into RESIF and, as a consequence, an unique portal for data distribution must be built up. Within RESIF, community-shared protocols have to be discussed and defined concerning technical specifications for instruments, data transmission and formats, site conditioning, all of these aspects aimed at

improving the quality of distributed data. All technical choices must be in agreement with international standards. In this sense, the European and worldwide experiences of other seismological institutions delivering real-time data services, with regulations on site conditions and instrumentations should be considered and evaluated.