

May 2010 Report of the Internal Committee for Scientific Evaluation and Strategic Control.

The Committee met in Rome on May 24-26, 2010 in the main building of the National Institute of Geophysics and Volcanology (INGV) and the office in Rome. Present were all members of the Committee: Prof. Franco Barberi, Ing. Mauro Massulli, Prof. Stephen Sparks and Prof. Adam Dziewonski, the chair the Committee.

The agenda of the meeting was as follows:

Monday morning (10:00 – 13:00)

Presentation of the Triennial Plan 2010-2012, including financial issues (URSI representative plus General Director)

Presentation of document of reorganization prepared by INGV in 2008 (URSI representative plus General Director)

Presentation of INGV scientific productivity data for 2009

Monday afternoon (14:30-17:00)

Discussion within the Committee (URSI spokesman available on request)

Tuesday morning (9:00 – 13:00)

Joint meeting with Scientific Advisory Board

Tuesday afternoon (14:30 - 18:00)

Presentation of outstanding research activities (2.5 hours, including questions and discussion)

Presentation of past and future INGV Education and Outreach activities (1 hour including questions and discussion)

Wednesday morning (9:00 – 13:00)

Committee discussion and Report writing (URSI spokesman available on request)

Wednesday afternoon

Completion of Committee Report

At the beginning of the meeting, Dr. Gianluca Valensise gave an overview of the Piano Triennale di Attività 2010 – 2012; a novel aspect of the Plan is that it emphasizes future activities in years 2011 and 2012. Dr. Valensise also presented the Committee with a series of tables summarizing some the Institute activities, as well as budgetary issues. The Power Point presentation of Dr. Valensise is included as Appendix A.

Unlike at previous CIV meetings we did not ask Section Directors to give personal presentations of activity in their Sections. Instead, we asked for brief (1 to 3 pages) outline of the status of each Section, achievements, major problems, etc. The Directors reports are attached as Appendix B.

Funding issues

A long discussion followed an announcement that the annual funding of INGV by the Department of Civil Protection might be reduced by €6,000,000 a year for the next three years, or about 30% of the funding obtained in previous contracts. Over many years, an important part of INGV budget has been based on the financial support from the Civil Protection Department (DPC). These funds were given to INGV mostly to ensure the permanent seismic and volcanic monitoring of the Italian territory, to maintain and improve monitoring networks and laboratories, to provide scientific advice to DPC during seismic or volcanic emergencies, to contribute to public education on earthquakes and volcanoes. In addition, a part of DPC funds had to be used to support joint INGV-University research projects on specific themes mostly dealing with seismic and volcanic hazard and risk assessment.

In the 2007-2009 contract, the DPC contribution has been of 21 M-Euros per year, i.e. 63 M-Euros total, of which 10.5 M-Euros was designated to support research projects, data banks and educational activities.

A draft of the 2010-2012 Agreement with DPC has not been yet approved at the time of the current Committee meeting. It was indicated to the Committee that DPC would intend to reduce its contribution to 15 M-Euros per year, for a total of 45 M-Euros, of which 6 M-Euros would be invested in new research projects to be carried out in 2011-2012.

This is a very substantial reduction of funds (about 30%) that might create great difficulties for INGV, considering also that data banks and educational activities costs should now be excluded from the funds allocated to research. On the other hand, the Committee considers that the availability of new, though reduced research funds (6 M-Euros), may be of crucial importance to INGV scientific activity and recommends that INGV should explore with the Government the possibility to restore the previous level of DPC funding, but without reducing the increase to the research contribution.

Another matter of concern for the future budgetary perspective comes from the measures contained in the financial emergency law just proposed by the Italian Government. Besides a general reduction of the budget of all Ministries, the 50% reduction of temporary personnel and the prohibition of personnel replacement, there would be a severe cut to the financial budget of Regions and Municipalities for the next 3 years (10 billion of Euro), which might make it very difficult for INGV to promote new research projects or contracts with them (this activity contributes 4.2 M Euro to the 2010 INGV budget).

In conclusion, the short term budget perspectives seem to be unfavorable: the acquisition of new contracts from national research projects (i.e. FAR, FIRB and PRIN) and for service activity (i.e. Regions, DPC) is at risk for a significant reduction in terms of funding due to the lack of new funds for FIRB projects and to a reduction of funding for FAR and PRIN, decrease in Regions

budgets, as well as the already discussed reduction of the funding in the new DPC-INGV contract.

At present, the retention in service of the temporary personnel already conflicts with the necessity of a constant improvement of the structural equipment of INGV. Currently, the ordinary resources do not appear sufficient to guarantee that INGV can continue to maintain the present level of excellence in monitoring and research achieved to date.

In this context the Committee thinks that a significant adjustment should be made in the distribution of the Ordinary Fund for Public Research Institutions, increasing the INGV fraction in order to avoid the depletion of its human and structural resources, to maintain the high level position reached by INGV within the international scientific community and to ensure the maintenance of a social services of crucial importance in a country, like Italy, severely exposed to seismic and volcanic risk.

Reorganization

The next item on the agenda, which generated a vigorous discussion, was the issue of reorganization of INGV. Dr. Valensise presented the background to the current efforts in this regard. The following is extracted from his presentation.

The law issued on 27 September 2007, n. 165, established that all public research institutions (Enti Pubblici di Ricerca, EPR) had to be reorganized in order to "... promote, support and rationalize activities in the area of research funded by the public sector..."

On 31 December 2009 the Government issued a decree that effectively started the process of "riordino". The decree states that the "riordino" will be based on the work of a specifically created panel formed by

- the present Consiglio Direttivo of INGV (four members plus INGV President)*
- two non-INGV representatives of the informed scientific community*
- three representatives appointed by the Ministry of Research (MIUR)*

The law stated that the panel has 6 months (plus 15 days) from 1 February 2010 to complete the task. Unfortunately the external members have been appointed only recently, which effectively reduces the time available to complete the work to less than 3 months.

In order to comply with the 2007 law in September 2008 INGV appointed an internal committee formed by:

Fabio Florindo, URSI

Gianluca Valensise, URSI

Antonio Meloni, director of Section Roma 2

Alessandro Bonaccorso, past-director of Section Catania

Tullio Pepe, General Director

The committee was in charge of preparing a proposal for updating the of INGV to comply with the above mentioned law. The document included one "official" INGV proposal plus five additional proposals presented by individual Section Directors or by URSI.

Clearly the main changes concern the structure of INGV. In URSI's proposal this would now be composed of:

Departments

These are thematic structures at national scale, each one covering one of the macro-areas of INGV activity. For example (it is just an example!)

Dept 1 - Seismology

Dept 2 - Volcanology

Dept 3 - Environment and climate

Dept 4 - Natural hazards

Sections

These are geographic entities similar to today's section except that most of the planning is decided at the level of Departments. Normally most of a Section falls within one Department. However scientists residing in one Section may belong to up to two Sections. Hence scientist from different Departments may end up working next to each other in the same geographic Section.

Observatories

The Sections of Naples and Catania are given a special status and a special name: Osservatorio Vesuviano, and Osservatorio Etneo. In case of volcanic crisis their special status allows decision to be made, and operations to be carried out, at the level of the Observatory (without having to wait for decision at Department level).

Divisions

The activity of Departments is based on the Divisions, which more or less coincide with today's TTCs. These are national structures that operate under the supervision of the head of the relevant Department (a Division reports to one Department only).

Central Administration

Similar to today's Administration. It takes care of all administrative tasks that cannot be accomplished by the Departments (or that are more effectively accomplished on a centralized basis). It includes structure like "Centro Servizi" for accomplishing service-related tasks at national level.

Open questions

- 1) *How many Departments are needed?*
- 2) *What will be the future role of Sections? Will they be purely geographic entities or will they have a role in the big planning?*
- 3) *What is the meaning of "joining a Department" for each individual scientist?*
- 4) *Will the new structure be more efficient than the current one?*

Why do we need a change

- 1) *Current Sections are mixed geographic-thematic and hence inhomogeneous*
- 2) *Sections often compete with each other for funding and personnel*
- 3) *Decisions made “by Section” seldom are the best possible decisions for INGV*
- 4) *Some Sections operate as if they were a small INGV within themselves (e.g. the INGV web page)*
- 5) *Due to the above, some activities are simply duplicated or planned without taking into account the potential for cooperation and exchange of instrumentation and data*

What follows is a summary of discussion within the Committee.

INGV has developed as an amalgamation of several research centers and institutions and is, as a consequence, a diverse organization in terms of disciplines, functions and traditions. The organization is constituted by 9 Sections most with different locations, profiles of research interests, and sizes. This diversity is a source of strength and it is an outstanding achievement that INGV is now recognized as one of the World's foremost research institution in volcanology, seismology and geophysics. More recently INGV is nurturing major interests in the environment. Notwithstanding these achievements there is recognition that in rapidly changing circumstances there is a need for some significant re-organization and that the historical way that INGV has developed also has some disadvantages. For the last 3 years there have been discussions about what might be a suitable model for INGV. The matter has now reached a critical stage because a new law requires INGV to consider re-organization and a National Committee has been established which is required to report to the Ministry of Instruction, University and Research (MIUR) within the next few months. At the same time Government proposed cuts announced during this meeting would imply significant losses of contract staff positions over the coming 2 years or so. These eventualities make the need for considering re-organization much more urgent. In particular it is likely to be much better if INGV forms a clear view of the re-organization strategy to inform the new national Committee. Thus the Committee of Evaluation and Strategic Review spent a significant amount of time at its May 2010 meeting discussing options for re-organization with INGV staff and with members of INGV Scientific Council.

Present organization: SWOT analysis

There is an old adage that if something works there is no need to fix it. This nostrum implies that there is no point in making changes unless it is clear that the changes will improve the organization. Thus a brief SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) provides a useful preliminary stage to the discussion of some ideas about re-organization.

Strengths. INGV is world-renown as a research organization for volcanoes and earthquakes. It includes the World's first Volcano Observatory (Osservatorio Vesuviano) established in 1851 and a long tradition of excellence in geophysics and volcanology. There are currently several research groups that are recognized as world-class and leading cutting edge science. The diverse nature of the Sections with different interests and historical missions is a source of strength. The scientific productivity of INGV continues to be impressive with over 430 publications in 2009, many of which are in the high impact journals of geophysics and volcanology.

Weaknesses. The current INGV is organized around its Sections with each Section having a Director who form a key component of the management structure. Thus the institution to some extent is organized on a geographic basis. There is evidence that there are rivalries and problems of communication with Sections competing for funds in a way that can be counterproductive. Examples given at the meeting include public announcements of earthquake locations by different Sections of INGV that disagree, and somewhat competitive research programs being developed by different sections of INGV on the same scientific themes. The senior management structure is larger than other international research organizations known to the Committee members of comparable size. Inevitably, Section Directors tend to represent the interests of their Section and this can potentially be in conflict with the broader interests of INGV. These characteristics of the INGV management structure make decision-making and reform more difficult and is illustrated by the observation that re-organization has been under discussion for over 3 years without significant progress in agreeing on a plan and then implementing it.

Opportunities. There is great potential within INGV to be even more effective in delivering cutting edge innovative research by improved collaboration, sharing of facilities and equipment and fully using the intellectual resources of INGV staff. Arguably this potential is being inhibited by the current structure. INGV has also recognized new areas of research and is actively expanding the range of science, in particular in the areas of environment and climate change. INGV already has the expertise to contribute significantly to topics like carbon capture and storage, geothermal energy development, safe development of nuclear power in Italy and providing a national resource for responding the threat of climate change.

Threats. INGV finds itself in a national and international environment of economic trouble. Like many other European nations the Italian Government is being faced with the need to reduce expenditure rapidly and cutting costs in the public sector is in forefront of newly proposed policies. INGV already faced difficulties in that a large fraction of the staff (285 out of 834) is employed on short term contracts. Many of the contract appointees are young scientists who are the future of research and so vital for long term success. Now that it has been announced that severe cuts will take place in contract staff across the Italian public sector, INGV might be faced with a significantly reduced work force in the near future, compounded by other kinds of funding cuts that are already imminent, such as the 30% reduction in the annual funds from Department of Civil Defense. If the job losses are based on seniority rather than merit, as seems possible, then INGV may well lose some significant new scientific talent. There is already discussion of cutting out expenditure on new equipment and upgrading of monitoring network. Longer term persistent lack of investment in people and equipment can degrade the ability of INGV to function adequately. Given its key national role in emergencies related to earthquake and volcanoes this is a major concern.

In summary this SWOT analysis confirms that INGV remains an excellent research organization that carries out research and fulfilling its national function of providing scientific monitoring, scientific products and advice on volcanoes and earthquakes to a very high standard. However, the current organization has its limitations and does not appear to allow INGV to realize its true potential. In addition, the economic environment is extremely challenging and there is also a strong case for re-organization to allow INGV to come through these difficult times and avoid major disaster as an organization.

New Organization

The Committee for Evaluation and Strategic Control has no decision-making authority and is commissioned to provide advice, including some comparison of INGV with other national and international institutions by the foreign members of the Committee. During this meeting the Committee discussed re-organization with INGV senior staff and members of the INGV Scientific Council. The Committee took the view that the basis of the discussions would be the plan to organize INGV into a small number of major Departments that cut across the Sections, since this plan has already been under discussion within INGV for over 3 years. The alternative option is of course to retain the main features of the current organization with some relatively minor reforms. While recognizing that there are staff in INGV who favor limited change, this Committee does not support this option. Organizations that are not willing or able to change are vulnerable to having changes imposed externally and this is an obvious scenario given the state of public finances in Italy. It is much better that INGV decides itself how best to change to protect its research excellence and reputation.

The discussions at the May meeting were centered around developing an outline of an organization based on the Department concept and how it might work in practice; the figure on page 12 shows an outline this organization structure. The main idea is that INGV is divided into three main Departments called Earthquakes, Volcanoes and Environment. Here the names of Department matter. The proposed structure purposefully avoids Seismology and Volcanology because, although these are clearly core disciplines within INGV, the science that is needed on volcanoes and earthquakes involves many more disciplines. We think that these topic rather than discipline names better encapsulate the multidisciplinary character of modern research. Each Department will have researchers based in several of the INGV geographical Sections. The extent to which each Section contributes research to a Department will vary greatly depending on the mission and make-up of the Section. Importantly, each Department has a Director who will form part of the senior scientific leadership of INGV under the direction of the President.

We identify what we define as “functional units” and Team leaders as senior scientists within INGV who lead particular activities and functional units. The Department Director and Team leaders form the science leadership and management function of a Department. A functional unit lies within a Section and is comprised of staff and research facilities that have some clear purpose or function. Examples might be a research unit concerned with development of a seismic hazard database or volcano modeling. In some cases functional research units within a Section might be entirely self-contained, while in other cases there may be two or more functional units in different Sections that are covering the same kinds of research. In these later cases the Directors of relevant Departments and Team leaders have the task of coordinating the activities. To give one example modeling of volcanic processes takes place at several INGV sections. If it was thought appropriate to have a Volcano Modeling Theme Leader within the Volcano Department then the Team Leaders task would be to coordinate and integrate the modeling research. Multidisciplinary research on themes or topics will continue to be an important part of INGV research. The introduction of the Coordinated Transverse Theme concept (TTC) has already been introduced to address multidisciplinary issues and themes. The new structure provides the opportunity for the TTC concept to develop and fulfill expectations. Directors of Departments can work with Team leaders to involve the key functional research units to address TTC topics.

There are also important laboratories within INGV, which range from specialist research to those that provide an analytical service to INGV. Laboratories will typically be hosted in a Section but may provide support for more than one of the Departments. There may also be functions that do not fit into research or laboratories so we recognize that more kinds of functional unit might well be identified as the details of this organization are considered. We suggest that Directors are responsible for defining functional units through discussion with INGV staff. There are also facilities that relate to services (e.g. finance department, travel, library, computing etc). Some of these may be most appropriately regarded as part of the central administration while others may be better within Sections.

A key change in this scheme is that the post of Section Director will be less prominent and will effectively be replaced by Department Directors in their role as the core senior management. Directors will work together to be responsible for allocation of resources to the Sections. The Director of a Section will be more of an administrative post in most Sections, except for the Volcano Observatories and National Earthquake Center. The scheme also proposes a new senior scientist role called "Team Leader" that will provide opportunities for the best scientists within INGV to play a leadership role. Each Department will have a number of Team Leaders. It is likely that some Team Leaders will manage functional research units located in several of the Sections and their job will be to integrate and co-ordinate researchers with common interests that are geographically separated. There may be a case for Team Leaders that are in two Departments where the nature of the research is very multidisciplinary. A team Leader may lead on some key INGV research topic or discipline and it will be the task of newly appointed Department Directors to decide on the number of Team Leaders. Volcano Observatory Directors will be Team leaders. In the case of Volcano Observatories the Committee thinks that it is vital that the Director is a scientist of stature and experience who can be a point of contact for local officials and fulfill the onerous functions of leadership during a volcanic emergency. We do not stipulate how many Team Leaders there might be, but recommend that the numbers are not too large and that the themes that they lead are broad-based. In this way the post of Team leader will come to be seen as prestigious. In comparison to the current structure, if each Department had 3 Team leaders then the number of senior posts for scientists in INGV would increase from the 9 Section Directors to a mixture of 3 Department Directors and 9 Team Leaders. This structure might be more attractive to scientists who would be relieved of more routine administrative tasks.

There was some discussion of the idea that there should be more than three major Departments. The Committee did not agree with this idea and think that it is much better to start with a very simple system that could evolve to something more complicated if necessary. Further subdivision for example into a Natural Hazards Department and Monitoring Departments would in our view separate research and activities that are intimately bound together and goes against the trend towards broad multidisciplinary research on volcanoes, earthquake and the environment.

We recognize that financial control, budget setting and related responsibilities play a key role in management of large scientific institutions. We did not have time to discuss these matters in any detail and recognize that there will be a need for clarity on finances. There will need to be detailed discussions on who decides and how budgets relate to the components of the organizational structure (Departments, Sections, Functional units and Groups of researchers under the line management of Team Leaders). Indeed, the success of the organization is likely to depend strongly on what is decided in terms of budget allocations.

Some international comparisons

We recognize that approaches in other countries are not always easily transferred to another. Cultural and national characteristics can play a major role in determining what works and there are also institutional traditions and legacies, which are important and valuable. However, it is always worthwhile seeing what others do or have done. Many research institutions round the world are facing broadly similar problems to INGV which include changing expectations among Governments and the public on what they expect from research, reducing budgets and threats of down-sizing. Typically the mantra seems to be “more for less” and this inevitably places great stresses on institutions and individual researchers. INGV is not alone!

In the last few years the British Geological Survey (BGS) has been through major changes, which have some parallels with INGV. One of us (Sparks) sits on the advisory Board for BGS and has seen these changes enacted. One major pressure on BGS has been to shift more of its activity towards research and away from what in the UK is termed “national capability” which is short hand for activities like geological mapping, providing geoscience information, archiving and developing databases, monitoring and other forms of survey. Approximately 10% of its core funding is being reduced over a 5-year adjustment period and BGS are being asked to reclaim this money by submitting competitive research proposals to NERC (the national research funder). BGS are also, like INGV, finding external income harder to get. The environment has meant that BGS is slightly shrinking both in terms of staff and income. Compulsory job losses have been avoided so far, but it seems likely that the newly elected UK Government will soon start some severe cutting of the public sector just as the Italian government has.

BGS recognized that its old organizational structure was not longer adequate to deal with these challenges and has substantially re-organized over the last 3 years. This was a sometimes painful exercise. Essentially the major changes were to reduce the size of the senior management to 7 people, including the Director, senior finance administrator and five heads of science activity. Under this management there are about 20 Team leaders who lead either teams of based on sciences themes or activities. There is, for example, a geohazards Team Leader in Edinburgh.

One of the lessons of the BGS re-organization is that change is often threatening to many staff members, especially when the rationale is not explained sufficiently convincingly. The BGS put a great deal of energy into explaining the changes to staff and helping staff to adjust. Even so there were inevitable stresses and tensions. These problems may be more acute at INGV given the very short time that the MIUR re-organization committee has to deliberate and report to the Ministry and the possible cut backs in public sector that may affect INGV staff numbers.

The US Geological Survey is another organization, which has some comparable functions to INGV including earthquakes and volcanoes. It is a much larger and hence more complex organization than INGV. There are five science divisions (e.g. geology, biology, geography, water and geospatial information) with Heads of Division form together with administrative officials the senior management under the USGS Director. In the case of volcanic hazards these are part of the Geology Division with five regional Volcano Observatories. There is a Head of Volcanic Hazards Program based in Reston. In this management structure the volcanic hazard program is distributed between the Observatories and several of the main USGS locations such

as Menlo Park, Boulder and Reston. Notably the distribution of activity between locations does not appear to have adversely effected the operations.

In summary, the re-organization being recommended is analogous to the structure in other comparable organizations.

The temporary personnel problem

This delicate problem has been already addressed by the Committee in its July 2009 report. INGV has a high number of temporary personnel of 285, i.e. 34.2% of the total personnel (832): (see attached Table). The problem is particularly acute in Palermo, where temporary personnel exceed permanent personnel, but it is serious also in Bologna, where temporary personnel are nearly the half of the total.

Temporary vs. permanent personnel

	Temporary	Permanent	%
AC	20	66	23.2
CNT	51	103	33.1
RM1	41	77	34.6
RM2	33	54	37.9
NA-OV	18	97	15.6
CT	41	62	39.8
PA	35	24	59.4
MI	12	19	38.7
BO	25	29	46.3
PI	9	16	36.0
TOTAL	285	547	34.2

The present situation is rather confused. Only for a minority of persons (18) the process of converting temporary into permanent positions has been activated (concorso). Contracts seem to have been renewed for all temporary INGV personnel until December 2012, but it is not clear whether or not their validity still depends on a specific Government authorization. On the other hand, the new financial emergency law just proposed by the Italian Government reduces to 50% the number of temporary personnel of all public administrations. If this limitation should apply also to INGV, the Committee recommends that in selection of the temporary personnel to be retained, meritocratic criteria be used instead of pure seniority.

This recommendation is particularly important considering that the temporary personnel have been recruited apparently without a general strategic plan, but by rather following *ad hoc* opportunities, such as availability of funds from specific projects. Consequently, also conversion of such appointments into permanent positions will not necessarily result in a logical, well thought out plan of personnel distribution among the priority tasks of INGV. Secondly, such a process might compromise for many years the possibility for the Institute to recruit new young brilliant scientists, as well as the unwelcome prospect of losing outstanding young scientists if losses were only based on seniority

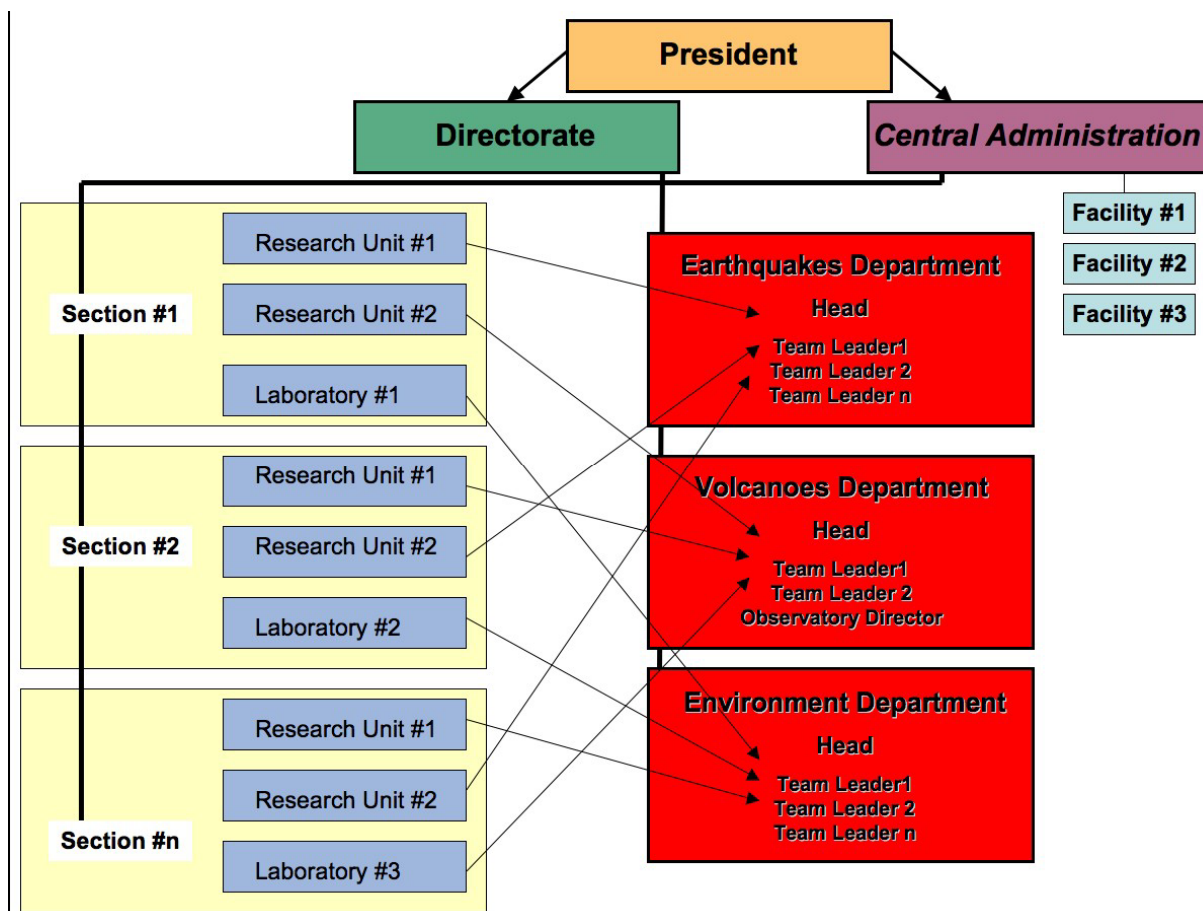
Another matter of concern arises from the high cost of the temporary personnel. In a period of potential budgetary difficulty, the maintenance of such high costs might significantly affect the INGV capability of investing in its priority tasks, as research, renewal of equipment and investment in laboratories and technological facilities.

Joint meeting with the Scientific Advisory Committee

In the morning of May 25 the CIV Committee held a joint meeting with the Scientific Advisory Committee (CCS; Prof. Lucia Civetta, Prof. Peter Suhadolc and Prof. Aldo Zollo; Dr. Massimiliano Stucchi could not attend). The principal point of discussion was the question of reorganization of INGV, which has been described above in detail. Notes from this meeting are attached as Appendix C.

The members of CCS have not discussed the question of reorganization since October 2008, when they provided series of comments to the report of the internal INGV Committee listed on page 3 of this report. However, in the joint meeting of CCS and CIV a consensus was developed that a matrix-like structure with three Departments (columns) and Sections (rows) be adopted. Instead of each current Section being assigned to a single Department, we think that Research Units (similar in structure to the current Functional Units; elements of rows in the matrix analogy) should be associated with a particular Department. A schematic proposed organizational structure is shown in the attached figure. A Section that have Research Units that would be associated with more than one Department (the Bologna Section is a good example). The current TTC's would be replaced by Teams, which would coordinate research or monitoring activities that take place in different Sections. The Teams would be led by Team Leaders, who would report to Department Directors. The role of current Section Directors would become more administrative in nature, with the principal responsibility of a Director being the oversight of Section's infrastructure and common services, scheduling seminars etc. The Sections that have the responsibility for responding to emergencies and informing the public (Naples, Catania, CNT) may require a variation in their structure that would make it more flexible in special circumstances. Their Directors may have a responsibility for operation of the Section as a unit in time of an emergency.

There followed discussion regarding cooperation of INGV with Universities. The meeting participants expressed an opinion that INGV does not make sufficient use of this resource. It was proposed that some Research Units could be located at Universities and be linked to an appropriate Department. It is an issue that keeps returning at CIV and CCS meetings and the hope is that the reorganization may help to achieve progress in this direction.



Suggested organizational chart of the INGV. Individual Research Units or Laboratories are connected to different Departments. The Teams, roughly equivalent to the present TTC's, will have Team Leaders who report to Department Directors. It is important to emphasize that all participants of the joint meeting were in favor of the principle of this solution.

Presentations on New Research Directions and Outreach

The Committee was pleased to have the opportunity to hear five research talks as examples of outstanding research within INGV. In addition there was a presentation of INGV Education and Outreach activities. The Committee records its thanks for the presenters who gave fascinating and engaging talks. The talks were as follows:

Sara Barsotti (INGV Section Pisa)

Modeling volcanic ash cloud dispersal for hazard assessment purposes

Roberto Basili (INGV Section Roma 1)

Toward a global seismogenic source database

Giulio Di Toro (Univ. of Padua & INGV Section Roma 1)

Uncovering the secrets of an earthquake: a multidisciplinary study of an earthquake fault

Antonella Longo (INGV Section Pisa)

Numerical simulation of underground magma dynamics and associated geophysical signals

Roberta Tozzi (INGV Section Roma 2)

Geomagnetic jerks: observations and their implication on the Earth's interior

The talks illustrated the diversity of INGV research from theoretical modeling of ash transport and magma chamber dynamics to seismic database and analysis to experimental studies of rock deformation along faults to analysis of data on jerks in the magnetic field.

The modeling presentation demonstrated that INGV (Pisa Section) is a World leader in development of complex models of volcanic processes and magma dynamics. These models have the potential to greatly improve understanding of how volcanoes work, facilitate interpretation of geophysical data during periods of volcanic unrest and eruption, and for better forecasting. The Committee had some concern that modelers should work more closely with other specialists to constrain parameters, parameter uncertainties and boundary conditions. The committee likewise had concerns that research models of complex processes which still have significant limitations might be developed into operational tools for hazards assessment and forecasting tools prematurely. The development of the seismic hazard database is impressive and is being well coordinated with other international efforts. The combined study of faulting through field studies and experiments is an exciting venture. INGV has developed unique apparatus, which can achieve power output comparable to that expected in large earthquakes. Dramatic examples of experiments with flash melting were shown and this research area has great potential to improve understanding the physics of faulting. The research on geomagnetic jerks has developed improved ways of analyzing data from geomagnetic observatories and in particular identifying jerks and mapping how they spread around the Earth. The distinction was made between global and local jerk events. The results of this study invite complementary theoretical research and INGV should consider developing collaborations with theoreticians.

The Outreach talk by Giuliana D'Addezio of Centro Servizi (INGV, Roma) "*Outreach Activities: Past and Future*" demonstrated the wide range of educational products and activities carried out by INGV to raise awareness about geological hazards in the community. It was clear that the outreach staff is committed and enthusiastic. The Committee thinks that, to reach a wider audience, this program could be strengthened by an advisory committee that would include teachers and other experts on education.

INGV leadership in international research projects

During the past few years INGV has engaged in at least three major international research efforts. This is creating an unprecedented opportunity for INGV to contribute to science in the wider international arena and to promote top-level training and cooperation opportunities for its younger scientists. Two of these efforts, EMSO and EPOS, were proposed by a dedicated group of experts representing EC-member countries called European Strategy Forum for Research Infrastructures (ESFRI), a panel in charge of developing roadmaps for major research infrastructures at European level.

EMSO, the European Multidisciplinary Seafloor Observatory, is a large-scale European Research Infrastructure. EMSO will be based on a European-scale network of seafloor observatories and platforms with the basic scientific objective of long-term monitoring, mainly in real-time, of environmental processes related to the interaction between the geosphere, biosphere, and hydrosphere, including natural hazards. It will be a geographically distributed infrastructure composed of several deep-seafloor observatories that will be deployed on specific sites around European waters, reaching from the Arctic to the Black Sea passing through the Mediterranean Sea, thus forming a widely distributed pan-European infrastructure.

INGV is the leader of EMSO PP, an infrastructure project launched in April 2008 for 4 years with the main objective of establishing the legal and governance framework for the infrastructure serving scientists and other stakeholders in Europe and outside Europe for long-term deep water observation and investigation. This framework will enable the deployment of the infrastructure and its long-term management.

The second initiative, EPOS, aims at creating a single sustainable, permanent observational infrastructure, integrating geophysical monitoring networks (e.g. seismic networks), local observatories (e.g. volcano observatories) and experimental laboratories in Europe and adjacent regions. It will provide open access to distributed geophysical and geological data and modeling tools, enabling a step change in multidisciplinary scientific research into natural hazards, environmental change, and energy resources. It will also build a strongly competitive European research infrastructure providing a radically new landscape and widening horizons for solid Earth science research in Europe through a comprehensive e-infrastructure. Finally, EPOS will foster trans-national coordination of solid Earth observing systems at the European level and promote cross-disciplinary approaches to challenging scientific and technological issues in Earth sciences through links with marine and space observations. INGV is one of the main partners and of the leading institutions for EPOS.

GEM is a worldwide initiative based on a public/private partnership initiated and approved by the Global Science Forum of the Organisation for Economic Co-operation and Development (OECD-GSF). GEM aims to be the uniform, independent standard to calculate and communicate earthquake risk worldwide. With committed backing from academia, governments, and industry, GEM will contribute to achieving profound, lasting reductions in earthquake risk worldwide.

GEM will be the critical instrument to support decisions and actions that reduce earthquake losses worldwide. By providing the information in a manner that is understandable to all users, GEM aims to raise awareness, lead to adoption and enforcement of building codes, promote seismic mitigation, and stimulate insurance use. It aims at constructing the first global, open source model for seismic risk assessment at a national and regional scale, and aims to achieve broad scientific participation and independence.

INGV contributes to GEM as one of the founders of the European Centre for Training and Research in Earthquake Engineering (EUCENTRE), a structure located in Pavia that acts as the Secretariat for the entire project. INGV also participates in GEM with a scientist on the Advisory Board and with various scientists involved in different research modules.

Closing Remarks

The Committee is very impressed with the increasing scientific productivity of INGV. There were 276 publications in JCR journals in 2007, 332 in 2008 (increase of 20%), but 434 in 2009, which represents a 31% increase. Whatever caused this change should be continued, since the quality and quantity of scientific publications led to this note in July 2008: *“In this month's [Rising Star](#) analysis, ScienceWatch.com recognizes the Istituto Nazionale di Geofisica e Vulcanologia (INGV) as having the highest percent increase in total citations in the field of Geosciences from December 2007 to February 2008. According to Essential Science Indicators from [Thomson Reuters](#), the current record of the INGV in this field includes 983 papers cited a total of 4,810 times.”*

The Committee did not select a date for its next meeting, as the need for such a meeting may be determined by the progress on reorganization and other factors.