

## **The Internal Advisory Committee (IAC) and its Review Process**

*IAC Meeting:* 18 July, 2011

*IAC Committee Members:*

Sierd Cloetingh (Netherlands Research Center for Integrated Solid Earth Science)  
Michael Bevis (School of Earth Sciences, Ohio State University)  
Phillipe Beogeault (Meteo France, Toulouse)

The committee received the following documentation:

- The IDL Annual Report for 2010
- IDL Research and Outreach for 2001/2015 (version 1.0)
- The 2010 External Evaluation of Associated Laboratories report on IDL sponsored by the Portuguese Foundation for Science and Technology (FCT)

The review committee attended presentations by the Director of IDL, and each of the ten research groups, and individual presentations by seven of the new researchers. These formal presentations were followed by an open discussion. The committee met with ten research groups for an in-depth discussion of past and present performance, group strategy and scientific planning. During this the committee explicitly addressed issues related to the synergies between research groups, opportunities for the generation of added value, the optimal use of existing resources, and the need for new initiatives to attract funding.

The committee noted with pleasure that most of our previous recommendations had been partially or fully implemented with the encouragement of IDL's leadership.

### **The Overall Structure of IDL**

The committee feels that IDL has made excellent progress in consolidating itself in the aftermath of a major and sometimes stressful restructuring. We think that IDL is lucky to be directed by a fair and insightful leader, Miguel Miranda, and to enjoy the high-level administrative support of the incomparable Celia Lee.

The internal organization or structure of IDL, in terms of its various research groups, etc., is working remarkably well given the recent birth of the organization. It would be unrealistic for IDL to expect that it could immediately crystallize into an optimal organizational structure. Some further readjustment and integration would probably be beneficial, and indeed such readjustments should probably continue throughout the lifetime of the institution, though presumably with a decreasing rate of change. In our opinion this fine-tuning of the internal structure of IDL should be openly discussed so as to promote self-organization rather than a structure largely imposed from above, or on the basis of historical associations.

The committee was pleased to see an increasing number of visiting scientists at IDL.

## **The main accomplishments of IDL**

Funding has grown to 1.9 million Euro *in toto*, which is a considerable achievement given the nature of the global and local economy. Funding from the EU now represents 15% of the total. Several internationally funded initiatives began in 2010. Output from IDL in the area of global and regional climate dynamics has progressed significantly during the last year. Joining the EC-Earth Consortium was a brilliant strategic move, and gives IDL the capacity to contribute to the fifth assessment report of the IPCC. IDL also contributed to the development of improved physical process representation in the EC-Earth code, and as a result the fruits of these labors are now being used by several major European institutions.

The installation of a new video observation for coastal monitoring, the development of software for tide prediction, an award winning tsunami warning system, all serve to bring visibility to IDL, from the scientific community, the media and the general public.

A new geophysical fluid laboratory was set up in 2010 hold considerable potential for new research initiatives and new patterns of cooperation between the research groups.

The applied geophysics group continues to develop useful geophysical software which are freely given to the scientific community.

The Basin Group established a large scale interaction with IFREMER, funded by Petrobras.

The Gulf of Cadiz active sources experiment using OBS's has come to a successful conclusion. This technically difficult project brings increased credibility to IDL.

Several research groups in IDL have made significant contributions to the TOPO-EUROPE and TOPO-IBERIA programs.

IDL has been very active in promoting and running international scientific conferences.

Paleoseismic research has been expanded, and its impact is improved by its contributions to SHARE.

The geological maps of Madeira and Fogo (Cape Verde)

The committee was impressed by IDL's proactive role in the upcoming initiative 'Mathematics for Earth Sciences'.

IDL continues its efforts in outreach, including a revamping of its website.

## **Discussion of individual research groups**

*RG1 – Climatology and Climate Change.* This group makes original contributions to the research lines Global Change and Societal Risk and Meteorology and Climate Research. This involves studies of the links between climate change and atmospheric circulation, and analysis of extreme events. They contribute to reanalysis projects by providing original data, and by conducting diagnostic studies. They maintain good cooperation with RG6 and RG10 on a variety of projects. They have been able to engage in new projects, especially using satellite data. The committee continues to be impressed by the vitality, ingenuity and productivity of this research group.

*RG2 – Applied and Environmental Geophysics.* This applied geophysics group is dominated by shallow and deep electromagnetic (EM) surveying technology and applications. The group has published 17 papers in ISI journals. The EM group is highly productive and well funded. Its links to hydrology seem very promising. The groups software for inversion of geophysical data finds applications all over the oceans. It contributes to the Antarctica program. Its activity in geothermal system characterization could be a major component of the emerging Energy theme within IDL. RG2 continues to develop links to industry.

*RG3 – Coastal Hazards and Warning Systems.* This coastal hazards group is quite small, but it is remarkably positive and well focused, and has been able to identify and implement some well thought-out strategies for building its importance and external funding levels. Its present focuses include cliff monitoring, beach dynamics, and short and long term sea level change. It published 8 papers in 2010. The committee feels that its access to the IDL's new LIDAR will drive up its publication. We are impressed by its work in sea level monitoring, and imagine this could encourage additional visitors to the IDL website.

*RG4 – Seismology and Earth Tomography.* This seismology group is fairly small but does excellent work in seismic structure and seismicity studies, and has established a high international profile. It is well embedded in major European research initiatives, including TOPO-EUROPE and the European Plate Observing System (EPOS). The group's research has a strong regional flavor, even while addressing problems of great international interest such as the detection of volcanic plumes in the Azores and Cape Verde islands. They are an active contributor to the TOPO-IBERIA program, and, as such, they investigate the connection between deep earth structure and processes in West Iberia and the Gulf of Cadiz. They contribute in a very significant way to IDL's overarching theme in Natural Hazards. Their research on plumes holds great potential for synergy with other IDL research groups.

*RG5 – Earth Dynamics.* This newly renamed group has undergone significant reorganization and has reshaped its research and teaching functions. It has constructed a new laboratory for geophysical fluid dynamics, and has set up a new research initiative in landslides. It published 20 papers in high quality journals. It

has developed a new course in geodynamics, tectonophysics and modeling. RG5 has re-positioned itself so as to allow improved interaction with the other solid earth groups in IDL. The group organized the successful international conference GeoMod2010 in Lisbon.

*RG6 – Atmospheric and Climate Modeling.* This group builds on a tradition of modeling and process-oriented studies in meteorology, which is an asset for its engagement in the EC-Earth consortium. The selection of 12 papers published in 2010 is inspiring. The group has made a strong investment in the development of the EC-Earth climate modeling system, in cooperation with RG10. This is now coming to fruition with the production of a first global scenario as part of the CMIP5 project. The group is also developing a regional climate simulation capability based on the WRF model. It will focus on the Portuguese islands Azores and Madeira, and parts of Africa. The committee supports the objective of developing expertise on the impact of climate change on solar and wind energy resources, as this will allow integration within the future research line on Geo- and Renewable Energies. We noted the successful posting of several of this group's Ph.D. students into leading international institutes.

*RG7 – Earth Observation and Space Geodesy.* The group has reorganized to accommodate a new member who has taken over the leadership of RG7. The committee was impressed with her emphasis on the need for more strategic planning, and the need to improve the group's publication rate. Access to the new LIDAR instrument might prove help, in this regard. The data organized the DAMES 2010 conference in Lisbon. It has stepped up its crustal motion work in the islands, but has made little progress on synergizing with RG 8 on active tectonics and natural hazard research in the Portuguese mainland.

*RG8 – Seismic and Volcanic Hazard.* The group has been very active in paleoseismology investigations in mainland Portugal and the Anatolian Fault in Turkey. In addition the group has cooperated with the European projects SHARE by contributing their data from Portugal into this wider database. The group is further pursuing neotectonic studies of the Azores, and is involved in oceanographic research connecting active structures offshore from Iberia to neotectonic structures apparent on-land. The committee noted with pleasure that this groups geological maps of Madeira Island and Fogo Island are now complete and will soon be published. We continue to recommend that RG8 and RG7 synergise so as to establish the contemporary rate of crustal straining in this region using crustal motion geodesy. If crustal strain rates are so low as to be undetectable, then seismic hazard may be overestimated. But if strain rates are detectable, then measuring them provides a unique opportunity to quantify the level of risk.

*RG9 – Sedimentary Basins.* Sedimentary basins are at the heart of the integration between deep earth and surface processes, and have considerable economic importance. This group engages in basin research through a combination of data acquisition, processing and analysis, as well as through analog and numerical

modeling. They are very successful at collaborating with outside scientific groups, as well as in establishing partnerships with the international petroleum industry in particular in the domain of rifted continental margins. The group is a partner in the TOPO-EUROPE program and the European Plate Observing System, and is associated with the international Basinmaster M.Sc. program. The committee recognizes the high potential for the petroleum geosciences training program set up by this group. Their research also holds a great potential for participation in international collaborative research efforts in geothermal energy and CO<sub>2</sub> sequestration. Considering their momentum and productivity this group deserved and would benefit from a permanent research position.

*RG10 – Land-Climate Interactions.* The group focuses on the study of the covariability of land surface variables and climate. It builds on strong synergies with IM, especially the common involvement in the long-term international projects LSA-SAF of EUMETSAT and GEOLAND of GMES. It also has strong cooperation with RG1 and RG6, on the representation of surface processes in EC-Earth, on the production of the global scenarios for the 5<sup>th</sup> IPCC Assessment Report, and the detection and mapping of wild fires from space. The group has the potential to make further major contributions on surface hydrology, both in terms of reanalysis of 20<sup>th</sup> century data and projections for the 21<sup>st</sup> century. The committee continues to be impressed by the productivity of the group, both in terms of publications (16 papers in 2010), and in terms of high potential data sets that can be used to initiate new collaborative projects.

### **Seminars**

The committee is delighted to see the success of the new IDL Lecture Series. We like the idea of having an overarching theme for each semester, and the number of lectures (about 6/semester) seems reasonable too, because it leads to an emphasis on quality rather than quantity, and it leaves room for parallel lecture series with a more consistent focus, such as the Atmosphere & Oceans seminar series. The latter series also seems to be enjoying considerable success, and we suggest that it might serve as a model for additional ‘focused’ lecture series. For example, a “Geodynamics” series might attract members of RG 2, 4, 5 and 7 and encourage them to build new synergies. Seminars also help new members of IDL to integrate into the institution.

### **GENERAL OBSERVATIONS AND RECOMMENDATIONS:**

#### **Integration and Synergy**

IDL should continue its efforts to generate new synergies between its different research groups. Identifying overlapping interests (e.g. landslides, geothermal energy) in the various research lines is a good place to start. Sharing of instruments and facilities, such as the new LIDAR, may also help in this regard. We suggest that in futures version of the annual report, the present discussion organized by research groups might be preceded by a present of the research lines, many of which involve more than one research group. This section might mention common publications,

and the complementary nature of the activities of different research groups. A clear potential exists for promoting integrated solid earth science with significant added value in understanding the earth system, and also for its applications in energy, natural resources, natural hazards, and the environment.

### **Technical Support**

Many groups have expressed an urgent need for technical support, and the committee recommends that IDL sets up committees on the sharing of technicians and related resources, to maximize the benefits of past and additional investments.

### **Facilities and Instruments**

Similar consideration to those expressed above apply to the needs associated with computer clusters. There are operational clusters, and needs to additional computational resources, and the committee feels that IDL needs to invest in multiple use computer facilities to the maximum extent that it can.

The institute seems to be lacking a common, robust data storage system operated by a professional computer specialist. Given that resources are tight, perhaps it would be attractive to develop a shared data storage system.

### **Publications**

We fully endorse the strategy of publishing in high quality, peer reviewed journals.

### **Attracting Ph.D. Students**

The committee is impressed with the quality of the graduate students in IDL, and their research output. But we note that almost all groups seem to have difficulty recruiting new Ph.D. students. This might be related to strong international competition for highly qualified students, and because the opportunities for well paid careers in the oil industry is encouraging solid earth students to attend universities that have stronger programs in this general area. The creation of a new energy research line – particularly one focusing on traditional and alternative energy sources – might help improve the recruitment process. The new courses in Petroleum Geology and Tectonophysics will also be beneficial.

### **Internationalization**

The committee notes an increasing number of international researchers within IDL, and applauds this development. In this context, the rising international profile of IDL can help it engage in greater numbers of international research projects, better pursue European Community funding, and compete for industrial funding from multinational corporations such as the major oil companies. The recently established funding schemes of the European Research Council (ERC) present a new class of opportunity for IDL research scientists, including ‘starting grants’ for young researchers with 2- 8 years of experience following their Ph.D. The IDL leadership is encouraged to identify potential candidates within an external to IDL, to coach them, and encourage them to apply.

## **SOME SPECIFIC OBSERVATIONS AND RECOMMENDATIONS:**

### **The emerging Energy theme**

We support IDLs emerging theme in Energy, both in the conventional hydrocarbon area, and in alternative energy sources such as hydrothermal, solar and wind energy. The committee is particularly intrigued by the idea of adding a new group to IDL with a specialty in solar energy and energy efficiency technologies. This could provide critical mass to the Energy cluster of activity, and bring new classes of talented students into IDL. We support IDL's decision to add a new research line in Energy, including geothermal, wind and solar energy production, and also carbon sequestration research. We note that alternative energy research may help IDL recruit additional students. The new course on Petroleum Geology provides balance, and may encourage additional interaction with oil companies.

### **Unite IDL in a single building**

The committee believes that IDL would benefit by housing all of its people in a single building. Physical separation tends to suppress the development of synergies between the research groups. Even greater benefits would ensue if IDL, Geology and Physical Geography could obtain adjoining spaces. This would not only foster new classes of research activity, but it might help IDL in its student recruitment.

### **Development of Climate Services**

The development of climate services is on the agenda of many institutes and government agencies worldwide. For instance, the World Meteorological Organization has recently taken steps for the creation of a global framework for climate services. In this respect, the committee was pleased to hear that IM and AEMET have concluded an agreement to jointly develop a virtual center for climate services in Iberia. IDL has several assets to contribute to this undertaking: (1) their role in the development of the EC-Earth Climate Modelling System, and their shared work with IM on climate scenarios, (2) their observational data sets, (3) previous agreements with IM concerning data rescue and digitization. The committee believes IDL should have a broader agreement with IM to define how it will contribute to Iberian climate services, with due regard to protecting its visibility.

### **Build a CGPS network in mainland Portugal**

In an era of restricted budgets, it makes sense to invest in multiple-use instruments, such as the new Lidar, which can benefit several different research groups, and even drive new patterns of collaboration. The committee believes that continuous GPS (CGPS) networks are multiple-use instruments *par excellence*. CGPS networks can be used to study active tectonics, absolute versus relative sea level change, hydrology, atmospheric water vapor and space weather, in addition to providing a spatial reference system for surveyors and engineers. Unfortunately, the various groups in Portugal that own CGPS stations tend not to share their data freely, and often put their antennas on buildings or poorly conceived monuments that limit their value for crustal motion geodesy. This committee has repeatedly recommended that the natural hazards group and the geodesy group collaborate by

constructing a GPS network that can measure crustal strain in Portugal. But we sense that the geodesy group is not much interested in spending a lot of time doing GPS fieldwork. Therefore we suggest that IDL focuses its geodetic efforts in the mainland on slowly building a CGPS network, perhaps two or three stations per year, purchased using IDL funds. The advantages that we perceive are (1) CGPS stations can more quickly and more reliably resolve the small crustal strain rates anticipated for Iberia, (2) IDL could demonstrate to other groups in Portugal how to construct appropriate monumentation for their antennas, (3) by making the IDL GPS network data freely available over the internet, it could build a community of users, and put pressure on other groups to open up their data sets, and (4) in this way IDL to lead the development of national consortium of organizations with an interest in GPS, and bring about a much improved national GPS network.

### **Outreach**

The committee believes that IDL shares with other institutions a responsibility to engage in the public debate on the detection and attribution of climate change.