

## MAP:GAC Community Communications Sub-project in Ecuador

Ministerio de Energía y Minas (DINAGE) – Provincial Counsel of Loja – Regional Office of Public Works for Loja and Zamora – Regional Office of Mining for Loja – Provincial Office of Civil Defense in Loja – Municipality of Loja – Programa Regional para el Desarrollo del Sur del Ecuador (PREDESUR) – Universidad Técnica Particular de Loja

### Pilot Project: Community of Reinaldo Espinoza

The province of Loja is subject to frequent landslides, putting the population in a scenario of latent risk. This risk is intensified by the rapid expansion of population centres without adequate planning.

In trying to solve this problem, it is important to consider prevention, which should be part of a state policy regarding an awareness of the environment and a need to coexist with, but be prepared for, natural hazards. This should be a continuous process at all levels of society, bringing together stakeholders ready to commit to a true culture of prevention.

With this in mind, MAP:GAC has designated the development of Reinaldo Espinoza as the Community Communications pilot project area in Ecuador. Reinaldo Espinoza, a community located within the city of Loja, was affected by landslides in 1983 and 2001. The most recent event destroyed a number of homes, but fortunately did not cause any fatalities. Land deformation can still be observed, as well as fractures and subsidence of walls and floors in some buildings.

This recent landslide experience is now being used positively to foster a culture of disaster prevention among the population in places directly and indirectly affected by geological hazards. As considerations and needs are identified in this case, the goal is for communities and local and national authorities to replicate the experience and apply their new knowledge to other areas and situations.



Building route signs in Reinaldo Espinoza.

Community meeting in the development of Reinaldo Espinoza.

The program in the community of Reinaldo Espinoza is working through three principal steps in its methodology:

- 1) Identifying the cultural and socioeconomic reality through a detailed analysis of the study area.
- 2) Obtaining inter-institutional support from local private and government institutions.
- 3) Proposing urban intervention strategies based on the two previous phases.

The strategic action plan for Reinaldo Espinoza includes:

- A cultural-socioeconomic diagnostic report on the community of Reinaldo Espinoza.
- Informational and training workshops to raise public awareness of existing hazards and methods of mitigating the risk.
- Signs for roadways in the community of Reinaldo Espinoza.
- Community meetings to engage the population.
- Creation of prevention and emergency plans for the community and Dr. Reinaldo Espinoza School.
- Educational talks in the school located in the study area.
- Incorporation of geological hazard topics (specifically landslides) and prevention into the curriculum of every grade in the primary program at Dr. Reinaldo Espinoza School.

Ms. Sonia Escarate and Mr. Elias Ibadango

## Word of the Month

The word of the month features definitions that are part of a standardized glossary compiled by MAP:GAC's GEMMA group and, in most cases, adapted from the book *Living with Risk*. In this issue, we feature the definition of 'capacity building'.

### Capacity Building

(From *Living with Risk: A global review of disaster reduction initiatives (UN/ISDR)*)

Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk.

*In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society.*

Ms. Malaika Ulmi

### Capacity Building



Community meeting with the residents of Reinaldo Espinoza.



Children from Dr. Reinaldo Espinoza School taking part in a talk on landslides.



Multinational Andean Project:

# map:gac

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## From the Manager's Desk

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This month I am pleased to point out that most of the content of this newsletter is made up of contributions from the MAP:GAC participating countries. An article from Colombia outlines how they are using advanced GPS measurements for tectonic studies; Chile writes about a debris flow; and two articles from Ecuador talk about training they are doing in differential GPS and progress in Community Communications. I hope the breadth of articles demonstrates the work that is being done by the countries.

Mr. Romulo Mucho Mamani, president of INGEMMET since August 2001 and recently named Vice-Minister of Mines, will be leaving his posts soon to take up a position in the Peruvian Congress. Mucho has been the Project's Executive Secretary since October 2004, and with his departure from INGEMMET, he will also step down as Executive Secretary. Firstly, we would like to take this opportunity to thank him for his support and promotion of the philosophy and ideals of the Project during his tenure as Executive Secretary, and secondly I thought I would use this opportunity to outline the roles and responsibilities of the position.

The Executive Secretary of MAP:GAC is elected from the national directors of Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela. So far Mr. Ricardo Troncoso (Chile) and Mucho (Peru) have held the post for the Project. The Executive Secretary has specific duties such as chairing the Executive Council meetings and calling these meetings when necessary. The Executive Secretary's greater role, however, is assisting the Project in moving forward by helping the Executive Council review the work of the Project and the effectiveness of the multi-country, bilateral, and individual country work in fulfilling MAP:GAC goals. Within the Executive Secretary resides the role of steward of the Project. Ultimately, the Executive Council, under the leadership of the Executive Secretary, is responsible for achieving the Project's stated outcome of improving the quality of life for peoples of the Andes by reducing the negative impact of natural hazards (volcanoes, earthquakes, and landslides). The influence of the Executive Secretary can help focus this influential group toward promulgating the ideas, concepts, and methodology of the Project both more broadly within their own institutions, and also to other agencies in their countries. The Executive Secretary can also be extremely influential in assisting the horizontal integration between the countries and promoting each country's ownership of the Project (rather than Canada) especially in an Andean context.

We are looking forward to working with the new Executive Secretary to be elected during July's Executive Council meeting.

Dr. Catherine Hickson

## Venezuela and Peru: MAP:GAC Landslide Courses



Participants in the first MAP:GAC Landslide Course in Venezuela visit the area of Minal, Montalban river basin, an area affected by debris flows.



Participants in the second MAP:GAC Landslide Course in Peru visit Paihua, an area in the Paihua river basin affected by rotational slides, rock falls, and debris flows.

The first two MAP:GAC landslide courses were taught in Merida, Venezuela, and Lima, Peru, in July 2005. The course program includes three days in a classroom (for a total of 22 lectures) and two days of field training, providing instruction to junior geoscientists in planning, conducting, and reporting on landslide studies. It covers topics in landslide identification, classification, and terminology; landslide mechanisms, rock and soil mechanics; Quaternary dating techniques; landslide monitoring techniques; hazard assessment and mapping; and risk management.

The course was designed exclusively for MAP:GAC country partners by Dr. Reginald Hermanns in collaboration with Dr. Lionel Jackson and Ms. Monica Jaramillo. It incorporates material from previous seminars and courses taught within MAP:GAC.

Hermanns and Jaramillo taught the first landslide course to representatives of INGEOMIN and local institutions in Merida, Venezuela from July 4 to 8, 2005.

A total of 14 staff members from the INGEOMIN Merida, Trujillo, and Caracas offices attended the course, as well as 12 participants from local institutions including the University of the Andes, Institute of Photogrammetry, the Institute for Natural Hazards Management of the Province of Merida (IMPRADEM), the Foundation for Seismic Risk Prevention (FUNDAPRIS), Institute of Civil Protection, and Venezuela's Ministry of the Environment and Natural Resources. The course was held at the Universidad de los Andes and organized by INGEOMIN, and the field trip was collaboratively planned by the same two institutions.

The course in Peru was taught by Hermanns at the INGEMMET office in Lima and in the Paihua basin from July 18 to 22, 2005 to seven employees of INGEMMET and one participant from each of the Universidad Nacional San Antonio Abat (Cusco), the Instituto Geofísico del Perú, and the Colegio Ingeniero del Perú.

In both countries, the course was very highly rated by the participants; hence, it is recommended that junior scientists from countries where this course will not be offered participate in upcoming courses. Future courses will be held in Ecuador and Bolivia in September and October 2005, respectively.

Ms. Monica Jaramillo and Dr. Reginald Hermanns

MAP:GAC Newsletter  
Production Team

Editor-in-Chief:  
Catherine Hickson

Features:  
Oscar Cerritos  
Mike Ellerbeck  
Jennifer Getsinger  
Claudia Goycoolea  
Reginald Hermanns  
Lionel Jackson  
Monica Jaramillo  
Otto Krauth  
Paul Rovers  
Mark Stasiuk  
Malaika Ulmi

Design & Layout:  
Loretta Wong

Translation:  
Malaika Ulmi

Geological Survey of Canada  
101-605 Robson Street  
Vancouver, B.C.  
V6B 5J3  
Tel: 604.666.0183  
Fax: 604.666.7507  
Email: [map@pma-map.com](mailto:map@pma-map.com)  
Web: [www.pma-map.com](http://www.pma-map.com)

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## Geodetic Satellite GPS Applications at INGEOMINAS



Installation of a GPS antenna on a constant-height base.



Antenna mounted on a wooden tripod.



Group discussion and planning for proposed field work.

Geodetic GPS satellite applications for geodynamic uses were first applied in Colombia at INGEOMINAS in 1988 as part of the CASA Project (Central And South America GPS Project). CASA was sponsored by the National Science Foundation, the National Aeronautics and Space Administration (NASA), and institutions from five countries (Costa Rica, Panama, Venezuela, Colombia, and Ecuador), which allowed for the creation of an initial network. Since the completion of CASA in 1998, INGEOMINAS has continued with the project's objective, creating what has become known as GEORED (Geodesia: Red de Estudios de Deformación). The purpose of GEORED is to take direct displacement measurements due to inter- and intra-plate deformation, which is basic for understanding deformation kinematics in northwestern South America. GEORED is thus a continuation of GPS activities initiated by INGEOMINAS, using CASA as a reference base.

It is suggested that a regional geodetic satellite network for geodynamic purposes could be a relevant and integral addition to the hazard programs of participating countries. This regional network would involve a variety of activities: constructing the foundations for installation of GPS instrumentation; setting out information specifications; determining the required instrumentation and observation times; data processing; and analyzing and interpreting the information on a regional, national, and local scale. As such, the Andean Deformation Studies Network, through proposed technical geodetic satellites (GPSANDES), would work toward establishing geodetic stations in all countries associated with the Project—Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina. This would mean covering most of the South American Andes, which are characterized by active volcanoes and earthquakes.

1. Coordination of an equipment loan for the October 2005 field campaign.
2. Meeting to identify geological structures to be the focus of monitoring within MAP:GAC.
3. Preliminary design of potential GPS station sites. Field exploration and site selection will take place in August 2005, with construction of station monuments in September 2005.
4. Preliminary design of the mounting system for the constant-height GPS antenna, in order to analyze the vertical component of land motion.

Due to an earthquake on November 15, 2004, some stations were engaged in southeastern Colombia that had been used in September and October 2003 as part of the micro-zoning seismic project in Santiago de Cali, one of the three biggest cities in Colombia. Within that project, and throughout the year in other locations, the Ashtech choke-ring antennas acquired through MAP:GAC have been used.

Dr. Héctor Mora-Páez  
Volcanic and Seismologic Observatory  
hmora@ingeominas.gov.co

## International Volcanic Health Hazard Network: New Standards

The International Volcanic Health Hazard Network (IVHHN) is a multidisciplinary group of experts from 25 organizations that collaborates to determine the health effects of volcanic emissions. The network produced a new set of guidelines for ash sample collection and dust mask recommendations in May 2005.

The new procedures outline techniques for the collection of samples for various analysis purposes (i.e. health hazards, chemical analysis, or grain size analysis). Recommendations include desiccation temperatures, required volumes, collection devices, methods to avoid contamination, labelling information, and monitoring techniques.

The dust mask recommendations offer background on risks and suggestions for various levels of exposure. Standards and comparative specifications are listed and tips for purchasing and fitting the masks are included. Along with the recommendations are references that list sources for purchasing masks, international guidelines, and fitting instructions from various companies and countries.

Information from the IVHHN and these new standards can be found in English and Spanish at [www.ivhhn.org](http://www.ivhhn.org). Additional standards and guidelines for volcanic gases and ash grain-size distribution analysis are also available from the site.

Ms. Malaika Ulmi

A first attempt at fulfilling these objectives would be the development of a geodetic GPS satellite network along the Colombian–Venezuelan border as part of an integrated seismic hazard evaluation by the two countries.

In the first part of 2005, initial conceptual discussions took place regarding the configuration and extent of the proposed network in northeastern Colombia. As part of this plan, the following action items were carried out:

## Differential GPS in Ecuador: Training and Application



Students from the School of Mines, Universidad Central



Personnel from the provincial government of Imbabura

Throughout 2004 and the beginning of 2005, differential GPS (dGPS) training seminars were held in Ecuador for educational institutions (Universidad Central and National Polytechnical School (EPN)), government agencies, and institutions participating in MAP:GAC. A total of 78 professionals and students (26 women and 52 men) attended training in the use and application of dGPS.

Each workshop was divided into three parts: an initial theoretical section, a practical fieldwork component, and a data processing module.

Fieldwork was planned with mobile points and base stations in areas of educational use (topographic data for the university), significance for tourism (La Mitad del Mundo, or “Middle of the World”), and scientific importance



Location of a control point at La Mitad del Mundo (Middle of the World equatorial line monument), latitude 0°0'0", 22 km N of Quito.



Field training in the use of the rover station at Catequilla Hill (Military Geographical Institute (IGM) milestone at La Mitad del Mundo)

(monitoring of Imbabura volcano), illustrating practical uses of the dGPS equipment. In addition, field data were entered in a GeoSemantica project by Imbabura provincial government staff, and included brief site descriptions, maps of ground control points, photos, and a video.

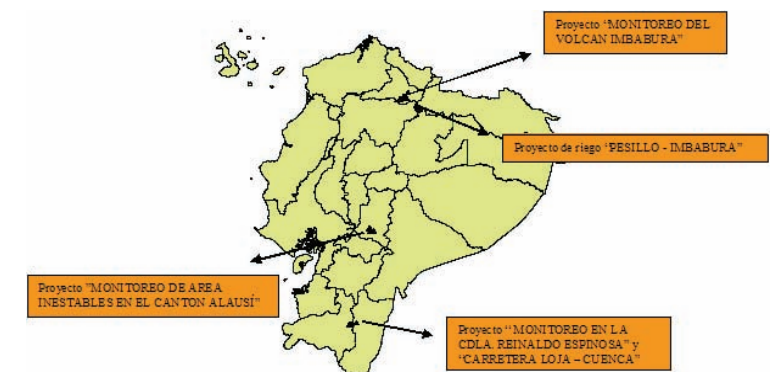
Workshop participants included a multidisciplinary group of civil and environmental engineers, economic geologists, and planners.

Both the availability of specialized equipment and the willingness and interest of authorities to be trained in the latest technology used by MAP:GAC made these activities relevant and well-received by the community. The workshops made clear the ease of use and applicability of dGPS equipment in many fields.

### Use in MAP:GAC Projects

Ecuador has designated five areas for dGPS monitoring, located in the north, centre, and south of the country. Two zones are in the province of Loja—the community of Reinaldo Espinoza, and a section of the Loja–Cuenca highway in the Santiago region. In the province of Imbabura there are control points at Imbabura Volcano and at the irrigation project in Pesillo Imbabura. Similarly, in the district of Alausi in the province of Chimborazo, dGPS is used for control points and monitoring in unstable areas.

Monitoring areas are located on the map:



During the monitoring campaign, data were collected at control points in the community of Reinaldo Espinoza. Variations detected in the range of millimetres could be explained by processing errors. Considering the complexity of the landslide in Reinaldo Espinoza, and the suggestions of visiting technical experts from MAP:GAC, plans were made to establish a network of control points to monitor the entire unstable area.

In the district of Alausí near Gampala Mountain, where there was a landslide in 2003, DINAGE has made a series of recommendations to stabilize the area. These recommendations were received by the municipality of Alausí, and the area is now being monitored by dGPS and showing no evidence of recent displacement.

Mr. Edwin León and Mr. Elías Ibadango

## Appreciation and Best Wishes to Mr. Jacobo Ojeda

Mr. Jacobo Ojeda has left his post as Program Manager in the field of Landslide Hazards Research at INGEOMINAS, Colombia. After more than 10 years with INGEOMINAS, Ojeda has accepted a full-time position as a professor in the Faculty of Engineering at the Javeriana University in Bogota.

Within MAP:GAC, Ojeda was elected as the South American Coordinator of the GEMMA group (landslides working group for the Andean region) in January 2004, and helped formulate and further the goals of GEMMA. Ojeda played an important role in the development of the book *Landslides in the Andean Region: A Guide for Hazard Evaluation*, a multinational product of MAP:GAC.

On behalf of MAP:GAC and GEMMA, we would like to thank Ojeda for his contributions and to wish him all the best in his new endeavours.

Ms. Monica Jaramillo