

## **Monitoring Taal volcano unrest in Philippines with joint Electromagnetic and multi-disciplinary educational EMSEV-PHIVOLCS program**

The Philippines is a developing highly populated country that faces serious Natural Hazards from Volcanic Eruptions and Earthquakes. Therefore, risk assessment is a key issue for Civil Authorities and Official Institutions (such as the Philippines Institute of Volcanology and Seismology - PHILVOCS) responsible for delivering reliable information on volcanic unrest and potential earthquakes. In 2004, a PHIVOLCS-EMSEV agreement was signed. This agreement focused on joint development of Electromagnetic and other geophysical methods in the Philippines, and, in particular, on Taal volcano, and to teach EM methods to young scientists.

The common objective of PHIVOLCS and EMSEV is to develop a new scientific community of both young and experienced Philippine scientists to implement EM methods for the study of volcanoes and earthquakes.

The rationale way to achieve this objective is to combine EM methods with other geophysical methods to study known geophysical hazard. Priority was given to Taal volcano which has exhibited signs of unrest since 1992. The surrounding population exceeds some hundreds thousands of local inhabitants. Recent catastrophic eruptions with surges, pyroclastic flows and phreatic explosions, the weak knowledge of the volcanic structure topped by an acidic hot Crater Lake, and the inadequate monitoring capability led to initiation of a multi-disciplinary program in 2005 in which several international teams contribute to the program. Targets are:

- Characterization of the volcano structure, the geological and regional settings,
- 2- and 3-D Mapping, of the hydrothermal system and of its connection with magmatic sources; using satellite and ground observations,
- Evaluation of the scenarios of future activity (i.e. collapse of crater rims, sudden phreatic explosions),
- Assessment of fluids transfer through the lakes and the volcano. Computation of the volatile and heat budgets,
- Development of continuous monitoring multi-parametric stations with real time data acquisition systems and processing at the local observatory and PHIVOLCS headquarters,
- Implementation of on-line data processing, and development of coherent models of the volcanic activity,
- Training program, invitations to young researchers for short stays in France and Japan,
- Organization of an International Workshop with Asian countries on EM methods in 2009 with the support of EMSEV Inter-Association.

This working methodology will be progressively taken over by PHIVOLCS who will gradually be able to export these techniques to other active volcanoes in Philippines. During each field visit, a joint local meeting identifies the level of knowledge and re-focuses the work plan. Later on, EMSEV will contribute to applying EM studies to earthquake monitoring.