Oral Presentations

Workshop Opening

Strengthening the role of geoelectric monitoring in addressing societal challenges: Past achievements and recent developments at the Geological Survey of Austria (GSA)

R. Supper(1)*

(1) Geological Survey of Austria, Vienna, Austria
* robert.supper@geologie.ac.at

Geoelectrical monitoring is an emerging geophysical method which rapidly developed in the recent past. This success can be contributed to a great extent to the development of reliable, remote controlled data acquisition systems. In the year 2001, scientist at GSA, in cooperation with the Torrent and Avalanche Control of Vorarlberg, started to develop a geoelectrical system specifically designed for monitoring of landslides. A prototype system was installed in 2002 at the landslide of Sibratsgfäll, but a lot of improvements were necessary until in 2007, when the GEOMON4D-II was finally ready for operation. This system, providing full remote control and operation, raw data recording, automatic data transfer and grid autarchy due to a combined solar - fuel cell power supply, represented the basis for the set up of an international landslide monitoring network, installed and operated within the SAFEland (FP7) and TEMPLE (Austrian Science Fund) projects. Experiences from 8 different monitoring sites operated between 2009 and 2014 suggested that several improvements to the system were still necessary: further lowering the power consumption, avoiding Windows system, increasing measuring speed, improving AD converter resolution, switching to constant current injection, recording of the full time-domain signal (including IP) and performing raw signal quality analysis directly during the data acquisition process. These requirements triggered the development of the GEOMON4D-HR system, finally ready for testing in late 2015. However, another backbone for reliable application of the method is data interpretation. Therefore, in parallel to the GEOMON development, based on preliminary contacts established at the NSG conference in Dublin, a fruitful cooperation was initiated between GSA and KIGAM on the development of the proper data inversion routines for monitoring data:

specifically designed for the GEOMON a software bundle, including so far 4D data inversion, data inversion with changing electrode positions, advanced raw data analysis tools and weighted 4D inversion, was developed. The high data quality from the GEOMON system combined with the advanced data analysis capabilities make it now possible to derive reliable information about changes in the subsurface. In 2013 geoelectrical monitoring was applied for the first time during a disaster operation (landslide and dam protection). The success in monitoring and the significance of the method for different applications was recently acknowledged by the Ministry of Science, Research and Economy (BMWFW) by releasing funds to setup a permanent GEO-monitoring data centre in Vienna, which can provide access to external user and to establish an emergency task group. Furthermore, funds could be raised by GSA to apply this method to the monitoring of permafrost, acid mine dumps, groundwater pumping, dams and developing IP monitoring as an extension of the methodology.

Due to the wide range of different applications, today international cooperation is essential to further enhance the acceptance of the method. Therefore, the first GELMON conference was organized in 2011 in Vienna and successfully repeated in a 2 years cycle since then. This conference significantly fostered the international cooperation in this emerging field of geophysics. Due to the wide area of applications it is not surprising that several calls on EC level published for the next years include ground based earth observation. This could give geoelectrical monitoring the chance to be established as a standard core methodology for observing subsurface processes.