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Hydrogeophysical site of "La Soutte" (Vosges, France): First flow models and perspectives

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As already presented at last year EGU meeting, our group has recently started to install a hydrogeophysical monitoring experiment in a small catchment area, a 6-hectare glade at La Soutte (Vosges, France). During 2004, we carried a series of investigations: magnetics, Electrical tomography (2D & 3D), multifrequency electrical conductivity mapping (using GEM-2 of Geophex, Ltd.), Control Source Audio Magneto-Telluric (CSAMT), Ground Penetrating Radar (GPR) and Nuclear Magnetic Resonance Soundings (MRS). Integration of these data allows us to suggest a rough model for the distribution of fractures, granites, volcanic rocks, clay and water contents, and allows us to suggest the existence of small perched aquifers in the first meters of the soil. In addition to a few time-lapse investigations, we have decided to monitor water flows using Self-Potential measurements. Taking account all information we had, we have installed a set up of 40 unpolarizable electrodes (Petiau's porous pots) for SP monitoring in an interesting area, where there are some subsurface water flow. These electrodes are connected to a data logger with 1min sampling rate since last November. The stability of these SP data in time is shown by comparison to meteorological data from a nearby weather station (provided by Meteo-France) and to magnetic data from a nearby magnetic observatory (maintained by our Institute). First models of flow causing these SP data have been obtained by using the electrical conductivity tomography models into forward modelling by finite differences. Presently, we don't know yet either there are different perched aquifers separated by clay layers or a single one of irregular water content within a complex medium of irregular distributions of volcanic rocks and clays. We expect that using a joint inversion of SP monitoring and time-lapse DC where a priori information is added using other hydrogeophysical data will answer this question. Also, from the beginning of spring 2005, a weather station and both borehole and subsoil sensors will provide other continuous measurements.

Such an experiment may contribute to our community in the development of future methodologies of 4D integrated hydrological modelling. Indeed, La Soutte already benefits from multiple supports and collaborations. We specially thank the CNRS for his support in the “WaterScan” project (cf. http://phineas.u-strasbg.fr/WaterScan/) and welcome new colleagues interested in collaborating.