Geophysical Research Abstracts
Vol. 14, EGU2012-11627, 2012
EGU General Assembly 2012

Deep fluids inflows in a deep-seated landslide detected with trace ions and isotopes

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In the deep-seated Ca' Lita landslide (northern Apennines) affecting flysch rock masses, groundwater chemical and isotopic characterization revealed a rising of deep and highly mineralized fluids (about 5,000 μS/cm).
Five years of continuous monitoring of groundwater levels, electrical conductivities, temperatures, hydrochemical surveys (detection of major ions and tracers such as B and Sr) and isotopical analyses (18O, 2H, 3H) were used to gain information about their amount and origin.
The hydrochemical data, coupled with water recharge estimation, allowed to confirm an inflow into the slope in the range of 7,770 – 17,500 m3 per year. It consists of Na-SO4 fluids with non-negligible content of chlorides (up to 800 mg/l), B and Sr (up to 6 and 3 mg/l respectively) .
The δ18O-δ2H analyses show as these fluids are clearly shifted downward from the local meteoric line, while the 3H analysis (3.5 TU) highlights the presence of an old end-member.
Their origin is related to deep oilfield reservoirs. They feed the pressurized aquifer hosted in the flysch below the sliding surface. The unconfined and highly compartmentalized hydrogeological unit laying above and located into the fractured and dismembered rock slide body, showed the presence of deep-fluids too. Due to infiltration of rainfalls and snowmelt waters, the latter assumes a depleted chemical imprint.