



³⁹Ar groundwater dating of a coastal aquifer in the Nam Dinh Province, Vietnam

Christoph Gerber (1), Roland Purtschert (1), Flemming Larsen (2), Hoan V. Hoang (3), Long V. Tran (3), Luu T. Tran (3), Nhan Q. Pham (3), and Jürgen Sültenfuss (4)

(1) University of Bern, Physics Institute, Climate and Environmental Physics, Switzerland (cgerber@climate.unibe.ch), (2) GEUS, Copenhagen, Denmark, (3) Hanoi University of Mining and Geology, Hanoi, Vietnam, (4) University of Bremen, Bremen, Germany

In the south of Nam Dinh Province, Red River Delta, Vietnam, fresh Pleistocene groundwater has been identified to exist next to brackish pore waters in the Red River area (WAGNER et al. 2011). Extensive exploitation of the fresh water results in decreasing groundwater heads and migration of brackish water towards the freshwater (WAGNER et al., 2012).

In order to understand the dynamics and origin of the fresh and saltwater and to predict the future evolution of the resource an extensive investigation using environmental tracers has been carried out. ³⁹Ar, ⁸⁵Kr, ³H/³He and stable noble gas measurements have been used for groundwater dating. Stable isotopes and other geochemical parameters (stable isotopes of the water molecule, water chemistry and gas composition) provide crucial information about the genesis of the water.

Groundwater ages are modern in the recharge area and increase to > 1000 years towards the coast and northwards based on the ³⁹Ar data (T_{1/2}: 269 years). Depleted stable noble gas concentrations correlate with high concentrations of dissolved methane suggesting degassing due to the high methane partial pressure. Physical modelling of the degassing process (AESCHBACH-HERTIG et al., 2008) supported by concentrations of accumulated radiogenic ⁴He indicates that diffusion controlled the observed degassing at a late stage of the groundwater evolution path.

References

Aeschbach-Hertig, W., El-Gamal, H., Wieser, M., Palcsu, L., 2008. Modeling excess air and degassing in groundwater by equilibrium partitioning with a gas phase. *Water Resour Res* 44:W08449.

Wagner, F., Trung, Đ. T., Phúc, H. Đ., Lindenmaier, F., 2011, Assessment of Groundwater Resources in Nam Dinh Province, Final Technical Report, Part A, Improvement of Groundwater Protection in Vietnam.

Wagner, F., Ludwig, R. R., Noell, U., Hoang, H. V., Pham, N. Q., Larsen, F., Lindenmaier, F., 2012, Genesis of economic relevant fresh groundwater resources in Pleistocene/Neogene aquifers in Nam Dinh (Red River Delta, Vietnam). EGU 12. European Geosciences Union, Vienna