Calibration of a reactive transport model to interpret a deep-well-recharge field experiment at Langerak (the Netherlands)

MAARTEN W. SAALTINK [1], CARLOS AYORA [2], PIETER J. STUYFZAND [3], HARRIE TIMMER [4]

[1] Dep. of Geotechnical Engineering and Geosciences, School of Civil Engineering, Technical University of Catalonia (UPC), Barcelona, Spain (maarten.saaltink@upc.es)
[2] Institute of Earth Sciences Jaume Almera, Spanish Research Council (CSIC), Barcelona, Spain (cayora@ija.csic.es)
[3] KIWA Research and Consultancy, Nieuwegein, the Netherlands (pieter.stuyfzand@kiwa.nl)
[4] Water Supply Company Hydron-Zuid-Holland, Gouda, the Netherlands (htr@hydron-zh.nl)

Introduction

Surface water may be artificially recharged into deep aquifers to improve the quality of recharged water for use by water supply companies. To study the feasibility and usefulness, a field test was carried out at Langerak (the Netherlands), where oxic was injected into an anoxic pyrite bearing aquifer. A reactive transport model was used to interpret the results.

Modelling approach

We calibrated hydrological and chemical parameters of the model to field measurements. Moreover, in order to improve matching field data and calculations, we changed or added some chemical reactions to the model.

Results and discussion

The results showed that oxidation of pyrite (FeS_2) and, to a less amount, organic matter dominate the changes in quality of the recharged water during its passage through the aquifer. This leads to the consumption of oxygen and nitrate and the formation of sulphate and ferrihydrite. We also identified complexation reactions, cation exchange and precipitation and dissolution of calcite, siderite and rhodochrosite.

Despite of problems of non-uniqueness of the calibrated parameters, the model could be successfully used to depict the geochemical processes.

Acknowledgements

This work was supported by the Water Supply Company Hydron Zuid-Holland and the European Community (contract: ENV-CT95-0071). The reactive transport calculations were performed with the code RETRASO, developed under a contract with ENRESA (Spanish company for nuclear waste disposal).

Surface temperatures from alkenones in late Quaternary marine sediments

JULIAN P. SACHS[1] AND ROBERT F. ANDERSON[2]

[1]Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA (jsachs@mit.edu)
[2]Lamont-Doherty Earth Observatory, Columbia University, Palisades, New York, USA (boba@ldeo.columbia.edu)

Alkenone Paleotempertaures in Southern Mid-Latitudes

Sea surface temperature (SST) estimates derived from alkenones in Cape Basin sediments (SE Atlantic, 41°S, 8°E, 4981 m) appear to vary inversely with changes in earth's tilt (obliquity) during the last glacial period (Fig. 1B&D).

Sensitivity to changes in obliquity has also been observed in records of deuterium excess (*d*), a moisture source temperature proxy, in central Antarctic ice cores (Vimeux et al., 1999) (Fig. 1D). Because Vostok precipitation derives from the mid-latitude Indian and Pacific Oceans the SST progression we observe in the Cape Basin may be circum-hemispheric in extent. Alternatively, the two proxies may respond to a common forcing for different reasons.

We will test these hypotheses with alkenone SST reconstructions from Cape Basin and other southern hemisphere cores.

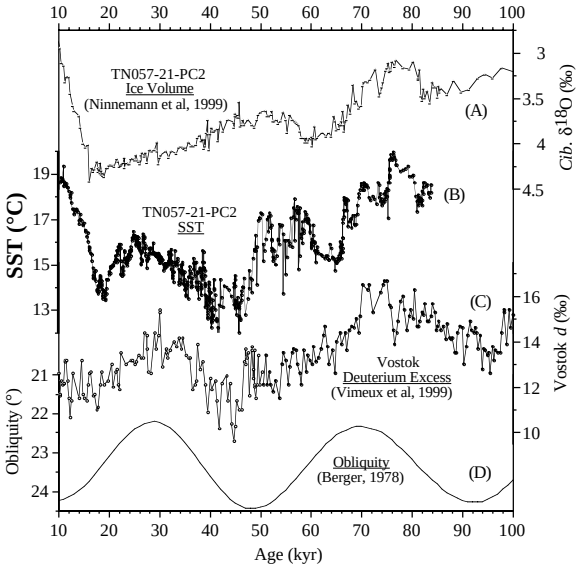

Figure 1 : Cape Basin SST (B) co-varies with deuterium excess in the Vostok ice core (C) and varies inversely with obliquity (D; scale reversed). Features of the global ice volume curve (A) are also observed in the SST record.

Vimeux F., Masson V., Jouzel J., Stievenard M., and Petit J. R., (1999), *Nature* **398,** 410-413.