Nd data for the Nile, eastern Mediterranean and forams document Nile outflow increases during S1 and S5

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Organic-carbon rich layers (sapropels) in recent eastern Mediterranean sediments are probably formed as a result of either increased export production or water column stagnation. The latter is supported by oxygen isotopes in forams, which document a freshwater excess during sapropel formation. But $\delta^{18}O$ depletions give no conclusive indication of the source of extra freshwater: enhanced regional precipitation due to the influence of westerlies, or increased Nile outflow due to intensification of the African monsoon. Radiogenic isotopes offer a solution to this problem. Previous studies clearly indicate that Nd isotopes in planktonic foraminifera record the isotopic ratio in surface seawater. Here we present Nd isotopic data from the present-day Nile and E. Mediterranean as well as for foraminifera from ODP hole 967, which demonstrate a significant increase in Nile outflow during the formation of sapropels S1 and S5. Nd isotopic analyses of Nile river water samples indicate that the Nile outflow into the Mediterranean has an ε_{Nd} around –3 ($[(^{143}Nd/^{144}Nd_{meas}/CHUR)-1]x10^4$). E. Mediterranean seawater, on the other hand, has ε_{Nd} around –5. Analytical uncertainty is 0.2 epsilon units. The data also show that the Nd concentrations in the Nile are up to 50 times higher than the Mediterranean, though there is uncertainty as to what fraction of this Nd escapes the estuary.

Planktonic forams from ODP hole 967 have been separated from intervals around sapropels S1 and S5 and analysed for Nd isotopes. They exhibit small but significant shifts from an ε_{Nd} of ~-5 outside the sapropel to values within the sapropel that are much closer to the Nile value, -3.15 during S1 and -3.5 during S5. Our data, therefore, show shifts of 1.5 to 2 epsilon units from the background E. Mediterranean values towards the Nile value during sapropel formation. The Nd shift in S5 is restricted to the early part of the sapropel. Interestingly, the alkenone SST and $\delta^{18}O$ data of Emeis et al. together suggest that the salinity anomaly associated with S5 is also largely restricted to this part of the sapropel, with the $\delta^{18}O$ anomaly in the latter part of the sapropel being dominated by temperature differences.

Emeis, K.-C., et al. (1998) in Robertson et al. (ed’s) *Proc. ODP Sci. Res.* **160**, 309-331.

Development of advanced tools for modelling Wind’s tests

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Moisture migration and its modelling are of common interest for diverse domains of soil science and technology. In connection with well-established Wind's tests that measure evaporation/infiltration fluxes with the evolution of potential at given column heads, the standard methods to manage the numerical non-linearity of the problem are based on self-consistent iterative algorithms. As the paper discuss the main drawbacks of them rely on:

(1) the method accuracy of values derived at near-zero head gradients,
(2) its intrinsic statistical dispersion when determining relationship between hydraulic conductivity and moisture concentration and,
(3) the compulsory "to-one-equivalent-phase" assumption.

Our Wind experimental set-up extends the method's tests precision by:

(A) using capacitive sensors to monitor pressure heads evolution and by
(B) controlling simultaneously both RH and neighbouring temperature along through-seasonal measurements.

Related with such achieved increase of the experimental precision, a new Finite Element model has been implemented. It expands the numerical capabilities of the above-mentioned procedures exploiting its large integration powerfulness. Simulations with the tool are explicit in the sense that two-phase evaporating process reproducing evolution of RH sensors and fluxes (loss weight) is accomplished with the unique input of laboratory conditions (laboratory RH and temperature) and soil properties: intrinsic conductivity, porosity, and gas/liquid relative permeability. Details are given concerning the main inputs for the evaporating and infiltrating boundary condition and how it is computationally managed by the tool. A satisfactory good agreement of results from both predicted of gas/liquid pressure head evolutions and phases saturation degree is obtained, certifying the quantitative consistence of the model.

Conclusion

A three-dimension Finite Element numerical tool has been validated for the precise modelling of Wind's evaporating/infiltrating tests. The simultaneous natural fitting of both capacitive sensor evolution and fluxes provides addition confidence on the tool soundness to manage the numerical non-linearity and of the problem. Solutions are now available for more reliable applications. We propose our modelling tool for the future exploitation of Wind´s tests.