$\delta^{13}C$ in the bivalve shells from the western continental shelf of India during and before seasonal oxygen deficiency

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$\delta^{13}C$ analysis were done on the carbonate shells of bivalves (<3 mm) collected from 15 stations from 8°N to 21°N (both outer shelf and inner shelf) along the western continental shelf of India during late summer (September-October, 2003) and pre-monsoon (April, 2004). During late summer when the region experienced intense oxygen deficiency, the bivalve shells showed depletion in $\delta^{13}C$ (0.29‰ ± 1.05) compared to pre-monsoon (0.80 ± 1.03) when the shelf was oxygen saturated (Figure 1). Greater accumulation of organic carbon is reported along the regions which experiences intense oxygen deficiency during late summer along the western continental shelf of India. The higher organic carbon along the region leading to a greater microbial activity causes the pore-waters to be depleted in ^{13}C which may lead to the depleted $\delta^{13}C$ signals in the inorganic carbonate shells of the benthic bivalves during late summer. The $\delta^{13}C$ in the sedimentary organic carbon is being analysed, the results of which will be presented during the conference.

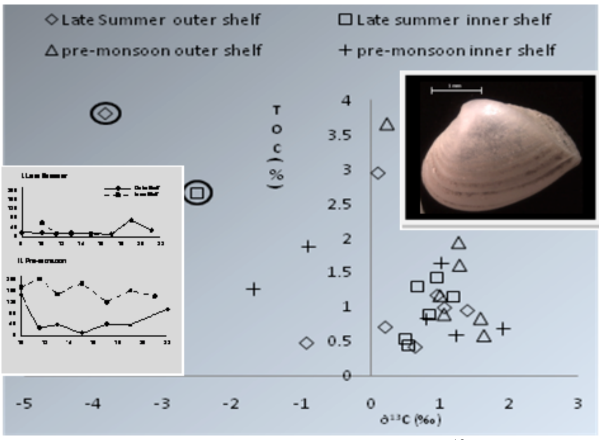

Figure 1: Total organic carbon (TOC) vs. $\delta^{13}C$ in the outer and inner shelf sediments of the western continental shelf of India during late summer and pre-monsoon. Insight is given the distribution of dissolved oxygen (DO) along the shelf during I. Late summer and II. Pre-monsoon. A photograph of one of the bivalves used for the analysis is also given in insight

Simulating water flow, heat and solute transport and biogeochemistry in variably-saturated porous media using HP1

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Coupling physical and biogeochemical processes within one integrated numerical simulator provides a process-based tool for investigating the fate of contaminants as affected by changing hydrologic regimes and geochemical conditions. The numerical simulator HP1 attempts to bridge these two interactive processes. The code is especially geared for variably-saturated conditions, thus serving as a powerful tool for vadose zone research and engineering applications. HP1 extends the capabilities of HYDRUS-1D to simulate physical soil processes by including the capabilities of PHREEQC to account for biogeochemical processes, all embedded in a user-friendly windows interface. A detailed account is given of the new features and processes that were recently incorporated in HP1: (i) full implementation of HP1 into the graphical user interface of HYDRUS-1D, (ii) dynamic changes in porosity, permeability and tortuosity when minerals dissolve or precipitate, and (iii) diffusion of gas components in the gaseous phase. The implementation of the porosity-permeability-tortuosity changes was benchmarked against results from the MIN3P code. HP1 users can implement their own porosity-permeability and porosity-tortuosity relationships using BASIC statements in the input file. Additionally, hydraulic conductivity and pressure head scaling factors can now also vary with time depending upon the geochemical state variables. An example is further presented in which HP1 is coupled with the model-independent optimization tool UCODE_2005. The resulting software allows thermodynamic, kinetic and geochemical parameters to be estimated from experimental data. The optimization features are illustrated for an experimental data set involving transient water flow, solute transport and cation exchange processes.