# A 200-kyr record of the relation between redox-sensitive-element concentrations and variations of the oxygen minimum zone (OMZ) at Murray Ridge, NE Arabian Sea

CORNELIS H. VAN DER WEIJDEN

Department of Geochemistry, Faculty of Earth Sciences, Utrecht University, P.O. Box 80.021, 3508 TA Utrecht, The Netherlands (chvdw@geo.uu.nl)

Two piston cores, containing two full glacial sedimentary cycles, were retrieved at Murray Ridge during the 1992/93 Netherlands Indian Ocean Program. One core (463) contains sediment deposited at 920 mbss within, the other (464) has sediment deposited at 1470 mbss below the present-day OMZ ($O_2$: ≤ 2 μM). Profiles of Al, Ti and Fe in the cores indicate that their lithogene fractions have a similar and rather constant composition. The marine fractions consist of carbonates (463: 37±7%, 464: 44±5%), organic carbon (463: 2.3± 1.1%, 464: 1.1±0.7%) and opal (463: ~3%, 464: ~ 2.5%). Variations in the organic carbon (TOC) content correlate well between the two cores. High TOC contents occur during periods of maximum insolation and are indicative of the presence of a stable and intensive (suboxic) OMZ.

Within the framework of the overall chemistry of these cores, special attention was paid to the behavior of redox-sensitive and chalcophile elements in response to the bottom-water oxygen (BWO) conditions. It turned out that the V, Mn, Co, Cu, Se, Zn and Sb contents in the lithogene fractions are in fair agreement with the values in reference shales, whereas the Ni content is higher due to its high content in the regional eolian input. The Mo, Re and U contents are higher than in the standard shales as a result of diagenetic overprints. After correction for the contributions of the terrigene fractions, the relationships between the element and TOC contents were tested. In both cores, Mn and Co shows a significant negative, the other elements a positive correlation with TOC. The slopes in the plots of (corrected) element vs. TOC content were steeper in for Mn, Co, Ni, Cu, Zn, Se, and Sb in core 464 than in core 463, whereas the opposite is the case for V, Mo, Cd, and Re. In most plots, a considerable scatter of the data points around the linear fits is most pronounced for core 463. Several processes may have contributed to these features, such as 1) scavenging of the elements by manganese oxides formed below the OMZ, 2) transport of the elements by settling organic matter and, as a result of early diagenesis, their concentration relative to buried TOC, and 3) diffusion across the benthic boundary along a concentration gradient and subsequent immobilization by reduction. It is difficult to unravel the role of these processes resulting in the profiles of each of these elements, but the latter process likely plays a pronounced role in the enrichment in Mo and Re.

# Geochemical Map of Zeeland, South-West Netherlands

P.F.M.VAN GAANS[1], J.SPIJKER[1] AND B. VAN OS[2]

[1]Centre for Geo-ecological Research, Department of Phyisical Geography, Utrecht University, P.O. Box 80115, 3508TC Utrecht, the Netherlands (p.gaans@geog.uu.nl) (spijker@geog.uu.nl)

[2]TNO-NITG, National Geological Survey, Deptartment of Geo-environment, P.O.Box 80015, 3508 TA, Utrecht, the Netherlands (b.vanos@nitg.tno.nl)

To asses environmental soil quality and control dissemmination of pollution, the Dutch government demanded a nation wide soil quality map. Within this context a general study of the soil quality in the Province of Zeeland, South-West of the Netherlands, is carried out. The basis for this study is a geochemical map of the rural part of the province.

The Holocene marine sediments were sampled at 270 locations at two depths. One sample was taken from the plough layer (0-35 cm) and another was taken from the the C-horizon (40-80 cm). The set of C-horiozn samples was used for a baseline model in which the natural concentrations were related to the $Al_2O_3$ content.

The samples were analyzed with ICP-MS (Aqua-regia microwave digestion) and XRF. Analytical quality was assessed with standards and duplicate analyses. Parametric leveling using Between-Survey-Duplicates was used to standardize the different surveys.

The geochemical map shows the actual concentrations of 29 selected elements and enrichments from the natural concentration in the plough layer most probably caused by human influence. With the use of factor analysis the the different underlying factors, like clay content and man induced diffuse contamination, are also mapped.

Most enriched are $P_2O_5$ and Cd, suggesting that this enrichment is mainly fertilizer related. Other enriched elements are Cu, Sb and to a lesser extent As, Pb and Zn.

The study showed that the deeper soil forms a good proxy for pristine natural concentrations and that the man induced diffuse pollution is evident but limited, not exceeding legal thresholds.