Can sedimentary $^{230}Th_{xs}$ track carbonate dissolution in the equatorial Indian Ocean?

N.P. SUKUMARAN[1]* AND D.V. BOROLE[2]

[1]National Geophysical Research Institute, Hyderabad, INDIA- 500 006 (*correspondence: npsukumaran@ngri.res.in)
[2]National Institute of Oceanography, Goa, INDIA- 403 004 (dnyan@nio.org)

Much of our understanding of the depositional changes in carbonate sedimentation in the equatorial Indian Ocean has come from the accumulation rates based on $\delta^{18}O$ records, which lacks not only the precision interms of absolute burial rates of sediment, but also accounts poorly the issue of lateral changes in the burial rates by sediment redistribution. Evaluating sediment fluxes by normalizing to $^{230}Th_{xs}$ provide a means to address these issues. Here we present the last 135ka records of $^{230}Th_{xs}$ normalized sediment fluxes to document changes in carbonate sedimentation associated with surface productivity and dissolution for an open ocean site located above the lysocline on the eastern flank of Carlsberg Ridge, southern Arabian Sea (SK 12/1; 3869m; 4° N & 65°E)

Using an age model based on the orbitally tuned $\delta^{18}O$ stratigraphy of Orbulina Universa to correct for ^{230}Th decay, we estimate the burial fluxes of total sediment, calcium carbonate, lithogenic and coarse fraction (>63µm) for the last 135ka. Records of paleofluxes show striking similarity in their burial pattern with an upward increasing trend beginning at 135ka, with a marked discontinuity around 100ka. Sediment fluxes (150 to 660mg.cm^{-2}.ka^{-1}) indicate dominant carbonate rain (80 to 380 mg.cm^{-2}.ka^{-1}) followed by lithogenic (85 to 210 mg.cm^{-2}.ka^{-1}) and coarse fraction (13 to 76 mg.cm^{-2}.ka^{-1}).

Combining concentrations and burial fluxes, we show that increased carbonate productivity occurred mainly during last glacial periods and reduced productivity during preceding interglacial. However, there are large temporal differences between carbonate contents and its rain rates during both climatic stages and between abundances of coarse fraction and carbonate during last glacial. Analysis of $^{230}Th_{xs}$ profile resolve these trends, and suggests percent carbonate record is overprinted by productivity and dissolution processes. Presence of authgenic uranium in the sediments of last glacial and interglacial periods characterizes increased flux of organic matter to the seafloor, and supports productivity driven dissolution by organic matter degradation.

Uncertainty assessment of tritiogenic ^{3}He and tritium/^{3}He-ages

J. SÜLTENFUSS[1], K. OSENBRÜCK[2] AND S.M. WEISE[2]

[1]Institute of Environmental Physics and Oceanography, University of Bremen, 28359 Bremen, Germany (*correspondence: suelten@uni-bremen.de)
[2]UFZ-Helmholtz Centre for Environmental Research, Isotope Hydrology, 06120 Halle, Germany (karsten.osenbrueck@ufz.de)

Groundwater dating using tritium and helium-3 ($^3He_{tri}$) has become a valuable and powerful tool in groundwater resources management, vulnerability studies, and the assessment of groundwater pollution [1]. ^{3}He dissolved in groundwater usually comprises of different sources that must be separated in order to determine $^3He_{tri}$. The parameters required for the sparation of the He components have to be estimated based on hydrological (temperature and altitude of infiltration) and geochemical (terrigenic ^{3}He/^{4}He) knowledge or deduced from additional measurements (e.g. Ar, Kr, Xe). Although such additional data is highly desirable, in many studies the available data is restricted to He and Ne isotopes.

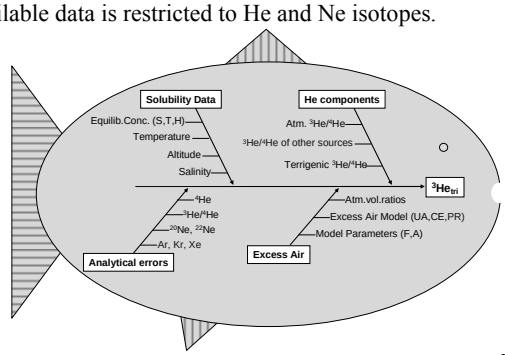

Figure 1: Uncertainty components in the calculation of $^3He_{tri}$

Here we present a comprehensive assessment of the uncertainties involved in the calculation of $^3He_{tri}$ (Fig. 1), the influence of the underlying model assumptions for excess air and terrigenic helium, and their impact on the interpretation of helium isotopes and on the calculation of tritium/^{3}He groundwater ages. We applied the derived uncertainty relationships to a large tritium/^{3}He data set of groundwater samples from low altitude areas in Northern Germany.

[1] Kipfer R., Aeschbach-Hertig W., Peeters F. and Stute M. (2002) Noble gases in lakes and ground waters. In: *Noble Gases in Geochemistry and Cosmochemistry, Rev. Mineral. Geochem.*, vol. 47 (eds. D. Porcelli, C. Ballentine and R. Wieler). Mineral. Soc. of Am., Washington, D. C., pp. 615-700.