Influence of bioturbation on the Re-Os systematics of black shales

D. VAN ACKEN[1], T. TÜTKEN[2], J.S. DALY[1], P.J. ORR[1]

[1] iCRAG (Irish Centre for Research in Applied Geosciences), University College Dublin, Ireland, david.vanacken@ucd.ie

[2] University of Mainz, Germany

Application of Re-Os isotope geochronology on organic-rich shales has yielded important information on the stratigraphy as well as hydrocarbon source and migration. The influence of post-depositional bioturbation disturbing the sedimentary sequence and possibly obscuring the isotopic signatures, has not yet been studied in detail, however may be relevant to fossiliferous Phanerozoic shales.

Shale samples from sedimentary layers between the *Unterer Stein*, *Oberer Stein*, *Inoceramus Bank*, and *Nagelkalk* horizons from the Dotternhausen quarry, SW Germany were analyzed for their Re and Os isotope composition and content. The ~11 m thick sedimentary sequence, composed of multiple layers of black shale with a total thickness of 8-9 m and intercalated limestone, was deposited during the Early Jurassic (Toarcian) between 180 and 182 Ma, a time during which black shale sedimentation was ubiquitous in Western Europe in what is considered a widespread oceanic anoxic event. Both the marl and shale layers beneath the sequence and some portions of the *Oberer Stein* limestone layers show signs of bioturbation. The excellent biostratigraphic constraints and the high Re and Os contents (24-290 ppb and 290-1050 ppt, respectively) of the Dotternhausen shales thus make these samples ideal for testing the influence of bioturbation on the Re-Os isotope system.

Measured Re/Os and $^{187}Os/^{188}Os$ ratios are variable across the sequence, ranging from 490-4050 and 1.87-12.70, respectively. The calculated isochron age is 183.0 ± 2.5 Ma, with a notably low initial $^{187}Os/^{188}Os$ of 0.35 ± 0.09, showing a Pliensbachian to Toarcian age, in agreement with published U-Pb ages and biostratigraphic correlations, suggesting limited disturbance of the isotope system by biological activity. The isochron age obtained from samples across all horizons suggests deposition of the entire sequence between the *Unterer Stein* and the *Nagelkalk* horizons on a timescale of less than 3 Ma, not resolvable by Re-Os geochonometry in this instance. Further analyses of strongly bioturbated layers will provide additional constraints on bioturbation as a potential source of disturbance of radiogenic isotope systems.