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Magnetic fabrics of slumped and normally deposited Quaternary sediments: Ursa Basin, northern Gulf of Mexico

S. Meissl (1), J.H. Behrmann (1), and Ch. Franke (2)

(1) Leibniz-Institut für Meereswissenschaften an der Universität Kiel (IFM-GEOMAR), D 24148 Kiel, Germany (smeissl@ifm-geomar.de), (2) Laboratoire des Sciences du Climat et de l'Environnement (LSCE), CEA-CNRS-UVSQ, Campus du CNRS, Bat. 12, Avenue de la Terrasse, 91198 Gif-sur-Yvette Cedex, France

Late Quaternary sediment successions originating from the northern Gulf of Mexico continental slope show one of the highest sedimentation rates in the world. Poorly consolidated muds and mudstones younger than about 56 kyr were cored during IODP Expedition 308 at two sites (U1322 and U1324) in the Ursa Basin. High pore fluid overpressures define potential slope instability, with alternating formation of mass transport deposits (MTD) and intervening intervals of normal fallout sedimentation. In order to characterize differences in magnetic fabrics resulting from fallout and compaction, in particular the MTD-related deformation overprints, we have determined AMS ellipsoids for 250 specimens from Site U1322, for which a complete sampling record exists. The samples originate from eleven MTD's and from the interleaved normally sedimented layers. Re-orientation of AMS principal axes was undertaken using the available tensor tool orientation data for the drill cores.

AMS ellipsoid shapes in the MTD samples are mostly triaxial, showing with a tendency towards prolate shapes, except for the uppermost MTD 1. AMS ellipsoids derrived from the normally sedimented layers subjacent to the individual MTD's depict distinct oblate shapes. In the normally deposited sediments short axes of AMS ellipsoids are vertical, whereas in the MTD they are generally inclined in the direction of downslope transport. Our preliminary interpretation is that all these differences reflect a purely compactive history in the normally sedimented sections, and a combination of compaction and transport-related shearing in the MTD. Below 174 mbsf, in the deeper part of the cored section (MTD 6 – MTD 11), this distinction is present as well, but the database is generally smaller. A common feature of almost all MTD is the larger P-factor of AMS ellipsoids when compared with the subjacent normally deposited sediments. We relate this to intense sediment deformation: a feature that was probably imprinted onto the Ursa Basin muds and clays during downslope movement. The long AMS ellipsoid axes in both types of deposits seem to be linked to the initial eastward suspension transport off the axial zones of the Ursa and Southwest Pass Canyons located in the West. In summary, we show that magnetic fabrics of fine grained sediments in the Ursa Basins were capable to record the complete history of sediment transport, compaction and downslope movement and shearing.