ORDOVICIAN ORGANOGENIC DEEP-SEA DOLOMITE: PHYSICAL AND CHEMICAL CONDITIONS OF CONCRETION GROWTH

HESSE, R.; SHAH, J., and ISLAM, S., Earth&Planetary Sciences, McGill Univ., Montreal, QC, H3A 2A7, Canada

Estimated depths of precipitation of authigenic dolomite in Middle Ordovician Cloridorme Formation are from the sea floor to about 150 m (in most cases 50 m) subsurface based on centre-to-margin variations in minus-cement porosity (80-90% to 45-75%), and from 350 to 600 m subbottom (25 to 17% porosity) in the Lower Ordovician Levis Fm., Quebec. Outward decreasing d13C values (10.2 - 3.9‰ to 8.5 - 2.1‰ PDB) suggest preci- pitation in the methane-generation zone with an increasing contribution of light carbonate derived from thermocatalytic reactions at greater depth. Burial T obtained from delta18O values (centre- to-margin variations: -0.4 - -4.1‰ to -1.0 - -7.5‰ PDB) give reasonable estimates only if an Ordovician sea- water value of -6‰ is assumed; however, organic-matter decomposition in the sulfate reduction zone and volcanic- matter alteration may have substantially lowered the delta18O of the pore waters. Diagenetic beds formed generally at somewhat greater subsurface depths than concretions. Hairpin-curves on d18O/d13C-diagrams show slight differen- ces in isotopic composition between the upper and lower margins of the Cloridorme concretions suggesting that most of them may have continued to grow slightly longer at the bottom than at the top. The reverse is true but less obvious for the dolomite beds. Calcium availability was likely the growth- limiting factor. Dolomite precipitation was favored over calcite by very high sedimentation rates, a correspondingly thin sulfate-reduction zone and the abundance of marine organic matter in the host sediment.