Geophysical Research Abstracts
Vol. 17, EGU2015-7979, 2015
EGU General Assembly 2015

Polygenetic Karsted Hardground Omission Surfaces in Lower Silurian Neritic Limestones: a Signature of Early Paleozoic Calcite Seas

Noel P. James (1), André Desrochers (2), and Kurt T. Kyser (1)

(1) Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, Ontario, Canada (jamesn@queensu.ca), (2) Department of Earth Sciences, University of Ottawa, Ottawa, Ontario, Canada (andre.desrochers@uottawa.ca)

Exquisitely preserved and well-exposed rocky paleoshoreline omission surfaces in Lower Silurian Chicotte Formation limestones on Anticosti Island, Quebec, are interpreted to be the product of combined marine and meteoric diagenesis. The different omission features include; 1) planar erosional bedding tops, 2) scalloped erosional surfaces, 3) knobs, ridges, and swales at bedding contacts, and 4) paleoscarps. An interpretation is proposed that relates specific omission surface styles to different diagenetic-depositional processes that took place in separate terrestrial-peritidal-shallow neritic zones. Such processes were linked to fluctuations in relative sea level with specific zones of diagenesis such as; 1) karst corrosion, 2) peritidal erosion, 3) subtidal seawater flushing and cementation, and 4) shallow subtidal deposition. Most surfaces are interpreted to have been the result of initial extensive shallow-water synsedimentary lithification that were, as sea level fell, altered by exposure and subaerial corrosion, only to be buried by sediments as sea level rose again. This succession was repeated several times resulting in a suite of recurring polyphase omission surfaces through many meters of stratigraphic section. Synsedimentary cloudy marine cements are well preserved and are thus interpreted to have been calcitic originally. Aragonite components are rare and thought to have to have been dissolved just below the Silurian seafloor. Large molluscs that survived such seafloor removal were nonetheless leached and the resultant megamoulds were filled with synsedimentary calcite cement. These Silurian inner neritic-strandline omission surfaces are temporally unique. They are part of a suite of marine omission surfaces that are mostly found in early Paleozoic neritic carbonate sedimentary rocks. These karsted hardgrounds formed during a calcite-sea time of elevated marine carbonate saturation and extensive marine cement precipitation. The contemporaneous greenhouse atmosphere was supercharged with CO_2 leading to profound surface karst under strongly acid rain. Younger peritidal omission surfaces, although potentially formed during aragonite or calcite sea times, would have been subject to very different terrestrial diagenetic process with lower atmospheric pCO_2 values but increasingly complex biogenic soils producing dissimilar alteration features.