

2007 SEPM Carbonate Session Long Beach, CA

Mid-Brunhes First High Amplitude Transgression (s): Platform Top and Shelf Contemporaneous Re-flooding Recorded on the Slopes of Great Bahama Bank and Central Belize Barrier Reef



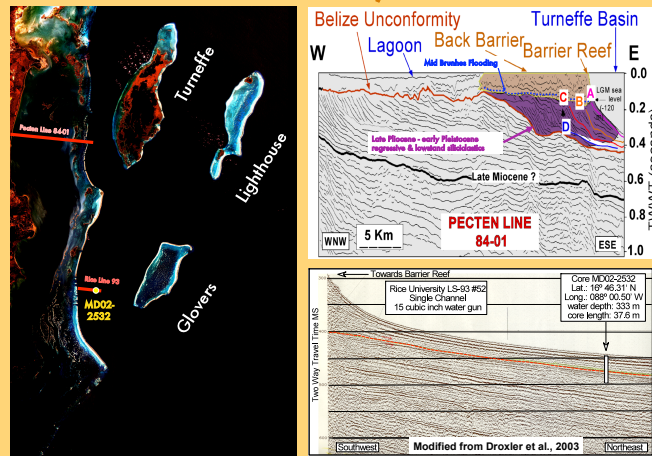
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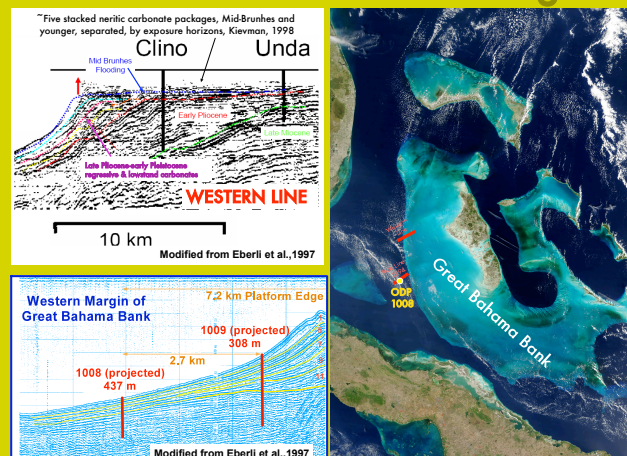
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ABSTRACT: Long term ice volume variations recorded for the last 5 Myr in stacked, globally distributed, benthic oxygen records, clearly show a systematic late Pliocene and early Pleistocene sea level regression following a more than a 1 million years-long early Pliocene sea level highstand estimated to be 15 to 25 m higher than current sea level. This systematic ocean base-level fall, initiated from the onset of major Northern Hemisphere glaciations about 2.7 Ma, was terminated by two mid Brunhes high amplitude transgressions at the MIS 16-15 and MIS 12-11 glacial to interglacial deglaciations. On the slopes of Great Bahama Bank and central Belize Barrier Reef, a series of five (six?) stacked and contemporaneous highstand wedges are observed and identified as being linked to the MIS 15-13, 11, 9, 7, 5, and 1 interglacial stages. Each package is defined by high concentration and/or mass accumulation rates of bank derived fine aragonite sediment bounded by intervening late glacial intervals enriched in Mg calcite cement corresponding to marine hardgrounds on the western margin of Great Bahama Bank and intradelta-rich levels with coarser grain concentrations on the slope off the Belize Barrier Reef. The highstand wedges are overlying an interval in both areas with lower bank-derived aragonite concentration and/or mass accumulation rates, higher pelagic calcite concentrations, and overall lower sedimentation rates. Based upon these observations, the two mid-Brunhes major MIS 16-15 and MIS 12-11 transgressions correspond to first a partial and then a full re-flooding of Great Bahama Bank top and the siliciclastic fluvial plain established at lower base level during the late Pliocene and early Pleistocene sea level regression in Belize. These two mid-Brunhes transgressions have most likely triggered also the onset of modern barrier reefs along the Queensland margin and the Florida Keys, and globally modern atolls. The MIS 12-11 transgression marks the first time interglacial atmospheric CO₂ concentration (measure in the Dome C Antarctic ice core) reached late Brunhes values between 280-300 ppm which has been suggested to be related to the global neritic carbonate re-establishment.

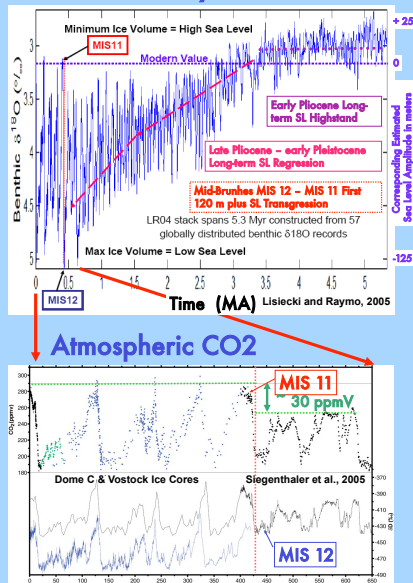
Gladden Basin, Belize



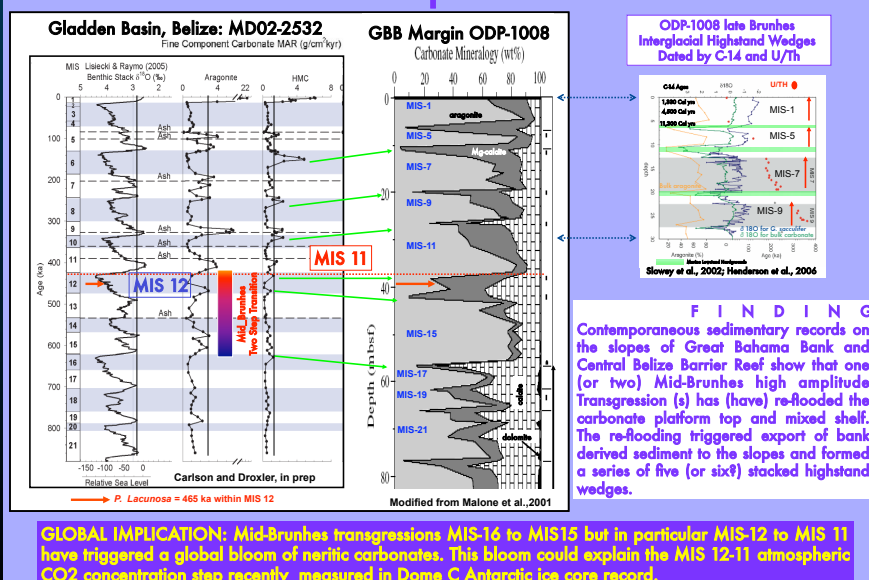
Great Bahama Bank Margin



Ice Volume Proxy ~ = Sea Level



Belize-Bahamas Comparison & Similarities



FINDINGS: Contemporaneous sedimentary records on the slopes of Great Bahama Bank and Central Belize Barrier Reef show that one (or two) Mid-Brunhes high amplitude Transgression (s) has (have) re-flooded the carbonate platform top and mixed shelf. The re-flooding triggered export of bank derived sediment to the slopes and formed a series of five (or six?) stacked highstand wedges.

GLOBAL IMPLICATION: Mid-Brunhes transgressions MIS-16 to MIS-15 but in particular MIS-12 to MIS-11 have triggered a global bloom of neritic carbonates. This bloom could explain the MIS 12-11 atmospheric CO₂ concentration step recently measured in Dome C Antarctic ice core record.