When worlds collide:

Microfaunal, stable isotope, and radiogenic isotope investigations into a marine/estuary or lacustrine origin for the southern Bouse Formation (late Miocene-early Pliocene), southeastern California and southwestern Arizona, USA, with implications for the integration of the Colorado River and the Gulf of California

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USGS Hydrologic Seminar Series
Thursday, November 12, 2015; 12:00 PM
Deconcini Environmental and Natural Resources Building
Catalina Conference Room 253

Microfaunal assemblages, $^{87}Sr/^{86}Sr$ ratios in biologic material, and $\delta^{18}O$ and $\delta^{13}C$ values in both inorganic and biologic calcite from the lacustrine northern Bouse Formation and contested southern Bouse Formation (late Miocene-early Pliocene) along the lower Colorado River corridor (southwestern US) were studied to determine depositional environments. Previously documented planktic foraminifers in the southern Bouse Formation presumably imply normal marine or estuarine conditions. Our results show that the microfaunal and geochemical characteristics of the northern and southern Bouse Formations are similar and are lacustrine in origin. The northern and southern Bouse Formations share the same mixed marginal-marine and continental ostracode assemblage, suggesting similar environments. The expected fill-and-spill lake origin for the northern Bouse Formation is observed as a rapid shift from a saline tolerant *Cyprideis-Limnocythere* ostracode assemblage with coincident high $\delta^{18}O$ and $\delta^{13}C$ values in associated micrite to a fresher water *Candona-Darwinula* ostracode assemblage with coincident low $\delta^{18}O$ and $\delta^{13}C$ values in associated micrite. An identical coincident shift to fresher water ostracode species and lower stable isotope values occurs in the southern Bouse Formation, suggesting a similar fill-and-spill lacustrine environment. $\delta^{18}O$ values from four genera of ostracodes steadily increase during deposition of the southern Bouse Formation, consistent with a terminal lake model. The $\delta^{18}O$ values from paired micrite and ostracode calcite in the southern Bouse Formation are incompatible with a marine origin. $\delta^{18}O$ and $\delta^{13}C$ values from *Cyprideis* sp. valves at the northern and southern margins of the southern Bouse Formation are nearly identical and are incompatible with an estuarine interpretation. Low $^{87}Sr/^{86}Sr$ ratios in micrite are associated with increased foraminifer abundances, but a marine influence is not supported by other paleoenvironmental indicators. A model invoking a freshwater plume onto a saline terminal lake may adequately explain the isotopic composition of the southern Bouse Formation micrite and associated biologic materials presented in this talk.