Pleistocene ground-water discharge at the boundary of the Sonoran and Chihuahuan Deserts, Southwestern U.S. – work (still) in progress

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Ground-water discharge deposits, also called “spring” or “wetland” deposits, form in arid environments as water tables rise and breach the ground surface during periods of enhanced effective precipitation. Where preserved, these deposits contain information on the timing and elevation of past ground-water highstands. This information, in turn, can be used to evaluate conceptual and/or numerical models of past climate conditions, such as the position of the polar jet stream and associated storm tracks, through time. Although spring deposits have been identified in all four of the major deserts of North America (Chihuahuan, Great Basin, Mojave and Sonoran), they have been studied in detail at only a handful of localities. For the last several years, we have investigated a series of spring deposits that are exposed in discontinuous outcrops along a ~150 km stretch of the San Pedro Valley in southern Arizona, near the boundary of the Sonoran and Chihuahuan Deserts. Known as the Coro Marl, the deposits are positioned >15 m above the modern water table and represent a period of enhanced effective precipitation that spanned most, if not all, of oxygen isotope stage (OIS) 2. Chronologic, isotopic, geochemical, faunal (ostracode and gastropod assemblages), and sedimentological evidence from the Coro Marl collectively suggest that hydrologic conditions, specifically the elevation of the regional ground-water table in the San Pedro Valley, remained relatively constant prior to, during, and after the last glacial maximum. Sedimentological evidence also suggests that the regional water table fell at the end of the late glacial period, approximately 15,500 years ago, before rebounding temporarily during the Younger Dryas Cold Event. We have not found evidence of ground-water highstands in the valley during the Holocene. The timing of these hydrologic changes coincides with large variations in the oxygen isotopic composition of calcite from a nearby speleothem to the west and changes in lake levels at Pluvial Lake Cochise to the east. Thus, not only does our study provide a record of past hydrologic conditions in this part of the American Southwest, it also further validates the concept of ground-water discharge deposits as recorders of past climate change.