
Uranium Decrease Marks the Permian/Triassic Boundary in the Khuff Formation (South Pars Field, Offshore Iran): Why?

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Profiles of bulk chemistry, isotope analyses, and plug porosity through 450 m of continuous core in the Khuff Formation reveal large-scale stratigraphic cycles involving dolomitization, anhydrite content, and porosity. In cores from three wells, the Permian/Triassic boundary is identified by abrupt negative shifts in bulk-carbonate oxygen and carbon isotopes. This surface shows no apparent relationship to the boundary of a cycle of sedimentary accommodation, but occurs within a grainstone interval 5-6 m thick, which is bounded above by a bed of microbial boundstone and below by muddy tidal-flat facies. The isotopically defined surface is also marked by a sharp drop in bulk-rock uranium content: from mostly 1.5-4 ppm below to mostly 0.2-0.8 ppm above, a change that is clearly visible on gamma ray logs. Similar shifts are apparent at the Permian/Triassic boundary on published GR profiles from Khuff wells in neighboring countries, suggesting that the drop in uranium content is a regional characteristic.

Possible explanations for the difference in uranium content include: 1. Triassic strata were more extensively recrystallized in oxidizing meteoric waters that leached uranium. 2. Uranium was less available overall in early Triassic depositional systems due to a shift in sediment provenance. 3. Depositional and early diagenetic conditions became more oxidizing in early Triassic time due to lesser availability organic matter, resulting in lesser incorporation of uranium in marine sediments. We are presently unsure which of these or other possible explanations is correct, but wish to present our observations in hopes of provoking dialog and progress toward a solution.
