From: McRoberts, C. A. and Olsen, P. E., 2002, Triassic-Jurassic Non-marine Boundary Events in the Newark, and Hartford basins (New Jersey, Pennsylvania, Connecticut, and Massachusetts), Eastern United States, 2nd Field Workshop, June 7th-12th, 2002, Abstracts with Programs, p. 14-15.

TRIASSIC-JURASSIC BOUNDARY STRATA IN EASTERN NORTH AMERICA AND MOROCCO

Paul . Olsen[1], Mohammed Et-Touhami[2, 1], Dennis V. Kent[3,1], Sarah J. Fowell[4, 1]

[1] Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY 10964 USA; [2] Faculty of Sciences, Department of Geology, Université Mohammed Premier, Oujda, Morocco; [3] Department of Geological Sciences, Rutgers University, Piscataway, NJ 08854-8066 USA; [4] Department of Geology and Geophysics, University of Alaska Fairbanks, Fairbanks, AK 99775-5780, USA.

The Triassic-Jurassic boundary is extremely well preserved in the rift basins formed during the incipient fragmentation of Central Pangea. In eastern North America, the most landward of these rifts have been structurally inverted and deeply eroded, revealing the deeper parts of very large rifts. As a consequence the interval around boundary is characterized by very high accumulation rates and continuous deposition, and the overlying CAMP (Central Atlantic Magmatic Province) basalt sequences are generally very thick, usually with thick sedimentary interbeds The rifts on the conjugate margin in Morocco have also been structurally inverted, but they are not as deeply eroded, so that in many places pre-rift strata are overlain by only a few tens of meters of Triassic and Early Jurassic strata that includes a well-preserved boundary interval and overlying CAMP basalts.

In the wholly continental strata of eastern North America the boundary is identified primarily by a dramatic palynological turnover with a major drop in diversity, similar to, but more dramatic than, that seen at the base of the pre-planorbis beds in the Kendelbach graben in Austria (and elsewhere) in marine strata. Associated terrestrial vertebrates show a similar drop in diversity, but at lower levels of temporal resolution. The Triassic-Jurassic boundary is also identified in Morocco by palynology, although at one site, a turnover in marine forams marks the boundary. Further, in eastern Morocco, there virtually unstudied are marine mollusk-bearing strata, in addition to overlying CAMP lava flows.

The Newark basin is one of the largest of the eastern North American rift basins and provided an astronomically tuned geomagnetic polarity time scale (based on continuous core), allowing temporal resolution of less than 20 ky, and at least in theory, global correlation by paleomagnetic reversal stratigraphy. In eastern North America, we have, as a consequence been able to identify the boundary with great confidence, in the Culpeper (VA), Newark (NY, NJ, PA), Hartford (CT, MA), and Fundy (Maritime Canada) basins, spanning about 10° of present (and Triassic) latitude.

Comparison between boundary sections in different basins in eastern North America and Morocco reveals some interesting trends along northeast and east transects . Going north from the Culpeper and Newark basins to the Hartford and Fundy basins, accumulation rates (based on cyclostratigraphy) decrease by over an order of magnitude. Relatively more humid continental facies characterize the more southern basins, while facies characteristic of arid environments and evaporite dissolution characterize the most northern basin (Fundy). Going along a more eastern direction, low accumulation rates and facies similar to the Fundy basin clastic facies, in western and central Morocco. However in the subsurface of several basins, the Fundy-like facies give way to thick salt sequences, with an order of magnitude higher accumulation rates. In these settings the Triassic-Jurassic boundary is entirely within bedded halite and potash salts. In

eastern Morocco, the boundary seems to lie within carbonate sequences, overlying red clastics, and underlying CAMP basalts. In these areas, there is a widespread carbonate interbed within the basalt flows producing marine bivalves (as yet unstudied). Very similar sequences are present in the Iberian peninsula and southern France

In the Newark basin we have found an Ir anomaly (up to 285 parts per trillion, average maximum 141 parts per trillion) and a fern spore spike at the palynologically identified boundary, suggesting that a bolide impact may have been the cause. While one to two orders of magnitude less than that at the K-T boundary, this anomaly is comparable to a number of other known impact distal ejecta. Hints that this anomaly may be very widespread include published data from the Fundy basin and the Kendelbach graben, and both are at the appropriate biostratigraphic level.

Although suggestive of an impact, at this stage a volcanic origin for the biotic pattern and Ir anomaly cannot be ruled out. However it is worth noting that in all cases where superposition between CAMP lavas and the Triassic-Boundary can be observed, the lavas postdate the boundary and there are always intervening Jurassic strata.