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Palynology constrains the synchrony of widespread volcanism and Triassic-Jurassic boundary biotic crisis

S. Cirilli (1), A. Marzoli (2), L. Tanner (3), H. Bertrand (4), N. Buratti (1), F. Jourdan (5), G. Bellieni (2)

(1) Dipartimento di Scienze della Terra, University of Perugia, Italy (simocir@unipg.it)

(2) Dipartimento di Geoscienze, University of Padova

(3) Le Moyne College, Syracuse, USA

(4) Ecole normale supérieure de Lyon & Univ. Lyon1, France

(5) Curtin University of Technology, Australia

The T-J transition has been characterized as one of the five most severe mass extinctions in the Phanerozoic (1) although some authors now recognize it as a progressive reduction of biotic diversity from Late Triassic to Early Jurassic (2). Eruption of voluminous basaltic flows of the Central Atlantic Magmatic Province (CAMP) occurred close to the T-J boundary at $\sim$199 Ma ($^{40}Ar/^{39}Ar$ age), yet it is debated if CAMP started before (4) or after the T-J boundary (5). Recent stratigraphic, palynological, geochronologic, paleomagnetic, geochemical data from Morocco (4,6) constrain the age of the sedimentary rocks below the basalts to Norian-lowermost Rhaetian. Herein, we present new stratigraphic data for continental basins from northeastern USA (Deerfield and Hartford) belonging to the upper parts of the thick Newark Supergroup succession, which contains up to three CAMP basalt units. In these basins, this sequence records initial deposition in a fluvial-alluvial setting, followed by lacustrine deposition and uppermost lacustrine and fluvio-lacustrine cycles and minor eolian deposits. The lower portion of the succession was deposited under arid/semiarid conditions, except for short humid events indicated by palynological and climate facies associations. The microfloral content is characterized by the presence of Circumpolles group, mainly represented by *Gliscopollis meyeriana* and *Corollina murphyae* con-

stantly present throughout the whole succession and minor *Classopollis torosus* more common in the Portland Fm, which overlies the last basalt flow (Hampden basalt). Exclusively Triassic Precircumpolles (i.e. *Partitispoprites novimundanus, Praecirculina granifer*), have been found in the lowermost part of the sequence (i.e.: Sugarloaf Fm. in the Deerfield basin). *Patinasporites densus* has been also recorded, although in only a few specimens, in the interval below the Hampden basalt (East Berlin Fm in the Hartford Basin), and thus above the presumed T-J boundary of (7) and above the two lower CAMP lava flows (Talcott and Holyoke basalt) in this basin. Correlating these new palynological data from USA and Morocco (4) with those from other key sections, including those belonging to and not belonging to the CAMP, clarifies the temporal relationships between the T-J boundary and CAMP volcanism, but requires stressing the following points:

-the last occurrence of *P. densus*, as well as the other Precircumpolles, has been usually observed within the Norian or, at least, early Rhaetian as demonstrated from numerous data worldwide collected by numerous authors.

-"*Corollina*" group makes its first occurrence in the Norian. The distribution of *G. meyeriana* and *C. torosus* starts elsewhere in the Norian and continues in the Jurassic. These data and the lack of any distinctly Jurassic taxa constrain the age of the sedimentary rocks between the first and the last basalt unit to Late Triassic. Thus, palynological results, joined to a set of other multidisciplinary data indicate that CAMP volcanism started before the T-J boundary and therefore support the possibility that intense volcanic activity may have had a causative role in the T-J biotic crisis.

1) Pálfy et al. 2000, Geol. 28. 2) Tanner et al. 2004, Earth Sc. Rev. 65. 3) Marzoli et al. 1999, Science 284. 4) Marzoli et al. 2004, Geology 32. 5)Whiteside et al. 2007, PPP 244. 6) Verati et al.2007, PPP 244. 7) Fowell & Olsen 1993, Tectonophysics 222