The age of the Sarmatian-Pannonian transition in the Transylvanian Basin (Central Paratethys)

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A marked paleoenvironmental change took place during the middle Miocene in the Central Paratethys (Fig. 1), with dominantly marine Sarmatian successions grading rapidly into mainly brackish Pannonian deposits. A long and excellently exposed section comprising the Sarmatian-Pannonian transition has been investigated at Oarba de Mures in the Transylvanian basin (Romania). In this research, we focus on both radiometric and magnetostratigraphic dating (Fig. 2) to provide a numerical age for the Sarmatian-Pannonian transition in Transylvania. Two volcaniclastic layers, located approximately 40 m below the Sarmatian-Pannonian transition, yield excellent 40Ar/39Ar ages. The weighted mean plateau age for biotite and sanidine separates provided isotopic ages of 11.6±0.02 Ma and 11.65±0.13 Ma (Fig. 3). This implies deposition during the magnetic chron C5r.2r, which is in agreement with the magnetostratigraphic results of the Oarba de Mures composite section (Fig. 4). Rock magnetic analyses indicate greigite as main magnetic carrier, with characteristics very similar to the magnetosomal greigite found in the Carpathian foredeep. The newly obtained chronology at Oarba de Mures limits the age of the Sarmatian-Pannonian transition in the Transylvanian basin to 11.3±0.1 Ma, slightly younger than the 11.61 Ma postulated in the Styrian and Vienna Basins (Fig. 4).

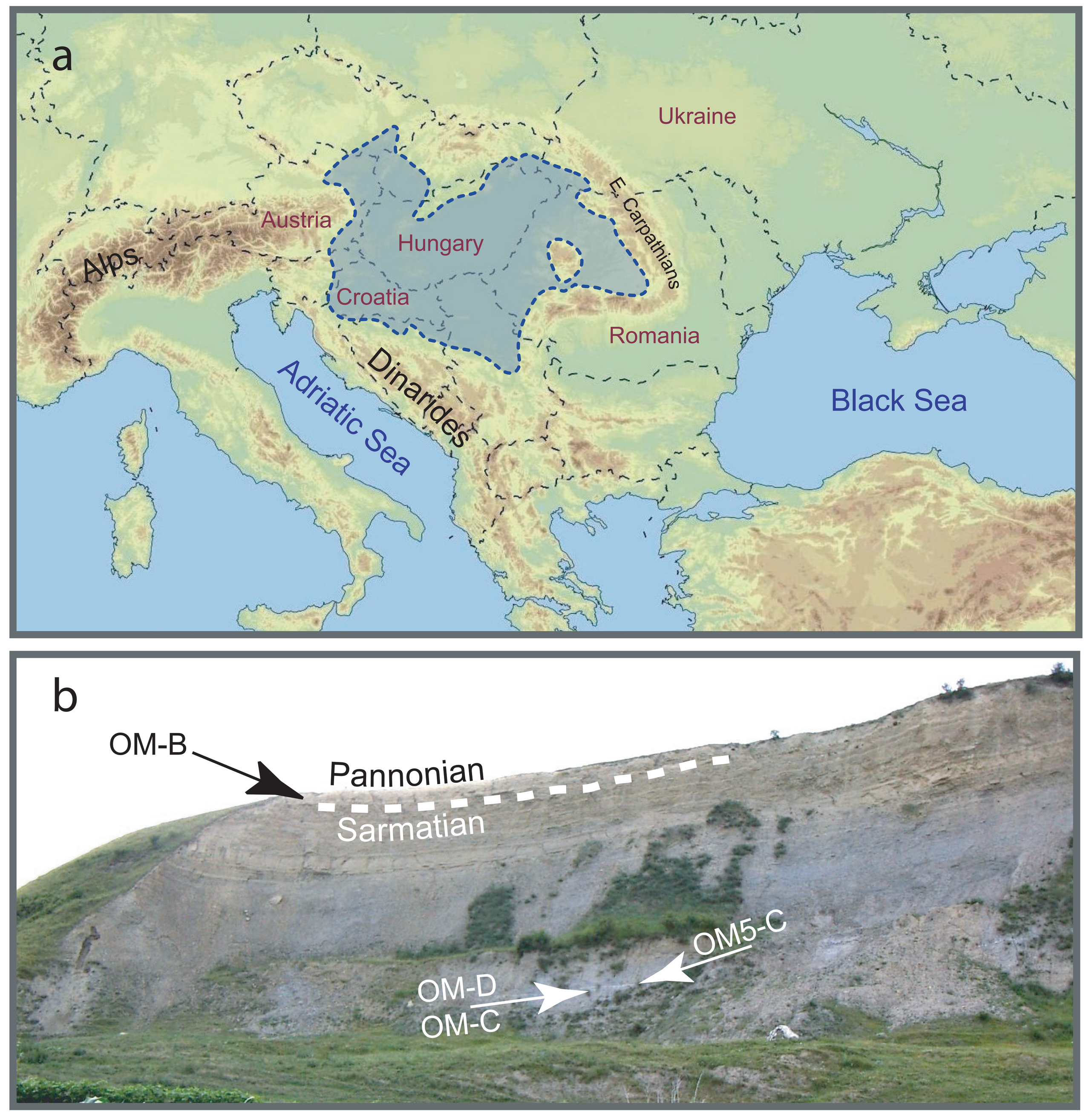

Figure 1. (a) The extent of the Central Paratethys basin during the Miocene on the present-day land configuration. (b) Outcrop A with the position of the sampled and analyzed volcaniclastic layers indicated with arrows.

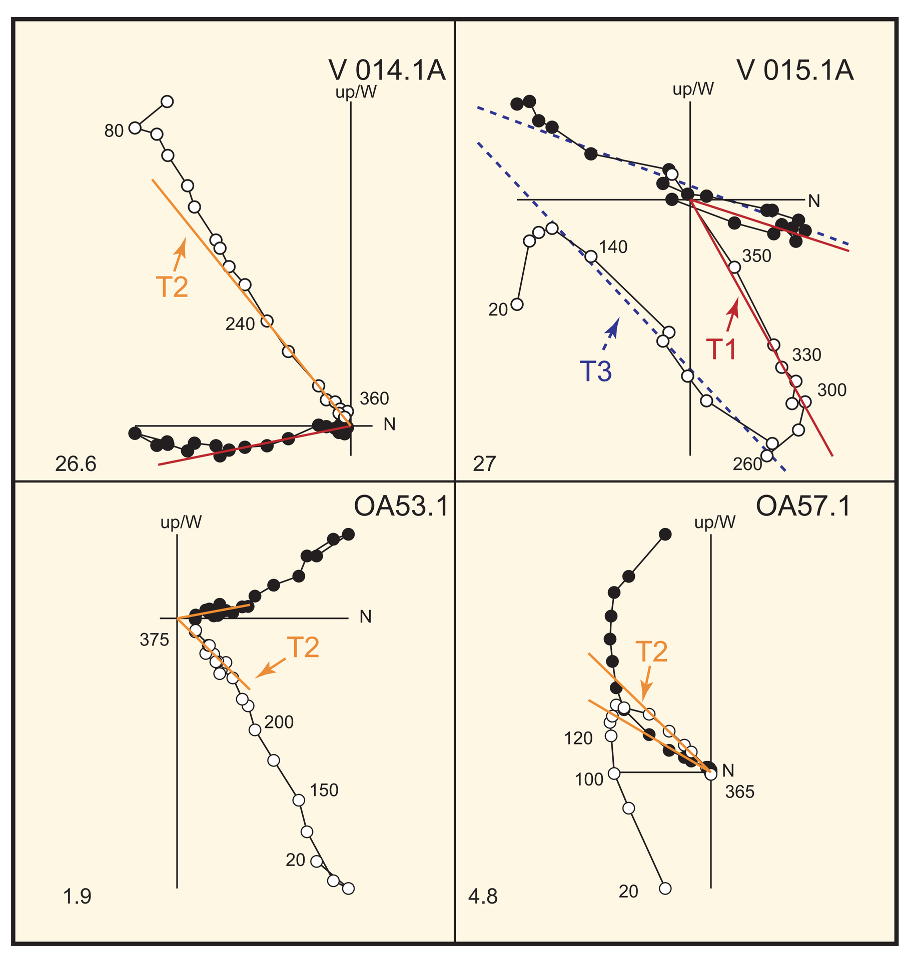

Figure 2. Representative thermal demagnetization diagrams (after tilt correction) with the directions of the different temperature components: T1 red solid lines, T2 orange solid line, T3 blue dashed lines, T4 green dashed lines. Solid (open) circles denote projection on the horizontal (vertical) plane and the attached numbers indicate temperatures in ºC. The samples code (in capital letters) is located in the right-top corner; stratigraphic levels (in metres) in bold-italic characters are indicated in the left-down corner.

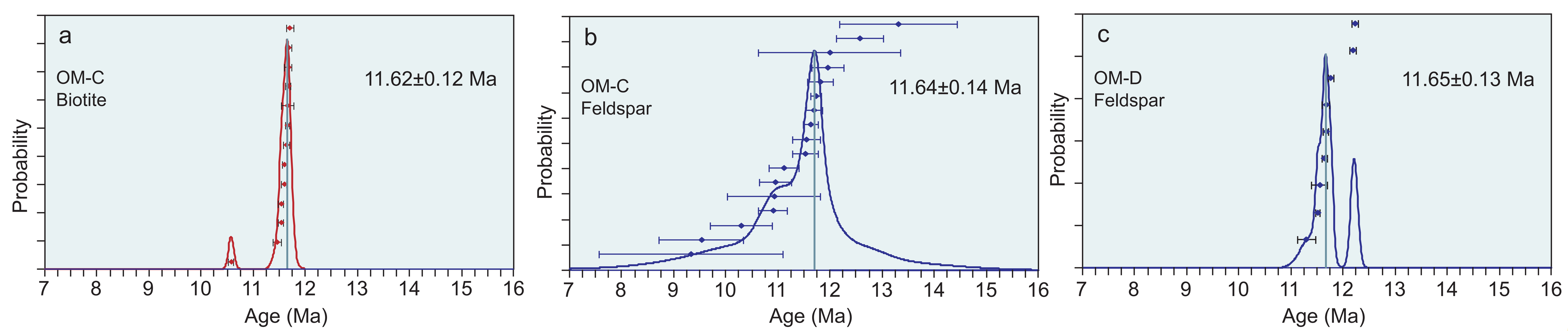

Figure 3. Figure 6. Cumulative probability distributions for 40Ar/39Ar biotite and sanidine ages of Oarba de Mures volcaniclastic layers. (a) OM-C with the probability distributions for 40Ar/39Ar ages derived from biotite. (b) OM-C with the probability distributions for 40Ar/39Ar ages derived from K-feldspar. (c) OM-D with the probability distributions for 40Ar/39Ar K-feldspar ages.

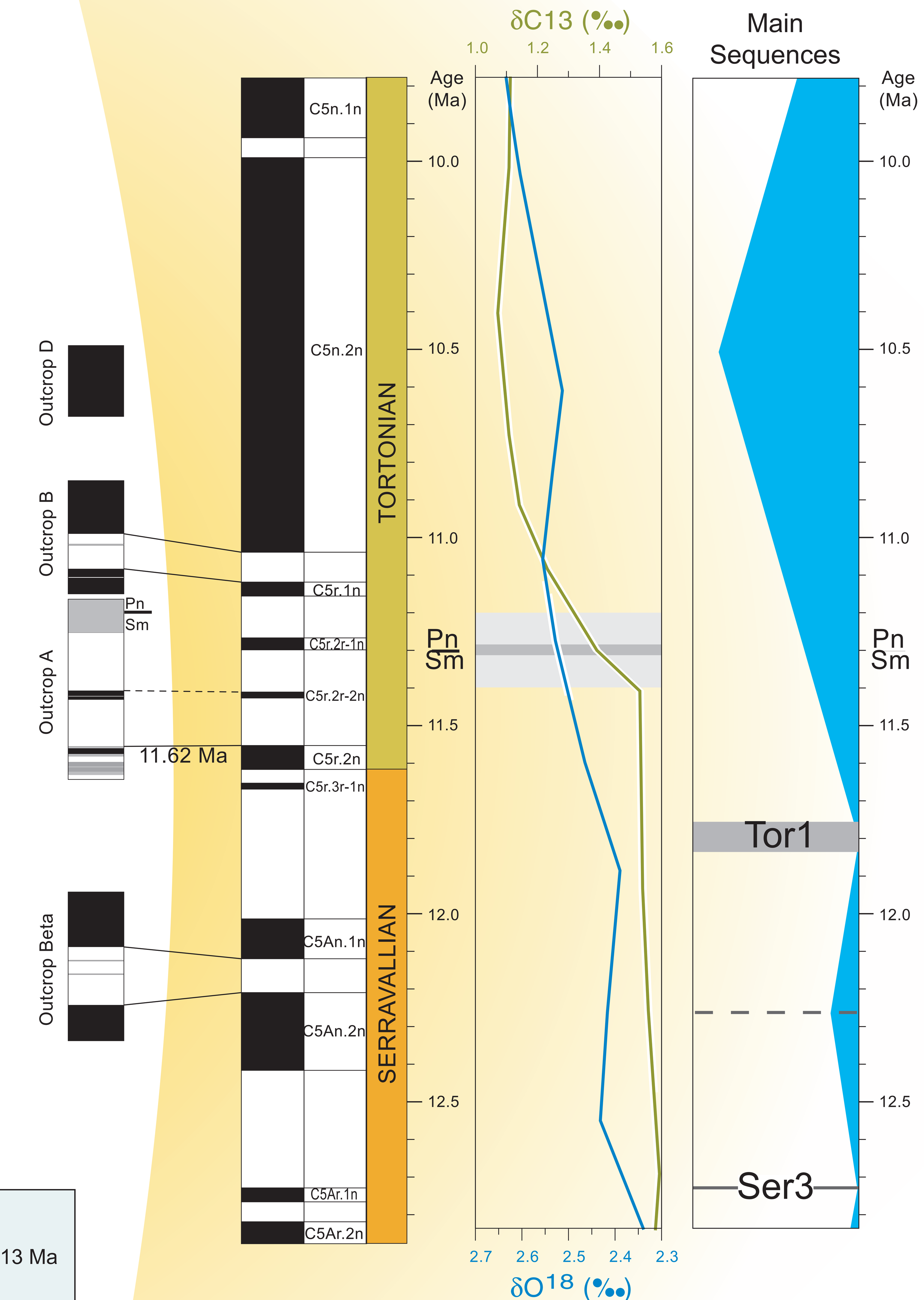

Figure 4. Correlation of the polarity sequence of Oarba de Mures section to the APTS (Lourens et al., 2005). The solid lined between the section record and APTS connect (interpretative) simultaneous polarity boundaries. The names of the subchrons are in the column attached to the APTS. The global deep-sea record of Zachos et al. (2001) is provided for comparison. The grey band marks the uncertainty in the age of the Sarmatian-Pannonian transition. Main trends in eustatic sea level are generalised from Hardenbol et al., 1998.