Publications of the Institute of Geophysics, Polish Academy of Sciences
Geophysical Data Bases, Processing and Instrumentation
vol. 423 (C-112), 2018, pp. 131-132
DOI: 10.25171/InstGeoph_PAS_Publs-2018-067
16th Castle Meeting New Trends on Paleo, Rock and Environmental Magnetism, Chęciny, Poland, 2018

Chasing the Jurassic Monster: A New Record from the Northern Apennines (Italy)

Sara SATOLLI[1,2,✉] and Jean BESSE[3]

[1]Department of Engineering and Geology, "G. D'Annunzio" University of Chieti-Pescara, Pescara, Italy

[2]ALP – Alpine Laboratory of Paleomagnetism, Peveragno, Italy

[3]Institut de Physique du Globe de Paris, Paris, France

✉ sara.satolli@unich.it

A b s t r a c t

A Late Jurassic 30° gap in the Apparent Polar Wandering Path (APWP) of the North American plate has been recently evidenced (Kent and Irving 2010, Kent *et al*. 2015), and is interpreted by these authors in term of plate motion (referred as to the "Jurassic monster shift"). This unusually fast plate motion was previously undetected or only resulted in smooth variations around the Jurassic/Cretaceous boundary in previous composite APWPs, due to the smoothing of data intrinsic to the method of construction, or in the inclusion of lower quality Jurassic paleopoles. The Jurassic shift started between 183 (Pliensbachian-Toarcian boundary) and 160 Ma (Oxfordian) and ended between 151 (early Tithonian) and 145 Ma (Tithonian/Barremian) (Kent and Irving 2010, Muttoni *et al*. 2013).

In this work, we take advantage of the magnetostratigraphic-constrained Salto del Cieco Section (Italy; latitude 42.61°N, longitude 12.86°E) to ascertain and precise the duration and amplitude of the shift. The polarity zone pattern, biostratigraphic and facies analysis from Salto del Cieco section (Satolli *et al*. 2015, Satolli and Turtù 2016) were used to define the age of paleomagnetic directions and paleopoles. The mean directions were computed using the magnetozones, or the stage boundaries when magnetostratigraphy was not defined. Furthermore, we evidence an almost perfect agreement between our new set of data and former discrete paleomagnetic studies from Northern Apennines and Southern Alps (e.g., Satolli *et al*. 2007, Channell *et al*. 2010). We computed from this set of data, a composite paleolatitude curve for Adria which displays first a slow southward motion of some 15° from 190 to 170 Ma, strongly accelerating between 175 to 160 Ma (a minimum paleolatitude of 11.9° is found at 160 Ma), followed by a slower northward motion up to 130 Ma. Despite minor differences, this curve is in global agreement with the expected paleolatitudes from the composite APWP proposed by Kent and Irving (2010), and from the Adria-Africa APWP proposed by Muttoni *et al*. (2013). The changes of direction found in our section are thus not related to some local event, but probably to a global motion of the lithosphere with respect to the earth rotation axis (True Polar Wander). Finally, we derived an APWP from our data, showing first a standstill, followed by a track between 171.8 and 150.4 Ma with a velocity of some 20 cm/yr, followed by other standstill between 142 and 150 Ma and finally a hairpin turn with a rather complex direction pattern. Should these data represent TPW, the velocity would be nearly twice faster than the presently geodetically measured TPW (10 cm/yr) but well below TPW in excess of 40 cm/yr suggested at the end of Precambrian (McCausland *et al*. 2011, Robert *et al*. 2017).

Keywords: paleomagnetism, apparent and true polar wander path, Adria.

References

Channell, J.E.T., C.E. Casellato, G. Muttoni, and E. Erba (2010), Magnetostratigraphy, nannofossil stratigraphy and apparent polar wander for Adria-Africa in the Jurassic– Cretaceous boundary interval, *Palaeogeogr. Palaecl*. **293**, 51–75.

Kent, D.V., and E. Irving (2010), Influence of inclination error in sedimentary rocks on the Triassic and Jurassic apparent pole wander path for North America and implications for Cordilleran tectonics, *J. Geophys. Res*. **115**, B10103.

Kent, D.V., B.A. Kjarsgaard, J.S. Gee, G. Muttoni, and L.M. Heaman (2015), Tracking the Late Jurassic apparent (or true) polar shift in U-Pb-dated kimberlites from cratonic North America (Superior Province of Canada), *Geochem. Geophys. Geosyst*. **16**, 983–994.

McCausland, P.J., F. Hankard, R. Van der Voo, and C.M. Hall (2011), Ediacaran paleogeography of Laurentia: Paleomagnetism and 40 Ar–39 Ar geochronology of the 583 Ma Baie des Moutons syenite, *Quebec Precambr Res*. **187**, 1, 58–78.

Muttoni, G., E. Dallanave, and J.E.T. Channell (2013), The drift history of Adria and Africa from 280 Ma to present, Jurassic true polar wander, and zonal climate control on Tethyan sedimentary facies, *Palaeogeogr Palaecl*. **386**, 415–435.

Robert, B., J. Besse, O. Blein, M. Greff-Lefftz, T. Baudin, F. Lopes, S. Meslouh, and M. Belbadaoui (2017), Constraints on the Ediacaran inertial interchange true polar wander hypothesis: A new paleomagnetic study in Morocco (West African Craton), *Precambrian Res*. **295**, 90–116.

Satolli, S., and A. Turtù (2016), Early Cretaceous magnetostratigraphy of the Salto del Cieco section (Northern Apennines, Italy), *Newsl. Stratigr*. **49**, 2, 361-382.

Satolli, S., J. Besse, F. Speranza, and F. Calamita (2007), The 125-150 Ma high-resolution Apparent Polar Wander Path for Adria from magnetostratigraphic sections in Umbria-Marche (Northern Apennines, Italy): timing and duration of the global Jurassic-Cretaceous hairpin turn, *Earth Planet. Sc. Lett.* **257**, 1-2, 329-342.

Satolli, S., A. Turtù, and U. Donatelli (2015), Detailed magnetostratigraphy of the Salto del Cieco section (Northern Apennines, Italy) from the Pliensbachian to Jurassic/Cretaceous boundary, *Newsl. Stratigr*. **48**, 2, 153–177.