Middle/Late Jurassic extension in the Pieniny Klippen Belt inferred from the orientation of neptunian dykes

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Abstract: Neptunian dykes are synsedimentary extensional fractures filled with sediment. They represent a good indicators of extensional events, mainly related to rifting and crust tilting. Neptunian dykes are common in the Czorsztyn Unit of the Pieniny Klippen belt, namely in the Váh Valley. Orientation of the Bathonian-Callovian neptunian dykes from 4 localities (Babiná, Mestečská skala, Vršatec and Bolešov valley) was measured and evaluated in structural diagrams (Aubrecht and Túnyi, 2001). As most of the klippen represent isolated blocks and tectonic lenses that rotated along several axes, utilization of paleomagnetic methods was useful for the reconstruction of their original position. However, sampling of the Vršatec locality which is well exposed and elevated area showed strong variation in the paleomagnetic vectors, even when sampling in distance not more than 0.5 m. This infers a relatively strong recent remagnetization that can be interpreted as remagnetization by lightning electric discharges. They are not only able to temporarily remagnetize the rock but they also fix the new thermoremanent magnetization by overheating it at the place of hitting the lightning into the rock. Other examined localities mostly represent quarries (Mestečská skala, Babiná). All the remaining localities are not so elevated as Vršatec. According to these new data, the final orientation of maxima of the measured neptunian dykes can be then done only on 3 localities. The Vršatec data of Aubrecht and Túnyi (2001) are no longer reliable. The final estimated trends of the neptunian dykes vary from N–S (Bolešovská dolina), through NE–SW (Mestečská skala) to ENE–WSW (Babiná). The mean orientation is then NE–SW. There are also

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some minor maxima that are perpendicular to oblique to the main ones. They can be interpreted as tension-cross gashes, along the side walls of the tilting blocks. Their opening was mostly parallel to oblique to the direction of the fracture, hence they did not reach the thickness of the dykes with perpendicular opening (direction mostly parallel with the mean extension). The NE–SW mean Middle to Late Jurassic orientation of the neptunian dykes indicates that the mean orientation of the extension in the Czorsztyn sedimentary area was NW–SE.

The inclinations of the Middle to Late Jurassic magnetic pole vector were as follows: Babiná = 30°, Mestečská skála = 20° and Bolešovská dolina = 33°. The mean value was then about 30°, which corresponds (taken into account also the dispersion of the data) to 20–30° paleolatitude at the time of origin. This means that the Czorsztyn sedimentary area was located much more southward during the Middle/Late Jurassic than is the recent geographic position.

Reference: