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New paleomagnetic data from syntectonic sediments indicate joined geodynamics of Eastern and Southern Alps in Oligocene to Miocene times

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Results from a previous study (Thöny et al., in press) indicate two major vertical axis rotations of Northern Calcareous and Central Alps in Oligocene to Miocene times. Inclusion of Southern Alps in the rotating block was suspected but could not yet be prooved. The exact boundaries of the rotating unit could not yet be defined. Therefore paleomagnetic sampling was extended to the northern (1) and southern (2/3) Alpine foreland basins (FWF-project P-17767).

We are presenting preliminary paleomagnetic data from the area between Lake Bodensee and Immenstadt/Allgäu (1), from the area north of Lake Garda/Mt. Baldo (2) and the Belluno syncline (3). These new data are compared to published results from intramontane Alpine basins. In the Allgäu area (1) primary magnetizations (pos. fold test, reversal test) were derived from 2 sites in stratigraphic sections at the transition from Lower Marine (UMM) to Lower Freshwater Molasse (USM) sediments (Oligocene). These magnetizations are characterized by negative polarities and south directed declinations. A second magnetization component, acquired after folding, could be calculated from 2 sites. The declination of this component indicates 30° of counterclockwise rotation. At Lake Garda area (2) results from 6 sites in Eocene to Miocene rocks are presented. Eocene volcanites and carbonates as well as Lower Oligocene carbonates are characterized by postfolding overprints (neg. area fold test, no polarity changes) with NE directed declinations. Aquitanian sandstones are the oldest rocks showing no clockwise rotated magnetization.

In contrary here a secondary magnetization, acquired in in-situ position, is indicating again 30˚ of counterclockwise rotation. From Belluno syncline area (3) preliminary results from 4 sites are presented. Lower Eocene (Ypresian) flysch sediments are showing 2 different magnetization events. A prefolding magnetization (?primary) is indicating 40˚ of counterclockwise rotation. The second, postfolding magnetization is indicating 60˚ of successive clockwise rotation. A site in Lower Rupelian sandstones does not support any clockwise rotation. Again, only overprint magnetizations with counterclockwise rotated declinations (30˚) could be derived.

At the moment new preliminary results from 14 sites can be presented and compared to results from previous studies (Thöny et al., in press; Scholger and Stingl, 2003; Marton et al., 2000). These new data are supporting the model of 2 times of large scale block rotation in Oligocene to Miocene times jointly affecting the Eastern and Southern Alps (Thöny et al., 2005).

A first event of clockwise rotation took place during the Early Oligocene. This rotation was probably caused by the collision and blocking of the Alpine wedge with the spur of the Bohemian massif in the eastern part of the Alps. With respect to the Cenozoic Alpine orogeny, clockwise rotation affected the upper plate units, which are the Austroalpine units and the Southern Alps, and lower plate units already accreted to the upper plate in the Early Oligocene.

The second, counterclockwise rotation occurred in the Late Oligocene to Middle Miocene. In this stage of orogeny, the internal massifs of the Western Alps were already accreted to the upper plate and therefore included in counterclockwise rotation (Thomas et al., 1999; Collombet et al., 2002). This rotation is contemporaneous with the counterclockwise rotation of Corsica/Sardinia (Speranza et al., 2002), the Apennines and opening of the Balearic basin (Muttoni et al., 2001) and a genetic relationship is suggested.