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GEODYNAMIC RECONSTRUCTION OF THE MIOCENE PALEOGEOGRAPHY FROM PALEOMAGNETIC AND GEOLOGICAL DATA

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We present sketches illustrating Oligo-Miocene paleogeography based on recent paleomagnetic results in the frame of the Tertiary geodynamic evolution. 67 sites located in the Northern Calcareous Alps, Central Alps and Southern Alps (Fig.1) were studied in the frame of two projects. Scholger & Stingl (2004) presented primary magnetisations from Miocene sediments of the allochthonous parts of the northern and eastern foreland basins which indicated a counterclockwise rotation of 20° about a vertical axis. A study by Thöny et al. (in review) focused on rocks from Triassic to Oligocene age sampled in Northern Calcareous Alps, Central Alps and Southern Alps.

Folded sediments of Oligocene age showed in situ magnetisations very similar to the primary magnetisations from Miocene sediments of the foreland basins (Scholger & Stingl, 2004). Also in situ magnetisations from sites of Late Cretaceous to Oligocene age, located in the Central Alps and Southern Alps are characterised by similar counterclockwise rotated ChRM (characteristic remanent magnetisation). A joined vertical axis rotation of 30° in the Late Oligocene to Middle Miocene is proposed that was affecting the foreland basins as well as the Austroalpine nappe pile and the Southern Alps. The rotation plane is possibly placed at the active Alpine basal thrust plane. 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. This rotation is contemporaneous with a counterclockwise rotation in the Apennines (Muttoni, 2002) and opening of the Balearic basin, and a genetic relationship is suggested. A second component of ChRM could be derived from rocks not younger than earliest Oligocene. This component indicating 60° of clockwise rotation was also found in Northern Calcareous Alps, Central Alps and Southern Alps (Fig.2). Again a joined vertical axis rotation is proposed. The clockwise rotation during the Early Oligocene, which 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, while the western part could still move freely to the north, affected the upper plate units in respect to the Cenozoic Alpine orogeny, which are the Austroalpine units and the Southern Alps, and lower plate units already accreted to the upper plate in the Early Oligocene (Fig.3).

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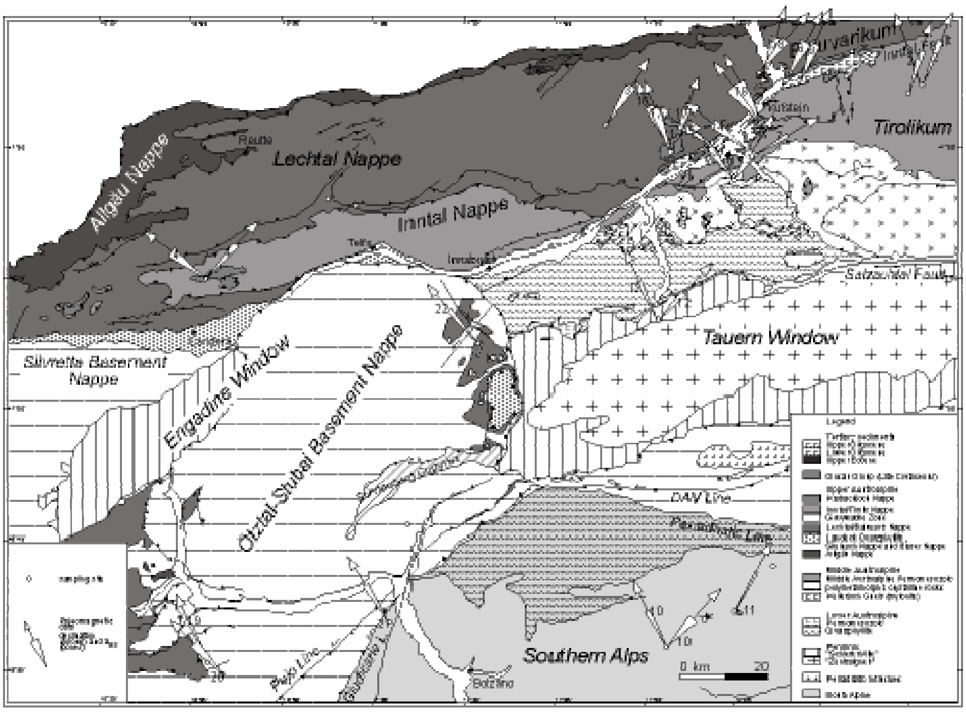

Fig. 1

Fig. 1.
Geological sketch of the study area, comprising the western part of the Eastern Alps and the northern part of the Southern Alps. Arrows indicate trend of declinations, and cones depict α_{95}.

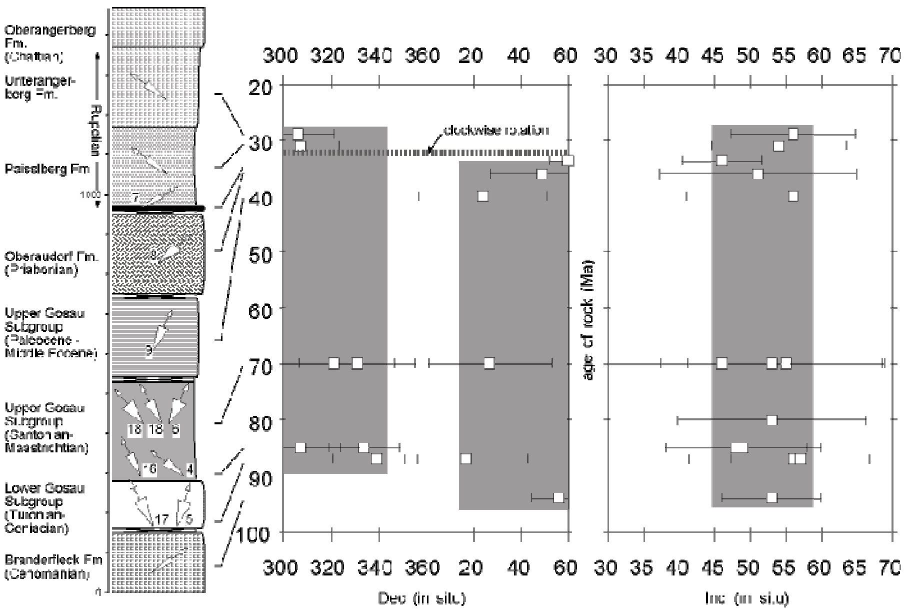

Fig.2

Fig. 2.
Stratigraphic summary section of Upper Cretaceous to Oligocene rocks in the Unterinntal area and associated cross plots of age of rock and declination/inclination of secondary magnetisations. Note that declinations do not change systematically with age of rock. Shaded squares illustrate mean direction of inclinations and declinations of clockwise and counterclockwise rotated magnetisations in the Unterinntal area in Cenozoic times.

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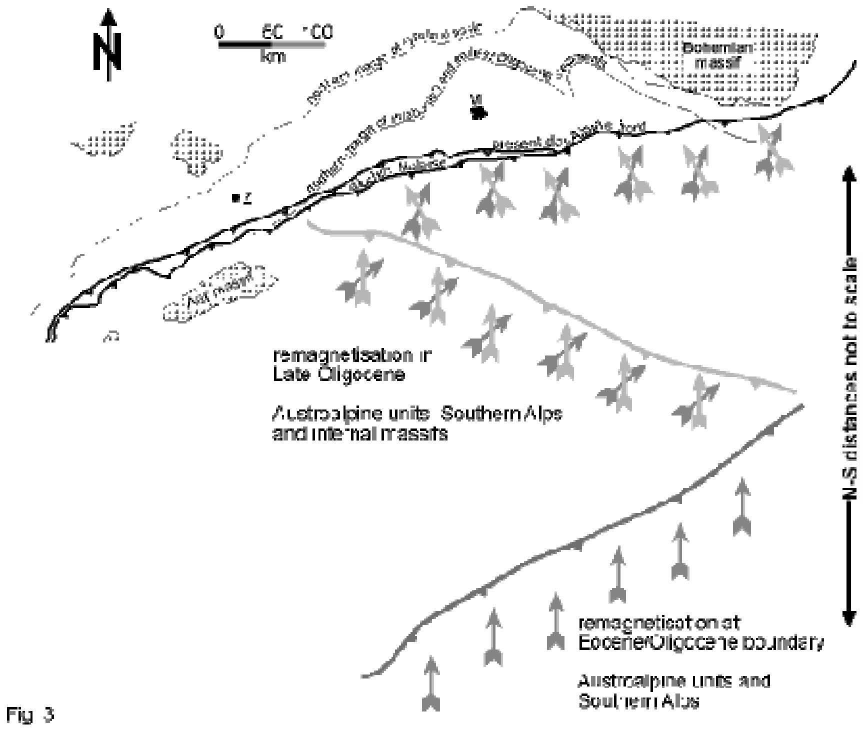

Fig. 3.
Kinematic evolution of the Alps in Eocene to Middle Miocene.
Dark grey arrows: remagnetisation in Eocene/Oligocene boundary. Light grey arrows: remagnetisation in Late Oligocene.