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On the age of sinistral shearing along the southern border of the Tauern Window (Eastern Alps).

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The first-order structure of the western Tauern Window consists of three upright, ENE-striking antiforms of large amplitude, whose flanks are overprinted by sinistral shear zones, striking parallel to the axial planes of the antiforms. Analogue modelling suggests that these shear zones accommodate part of the shortening of the South Alpine indenter (Rosenberg et al., 2004).

The age of sinistral shearing in the western Tauern Window and immediately south of it is still controversial. Mancktelow et al. (2001) suggested that sinistral shearing at the southern border of the Tauern Window terminated at 30 Ma. Based on monazite spot dates ranging between 29.0-20.3 Ma (n=10) of dextral shear zones, which cross-cut the sinistral Greiner shear zone, Barnes et al. (2004) argued that the switch from sinistral to dextral shear occurred shortly after the thermal peak of the Alpine orogeny (c.$\sim$ 30 Ma). Recent dating of mica-bearing marble suggested that the activity of the southernmost sinistral shear zone of the Tauern Window (the Ahrntal shear zone) was 19.8$\pm$0.4 Ma ago (Glodny et al. 2008).

Sinistral shearing is commonly interpreted as part of the 2nd Alpine phase of deformation that affected the Tauern Window. The main foliation (S1) of the Tauern Window was acquired during a first phase, which resulted in the present day nappe stack. Only along some of the later shear zones a second Alpine foliation (S2) was formed. At present no attempt has been made, to distinguish the two and directly date the S2 mylonitic foliation.

In the present work we use the Rb/Sr method to date mineral pairs formed under greenschist to lower amphibolite facies conditions from the tonalitic Zentral Gneiss. We dated four samples, two from the inferred undeformed tonalite protolith, one from the strongly foliated tonalitic gneiss and one from an outcrop-scale sinistral shear zone within the foliated tonalitic gneiss. Generally biotite and feldspar define isochrones for the four samples. The undeformed tonalites yield an age of 26.4$\pm$0.1 Ma and of 11.1$\pm$0.1 Ma, the strongly foliated tonalitic gneiss yields an age of 19.8$\pm$0.1 Ma, which is close to the age of the outcrop-scale shear zone of 18.0$\pm$0.1 Ma. It is difficult to interpret the 11 Ma age of one undeformed sample, because it is significantly younger than the ages obtained from zircon fission tracks from neighbouring areas. The older age of 26 Ma for the undeformed tonalite sample is interpreted as cooling age below the closure temperature of biotite, based on the following arguments: 1) This age is consistent with the inferred regional thermochronological distribution of cooling (Luth and Willingshofer, 2008); 2) The rock fabric is undeformed; 3) The age is older than the two deformed samples collected within a distance of a few hundreds of meters. The mineral assemblage of the deformed samples (green biotite and albite crystallisation) differs from the one of the undeformed rocks (red-brown biotite and K-feldspar clasts). Therefore, the albite-biotite isochrons of the deformed samples are inferred to date the deformation event.

This age of deformation is consistent with the age determination of Glodny et al. (2008) from deformed marbles of the Schieferhülle, and with previous dating of sinistral shearing along the northern border of the western Tauern Window (Schneider et al., 2007), which yielded an average (n=5) age of 21.9$\pm$1.6 Ma. Therefore, sinistral deformation appears to have affected contemporaneously both the northern and the southern margins of the Zentral Gneiss in the western Tauern Window.

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