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The characterisation and U/Pb zircon and Rb/Sr mica age of the Rojen dyke swarm of the Austroalpine Ötztal nappe, (South Tyrol, Italy)

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Near the Austria-Italy-Switzerland border, the Austroalpine Ötztal nappe contains the Rojen dyke swarm that intrudes micaschist. We have studied these dykes by geochemical, petrological, geological, and isotopic methods to better define the protolith ages of these units of the nappe sheet and assess the impact of Alpine metamorphism. Seven different dyke samples were collected for geochemical investigations. Two of these were selected for dating from the area of Zehnerkopf, forming the eastern part of the "Rojen dyke swarm". A third was from further west in the Vallungsspitz area. Also collected for further geochronological and geochemical analysis were two wallrock samples of micaschist/paragneiss intruded by the dykes. The dykes are discordant with reasonably sharp contact to micaschist/paragneiss (Qtz + Pl + Bt + Ms + Ky + St + Grt +/- Gr) assigned to the Ötztal-Stubai Crystalline Complex and have a thickness of up to 50 m with apophyses extending into the country rocks by up to 5m. Dykes thicker than 20m show a chemical reaction zone in the wallrock up to 0.5m thick indicating a minimum temperature of 500°C in this zone. Thin section analysis of dykes show a modest metamorphism in the lower greenschist facies. The dykes are porphyritic with the predominant being Kfs (˜1 mm) but Qtz and Cpx up to 700 μm are also observed. Kfs also occurs in the matrix together with Pl, Qtz, +/- Hbl +/- Bt and +/- Chl. Geochemical data suggests they form two groups, rhyolite and trachyandesite. Zircons

were separated and investigated by cathodoluminescence imaging (CL). Oscillatory zones within the crystals are interpreted as representing magmatic growth whereas signs of metamorphic overprinting and/or recrystallisation could not be found. The CL pictures provide the basis for U/Pb dating by laser ablation ICP-MC-MS from one rhyolite and two trachyandesites. The dating method used a 193nm solid state laser and a Nu Plasma HR MC-ICP-MS instrument with ages measured relative to 91500 and other accepted zircon standards. Rhyolite shows a zircon age of 305.5 +/- 4.2 Ma (2 sd; n = 4), whereas the formation age of trachyandesite is 307.6 +/- 7.5 Ma (2 sd; n = 4). The Rb/Sr Bt-Wr age of the wallrock of the rhyolite (I) has a ‘cooling’ age of 277.9 +/- 5.6 Ma. The much younger Rb/Sr Ap-Wr age of 200.9 +/- 4.5 Ma is interpreted to give evidence for open Rb/Sr behaviour in this rock during the low-grade Alpine tectonometamorphic overprint. Further west in the Vallungsspitz area the other trachyandesite has a zircon U/Pb age of 454.2 +/- 5.6 Ma (2 sd; n = 11). This appears to show that there are two unrelated generations of trachyandesite dykes. Wallrock was sampled near the Grionkopf, further west of Vallungsspitz and has a Varsican cooling age of 295 +/- 27 Ma, (Bt, Bt, Ap, Wr). Both Rb/Sr Bt ages fit well into the regional age pattern.