

Eclogite dating and subduction zones in the Alps

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We applied Lu-Hf geochronology on eclogites from different tectonic units in the Penninic nappe stack of the Western Alps. Overall, older ages were found in structurally higher units of the nappe stack and younger ages in lower units, in accordance with a progression of subduction and accretion from originally more internal (SE) to external (NW) domains. The oldest age, $52,96 \pm 0,91$ Ma, was determined for Monte Emilius, a unit originally at the transition from the Cervinia Microcontinent (Sesia nappe) to the Zermatt-Saas Basin of the Piemont-Ligurian Ocean (Weber et al., 2021). Eclogites from the Zermatt-Saas Basin yielded ages of $49,79 \pm 0,52$ Ma (Champorcher), $47,98 \pm 0,21$ (Punta Nera), and $47,39 \pm 0,34$ Ma (Colle delle Finestre). A sample from the top of the Monte Rosa Nappe, a continental thrust sheet beneath the Zermatt-Saas Ophiolites, yielded $44,24 \pm 0,83$ Ma (Passo dei Salati).

A significantly younger age ($36,09 \pm 0,59$ Ma) was determined for an eclogitic meta-andesite from the ultrahigh-pressure Dora-Maira Nappe (locality Parigi), a continental thrust sheet thought to be a lateral equivalent of the Monte Rosa Nappe. This age accords well with a U-Pb zircon age of 35.4 ± 1.0 Ma from the same area (Gebauer et al., 1997) and confirms that this nappe records the youngest subduction-related metamorphism of the Western Alps. The ca. 36 Ma old Parigi UHP rocks come from the structurally lowermost unit of the Dora-Maira Nappe, whereas the ca. 44 Ma old Passo dei Salati eclogite mentioned above comes from the top of the Monte Rosa nappe. Therefore, the age difference may again reflect progradation of subduction and accretion from SE to NW and from higher to deeper units. In the Central and Eastern Alps, the youngest eclogites, ca. 37 and ca. 33 Ma old, occur in the distal parts of the former European margin (Adula Nappe and Eclogite Zone in the Tauern Window, respectively). This supports the derivation of Dora-Maira from the European margin.

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