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Unravelling the pre-Alpine evolution of Alpine basement units by U-Pb zircon geochronology – a case study of the Austroalpine Schladming nappe system

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Pre-Variscan and Variscan remnants within the Eastern Alps are an important source of information regarding the paleogeographic and tectono-magmatic history prior to the Eo-alpine and Alpine tectonic and metamorphic events. U-Pb zircon dating in combination with Hf-isotope of pre-Alpine metagranitoids of the Schladming nappe system revealed three distinct plutonic suites: (1) the Lignitz, (2) the Untertal and (3) the Eisenhut Plutonic suite. The mostly fine grained, highly evolved metagranitoids of the Lignitz Plutonic suite have an age ranging from 480.1 ± 6.4 to 501.2 ± 6.6 Ma and a weighted ƐHf(t) value between 6.8 ± 2.7 and 11.2 ± 2.6. The Hf-isotopes hint to a partly juvenile source with different degrees of crustal material assimilated during its ascent. The highly evolved granitic Lignitz Plutonic suite can be genetically linked to a crustal contaminated mafic magmatic source with a complex origin at a subduction zone setting. This leads to a likely emplacement of the suite as a batholith within the context of a Ceneric active margin along northern Gondwana. The Hochreichart Plutonic suite of the closely connected Seckau nappe system is regarded as an equivalent of this suite. The metagranitoids to metagranodiorites of the Untertal Plutonic suite are less deformed and show in parts still a magmatic fabric. The U-Pb zircon ages scatter between 350.4±4.8 Ma and 370.4±4.9 Ma while the ƐHf(t) values are between 2.6 and 3.9. Ordovician ages and ƐHf(t) values of zircon cores indicate an incorporation of older Lignitz Plutonic material. The less complex affinities Untertal Plutonic suite with typical igneous fractionation trends, connect this suite to a subduction related origin. The origin can be attributed to a metabasic granulitic crustal source. The generated granodioritic to granitic melts were then emplaced at the active margin near the southern margin of the Galatian terrane. The Eisenhut Plutonic suite contains highly evolved metagranitoids with ages between 261.0±3.5 Ma and 263.4±3.5 Ma and ƐHf(t) values of 2.7 to 5.2. There is no evidence that any material from the older magmatic suites was assimilated or is part of the magmatic source rock. The Eisenhut Plutonic suite is a highly evolved granitic suite with affinities to a dry granulitic residue connected to an extensional tectonic setting. This fits the Permian tectonic conditions during the disintegration of Pangea. The post-orogenic rift-related magmatism due to extension in the Permian probably lead to horst-graben structures.

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