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Mn^{2+}-allanite and rare Co-Ni-As sulfides from the Veitsch Mn deposit (Styria)

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Several carbonate-hosted Fe and Mn ore deposits occur within the upper Austroalpine Grewywacke Zone. The Mn deposit of Veitsch at the Kaskogel and north of the Friedelkogel consists of lense-shaped carbonate bodies of ca. 1.5 m in length which are thought to have formed as sedimentary or submarine hydrothermal Mn-deposits. The manganese silicates described from this deposit are: tephroite, pyroxmangite, spessartine, Mn-chlorite, Mn-humite and friedellite. Sulfides such as sphalerite, galena, chalcopyrite and Co-Ni sulfides also occur.
During this investigation in several samples an unusual REE-Mn-(V)-bearing allanite mineral was found. The allanite occurs in a veinlet with the mineral assemblage REE-Mn-allanite + tephroite + spessartine + Mn-chlorite + rhodochrosite + kutnahorite + serpentine. The REE varies between 1.5 and 1.8 a.p.f.u., and Mn ranges from 1.2 to 1.5 a.p.f.u. In one sample elevated V contents of 1.3-7 wt.% V_2O_3 were observed. The BSE images and chemical analysis reveal a complex zoning of the mineral with increasing Fe_2O_3, MnO and decreasing Al_2O_3 and CaO towards the rim, whereas the REE are unzoned except for V-bearing areas. Charge balance considerations and site assignments indicate that the fraction of Mn^{3+} is very low (<0.2 a.p.f.u.). With such low Mn^{3+} the mineral is a REE-Mn^{2+}allanite [$CaREE(Mn^{2+})(Al,Fe^{3+})2Si_3O_{12}(OH)$], with some androsite [$MnREE(Mn^{2+})(R^{3+})2Si_3O_{12}(OH)$], dissakisite [$CaREEMgAl_2Si_3O_{12}(OH)$], but little or no allanite [$CaREE(Fe^{2+})Al_2Si_3O_{12}(OH)$] component. The elevated F contents of 0.14 to 0.23 a.p.f.u. indicate that a khristovite component [$CaREEMgMn^{2+}AlSi_3O_{11}(F,OH)(OH)$] may also be present.
The complex accompanying sulfide assemblage contains chalcopyrite, pyrite, bornite, digenite, sphalerite, Co-pentlandite and rare Co-Ni sulfides such as linnaeite, carrolite and three so far unidentified Co-As sulfides.

Postglacial denudation and sedimentation in an inner-alpine headwater catchment (Gradenmoos Basin, Schober Mountains, Austrian Alps)

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Knickpoints in alpine stream profiles frequently refer to different lithologic and tectonic units of a catchment, to damming effects through large rockfall deposits, or to the impact of Pleistocene glaciations. As a consequence of glacial overdeepening, various sedimentary sinks developed in alpine drainage basins effectively interrupting postglacial sediment fluxes. In recent times these sinks have been filled up to different degrees with sediments from various sources. The sedimentary record and volumes of sediment storage within these (semi-) closed systems are of great value for the reconstruction of postglacial landscape evolution.
This study investigates the glacially overdeepened Gradenmoos basin an alpine lake mire with adjacent floodplain deposits and surrounding hillslope storage landforms (1920 m; 4.1 km2) - the most pronounced sink in the Gradenbach catchment (32.5 km2, Schober Mountains, Hohe Tauern, Austria). The basin has been filled up with sediments delivered by mainly fluvial processes, debris flows, as well as rockfall and avalanche activity, it is deglaciated since Egesen times and it archives a continuous postglacial stratigraphy. Following the approach of denudation-accumulation-systems, most reliable data on denudation and sedimentation are obtained (1) if sediment output of a system can be neglected for an established period of time, (2) if - due to spatial scale - sediment storage can be assessed with a high level of accuracy, (3) if the onset of sedimentation and the amount of initially stored sediments are known, and (4) if sediment contributing areas can be clearly delimited. All aspects are fulfilled to a high degree within the studied basin.
Sediment storage in and surrounding the basin was quantified using geophysical methods, core-drillings, as well as GIS and 3D-modelling whereas postglacial sedimentation was reconstructed by means of radiocarbon dating and palynological analyses. Subject to variable subsurface conditions (e.g., grain sizes, bulk densities, and water contents) multiple geophysical methods were applied to detect sediment thicknesses. 2D DC resistivity surveying was used most extensively as it delivered most detailed and realistic subsurface models with only low residual errors in the fine-grained and water-saturated central and distal part of the basin. With a lower data density,