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# Comparing Carbon and Strontium Isotope Chemostratigraphy against U-Pb Detrital Zircon Analysis in Dating Marbles of the Uppermost Allochthon in North Norway

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The basal parts of the Uppermost Allochthon between latitudes N67oN (Fauske) and N68.45oN (Ofoten) comprise a thick sequence of platformal marbles that overlie a fragmented ophiolite complex. This basement-cover package can be traced discontinuously from Ofoten more than 150 kilometers northward to connect with the Lyngen ophiolite, the largest ophiolite complex in Scandinavia. U-Pb zircon geochronology documents an Early Ordovician age (469 $\pm$5 Ma) for magmatic crystallization of the Lyngen ophiolite and for the Ofoten mafic complex (474 $\pm$0.7 Ma). A regional unconformity separates the Lyngen ophiolite from overlying rocks of the Balsfjord Group. Halysitid corals from the Balsfjord Group constrain an Upper Llandoverian age for the unconformity. In Ofoten, metasedimentary rocks of the Evenes Group nonconformably overlie the mafic complex and are lithologically correlated to parts of the Balsfjord Group. The basal unit of the Evenes Group, the Elvenes Conglomerate, contains clasts of plutonic igneous rocks clearly derived from the underlying mafic complex (Lillevik dike complex). Suites of multiple phases of felsic intrusions occur within overlying (Bogen/Niingen nappes) and underlying (Narvik nappe) allochthons but are absent in the Evenes Group. Carbon and strontium isotopes reported on these amphibolite-facies marbles have been interpreted to place chemostratigraphic ages that range from Neoproterozoic to Silurian, requiring the placement of hypothetical thrusts and normal faults to explain their vertical stacking although no faults are yet recognized based on field and structural studies.

We present LA-ICPMS U-Pb isotope data on detrital zircons from a siliciclastic layer within one of the carbonate units of the Evenes Group that had previously been assigned a Neoproterozoic chemostratigraphic apparent age. Twenty-seven percent of the ages are younger than 600 Ma and define a prominent 470 Ma age population with the 5 youngest ones giving a concordia age of 460.5 $\pm$3.3 Ma. This age is consistent with deposition upon the 474 Ma ophiolitic basement and reconciles the discrepancy between the chemostratigraphic ages and the field/structural observations. We interpret the chemostratigraphic age assignment in this instance to be erroneous likely due to disturbance of the isotopic systems during amphibolite-facies metamorphism.

We also present LA-ICPMS data on detrital zircons from the psammitic matrix of a conglomerate from the Fauske nappe $\sim$150 km south of Ofoten, which is lithologically correlated to the Evenes Group. Twelve percent of the 120 zircons analyzed with <10% central discordance produce a major peak at ca. 460 Ma with the two youngest zircons having a concordia age of 443.4 $\pm$2.2 Ma (MSWD= 0.87). Chemostratigraphic dating of the conglomerate reportedly was non-unique but suggested it was younger than Early Ordovician, which is compatible with our 443 Ma maximum age for deposition. As in Ofoten, however, a fault placed between the conglomerate-bearing units and underlying 440 Ma marbles (based on chemostratigraphy) is not required by the age dates because they are essentially the same.

Our current work, therefore, indicates that carbon and strontium isotope stratigraphy for dating amphibolite-facies marbles in north Norway may either conflict or conform to age dates based on U-Pb isotopic systems that are much more stable and resistant to subsequent geological disturbances. More systematic studies are underway to attempt to further clarify this.