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Toward Reconciling Discrepencies between Field/Structural, Chemostratigraphic and U-Pb Age Dating of Marbles of the Ofoten and Fauske Nappes: A Regional Ordovician unconformity in the Northern Scandinavian Caledonides

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The basal parts of the Uppermost Allochthon in Fauske and in Ofoten comprise thick packages of platformal marbles overlying a dismembered ophiolite complex, and this basement-cover package is traceable 150 km farther north to Lyngen. U-Pb zircon geochronology documents magmatic crystallization ages of 481+/- 6 Ma for the Lyngen ophiolite, and 474 ±0.7 Ma for the Ofoten mafic complex. In Lyngen, the regional unconformity is constrained by Halysitid corals from the Balsfjord Group to an Upper Llandoverian age. In Ofoten, the Evenes Group nonconformably overlies the mafic complex and is lithologically correlated to the Balsfjord Group. Carbon and strontium isotopes reported on marbles of the Evenes Group have been interpreted to place Neoproterozoic to Silurian chemostratigraphic ages that require the placement of "postulated" thrusts and normal faults to explain their vertical stacking. No faults are recognized, however, based on detailed field and structural studies. To explore how to reconcile the conflict between the geology and the chemostratigraphic age assignments, LA-ICPMS U-Pb isotope analyses were employed on detrital zircons from two select samples from the marble sequences. A siliciclastic layer within an Evenes Group marble, which previously had been assigned a Neoproterozoic chemostratigraphic apparent age, has 27% of the ages <600 Ma defining a prominent 470 Ma age population. This age is consistent with deposition upon the 474 Ma ophiolitic basement and it negates the need for "postulated" faults to accommodate the chemostratigraphic ages as the isotopic systems likely were disturbed during amphibolite-facies metamorphism. Detrital zircons from the psammitic matrix of a conglomerate from the Fauske nappe, which is lithologically correlated to the Evenes Group, has 12% of 120 zircons analyzed with <10% central discordance producing a major peak at ca. 460 Ma with the two youngest zircons having a concordia age of 443.4 ±2.2 Ma. Chemostratigraphic dating of this conglomerate was reported to be non-unique but suggested younger than Early Ordovician, which is compatible with our 443 Ma maximum age for deposition. As in Ofoten, however, a fault was "postulated" because the chemostratigraphic age assignments required placement of the older conglomerate upon younger marbles, which may no longer be required given that the detrital zircon age dates are within analytical uncertainty.

To date, no U-Pb depositional ages older than 460 Ma are reported for any Evenes Group rock or its equivalents between Fauske and Lyngen. Likewise, no U-Pb dates older than 481 Ma are reported for any rocks from the underlying ophiolite complexes. The U-Pb dates are consistent with field and structural evidence for the carbonate package having an unconformable contact with the underlying ophiolite complex, mollifying the need to infer any internal faults where none are observed. We conclude that U-Pb isotopic systems are more stable and resistant to subsequent geological disturbances than is carbon and strontium isotope stratigraphy for dating amphibolite-facies marbles in north Norway, and we emphasize the importance of this regional Ordovician unconformity extending for 325 km along the northern Scandinavian Caledonides.