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U-Pg Zircon Dating of the Mesoproterozoic Brunkeberg Formation and its Bearing on the Stratigraphy and Tectonic Setting of Telemark Supracrustals, South Norway

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The bedrock of Central Telemark in southern Norway consists of a thick sequence of Mesoproterozoic (1500 Ma - 1100 Ma) metasediments, mostly quartzites, and metavolcanics predominantly of acid affinity, known as the Telemark supracrustals. Traditionally the rocks have been subdivided into three groups separated by angular unconformities (Dons, 1960). These are the volcanic Rjukan Group (oldest), the quartzite-dominated Seljord Group and the mixed volcanic-sedimentary Bandak Group (youngest). The Brunkeberg formation (new informal name) is made up mostly of homogeneous acid volcanics with sporadic feldspar and quartz blasto-xenocrysts. It has been correlated with the type Rjukan Group acid volcanics (c. 1500 Ma, Dahlgren et al., 1990) on the basis that it is overlain by type Seljord quartzites. These two volcanic centres are some 30 km apart and are separated by a wide area of folded Seljord Group quartzites. Recent field studies have shown that the Seljord Group sequence, which overlies the Brunkeberg formation, is quite different than the one overlying the type Rjukan Group and that the Brunkeberg formation/Seljord Group contact is not an angular unconformity, but the Brunkeberg formation changes gradually via an acid volcanic palaeo-regolith to the quartzite-clast-conglomerate of the basal Seljord Group (Laajoki, 1998). This suggested that the Brunkeberg formation may not be of the same age as the Rjukan Group volcanics. As this could not be demonstrated by mapping alone we have dated a volcanic unit of the Brunkeberg formation by the ID-TIMS U-Pb method on zircon.

The Brunkeberg formation sample analysed is a homogenous rock containing a few microcline blasto-xenocrysts and quartz augens in a recrystallised quartz- and microcline-rich groundmass with muscovite, biotite epidote, opaques, some carbonate, apatite, and zircon. Opaques and muscovite define faint ?primary banding and muscovite a faint foliation. Mineral separation from this sample yielded an abundant population of euhedral zircon of magmatic appearance, but commonly also containing xenocrystic cores. Two of the analyses carried out on picked pyramidal tips of zircon crystals provide concordant data at about 1155 Ma; this age is interpreted as the time of volcanism and it is very close to the U-Pb zircon age of the anorogenic Hidderskog charnockite (1159+ or - 5 Ma, Zhou et al., 1995) in the near-by Rogaland-Vest Agner segment. Two additional analyses yield slightly older 207/206 ages suggesting that these fractions included older xenocrystic cores.

The new age of 1155 Ma indicates that the Brunkeberg formation represents a separate volcanic event unrelated to the ca. 350 Ma older Rjukan volcanism. Secondly, the age of Brunkeberg formation volcanism is close to the preliminary ages reported from the Bandak Group acid volcanics (1250 and 1150 Ma, Dahlgren et al. 1990) indicating that the Brunkeberg formation may be correlated geochronologically, but not necessarily lithostratigraphically, with some of the acid volcanic units of the Bandak Group. This further implies that the traditional Seljord Group must in fact consist of two major quartzite sequences; the first one sandwiched between the Rjukan and the Bandak groups and the second one overlying the Brunkeberg formation. The depositional age of the latter, which represents type-Seljord quartzite, is younger than 1150 Ma. Consequently, in Starmer's (1993) tectonic model, the type Seljord quartzite should be moved from the post-Kongsbergian anorogenic period (ca. 1500 - 1300 Ma) to the inter-Sveconorwegian extensional period (ca. 1250 - 1100 Ma).

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