ERVING GRANULITE, WEST-CENTRAL MASSACHUSETTS: DETRITAL ZIRCONS SUGGEST A LOCH Kovian MAXIMUM DEPOSITIONAL AGE

Abstract

Emerson (1898) described amphibolite interbanded with "teholite" near Erving, MA, later called Erving Hornblende Schist, in contact with graphitic schist to the east. Robinson (1984) mapped these rocks as Erving and Littleton Fms. Erving consists of plagioclase-quartz-granite with non-graphitic sphyole and calc-silicate beds, epidote-amphibolite, contact with diorite magnetite olistoliths, and rare inside calcite- and marble.

Field relations alone have not been able to resolve questions of Erving's correlation with other units and the nature of its local context. For example, in the core of the Northfield-Wendell Syncline, Erving displays different relationships on each limb, to the E it lies above Littleton and Fish, which is linked to Bernardston Lockchowan consistsents. To the W it lies locally against Littleton, but elsewhere on Chugh, Partridge or even Fourmile Gneiss, suggesting an onlapping unconformity or a thrust fault. Robinson and Rosefield (1980) recognized similarities between the Erving and Gile Mountain granulite and Standing Pond amphibolite in the 'fish-host' of SE VT, linking the Erving to questions about "VT" and "NH" Devonian strata. Published detrital zircon maximum depositional ages from the Littleton and Gile Mts. as well as zircon ages from metavolcanics in the Littleton and Meetinghouse Slate, all fall within the range from 471 to 412 Ma.

In order to address the depositional age of the Erving, we chose a W-facing section of Chugh, Littleton and Erving granulite at Round Mountain, on the E limb of the Northfield Syncline. The collected samples of Erving granulite be approximately along the axis of the Northfield Syncline at the highest stratigraphic level within a section involving as many as 5 amphibolite layers interpreted as broken down rock. Our results indicate a maximum age for the Erving formation of about 419 Ma, or Lochkovian (early Devonian).

Discussion

- Detrital zircons indicate that the Erving Formation is no older than about 419 Ma, or Lochkovian (early Devonian).
- Erving may correlate with parts of the Waits River Formation in VT, which contain detrital zircons as young as ca. 418 to 415 Ma (McWilliams et al., 2010). If so, what is mapped as Littleton in the Northfield Syncline beneath Erving also correlates with Waits River.
- Erving could be as young as Gile Mountain Formation, from which McWilliams et al. (2010) estimated maximum deposition ages of ca. 411 to 405 Ma.
- Amphibolite in the Erving might correlate with Standing Pond Volcanics. Depleted U-Pb patterns are quite similar between Erving and Standing Pond of the Guilford Dome, but other Standing Pond samples were more enriched (Robinson and Hepburn, 2013). Further geochronology analysis of these rocks may shed light on this question.
- We envision the Littleton and Erving in this area as an early onlap facies of Acadian flysch and associated volcanics advancing toward the west, which culminated in Erismian time (Bradley and Tucker, 2002). The Erving may represent a somewhat sandier facies than the Littleton, deposited in a submarine fan.