P-T Evolution and Ages of Granulite Facies Metamorphism and Partial Melting From the Winding Stair Gap, Eastern Blue Ridge

EL-SHALY, Aly C.1, and Loehn, Clayton.2 (1) Department of Geology, Marshall University, Huntington, W.V. (2) Department of Geosciences, Virginia Tech, Blacksburg, Va. 24061

Abstract
The Winding Stair Gap NW of Franklin, North Carolina, exposes schists, gneisses, granulites, metamorphic rocks, and minor dike-rapides representing early and late granulite facies metamorphism. Characteristic mineral-melt assemblages in mesaic and bimorphic gneiss include (Gt + Ab) ± Qtz ± Plg ± Ksp ± Cpx ± St ± Hbl ± Ilm ± Gln ± Hm ± Cbl ± Cc ± Bt ± Opx + Monazite ± Yf ± Nb ± Zr ± Hf ± U ± Th + rare Sill, Zrn, and Xn. Chemical analysis of all age data shows three age populations.

P-T conditions
Three pelitic schists (WSG-2, WSG-3, and WSG-4) with adularia amphibolite (WSG-23) were selected for their chemical and textural compositions. Three schists were examined for their textural and chemical compositions. The younger age population is characterized by Yf, Nb, Zr, Hf, Th, and U values and 2σ error bars in radiogenic ages. A fission-track study of biotite in these schists yielded 14 major geochemical elements.

Mineral chemistry
Garnet is rimmed by Cpx which is rimmed by Plg, which is rimmed by Bi. Garnet: Xg = 0.67, Xg = 0.57, Xg = 0.68, and Xg = 0.05 ± 0.01. All garnets have high Mg# (0.97 ± 0.01) and high CaO. Garnet: Xg = 0.67, Xg = 0.68, and Xg = 0.05 ± 0.01. All garnets have high Mg# (0.97 ± 0.01) and high CaO.

Thermal evolution
Staurolite replaced by Gt in the northern part of the WSG-14 area. Staurolite: Xg = 0.87, Xg = 0.85, Xg = 0.85, and Xg = 0.05 ± 0.01. All staurolites have high Mg# (0.97 ± 0.01) and high CaO.

Natural history
Plagioclase is rimmed by Cpx which is rimmed by Plg, which is rimmed by Bi. Plagioclase: Xg = 0.87, Xg = 0.85, Xg = 0.85, and Xg = 0.05 ± 0.01. All plagioclases have high Mg# (0.97 ± 0.01) and high CaO.

Conclusions
WGS-4 rocks followed a clockwise P-T path with a stage of late isotopic heating. This is indicated by early Gt + Ab, late Cpx + Qtz, and late Plg + Ksp assemblages. Partial melting was triggered by high P-T derivatives of melting and the extraction of melt in a late stage, and represented by low-pressure melting of biotite and garnet.

Acknowledgments
We thank T. Brown for guidance and support with this project. We thank R. Hovorka for NAA analysis at Virginia Tech.

References