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Synchronous High Strain, Granulite Facies Metamorphism and A-type Magmatism at 1.4 Ga, Wet Mountains, Colorado, USA

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Proterozoic rocks of the Wet Mountains, CO, represent part of a regional high temperature metamorphic culmination at 1.4-1.3 Ga, expressed in NE New Mexico and SE Colorado. Peak metamorphic temperatures exceeded 700°C and locally reached granulite facies, as recorded by varied parageneses including px-bearing mafic granulites and Kfs-Sil-Bt-Grt metapelites. 40Ar/39Ar cooling ages on amphiboles aligned with or overprinting foliations have been entirely reset to 1.42 to 1.38 Ga . High strain, HT deformational fabrics attributed to ˜1.4 Ga tectonism pervade the range, yet the gneisses host Mesoproterozoic plutonic rocks with A-type (anorogenic) geochemistry. The Wet Mountains therefore present important relationships that bear on the debate over a dynamic vs. anorogenic setting for 1.4 Ga plutonism.

Key plutonic relationships and U-Pb geochronology results are as follows. Extensive coarse-grained granitic sills were emplaced at ca. 1434 Ma into amphibolite gneisses and migmatitic biotite-Kfs gneisses. The sills are texturally, temporally and geochemically correlated with a regional suite of A-type granitoids emplaced across the Rocky Mountain region. Granite plutonism was accompanied by growth of metamorphic zircon in amphibolite wall rock at ca. 1436 Ma, and the granites contain a gneissic foliation that dips moderately NNW associated with a NNW-plunging biotite mineral lineation. These gneissic granites exhibit asymmetric mineral fabrics and folds that indicate top-up-to-the SSE kinematics across the southern Wet Mountains, broadly

synchronous with granite emplacement. These fabrics are in turn cut by a suite of ca. 1386 Ma fine-grained granitic sills that contain a concordant biotite foliation, mineral lineation, and asymmetric mineral fabrics and folds also recording top-up-to-the SSE. These consistent fabrics and crosscutting relationships suggest long-lived penetrative deformation broadly synchronous with pulses of concordant, synkinematic granitic magmatism that culminated with the emplacement of the San Isabel granite ca. 1361 Ma (Bickford et al., 1989). These fabrics indicate protracted NNW-SSE shortening, consistent with models for emplacement of ca. 1.4 Ga granites during a long-lived episode of intracontinental tectonism related to northward convergence along the southern margin of Laurentia. Alternatively the tectonism may have been induced by regional-scale gravitational response to a Mesoproterozoic superplume.