Origin of Archaeologically Significant Gravel and Lag Deposits on Southwestern Horace Mesa, Mount Taylor Region, New Mexico

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Previous and on-going archaeological investigations in and around Lobo Canyon in the Mount Taylor volcano region have identified an important source of obsidian nodules used by Puebloan and Pre-Puebloan inhabitants. The obsidian nodules are found in thin gravel and lag deposits 0-1.5 m thick on the top of the southwesterly part of the northern edge of Horace Mesa over a linear distance of roughly 2.5 km. The obsidian-bearing deposits (OBD) extend as much as 300 m south and east from the mesa edge and are partially traversed by Forest Service 193. The east portion of the OBD grades into and mixes with thicker, non-obsidian bearing volcaniclastic deposits that are shed from the Mount Taylor stratovolcano located 10 to 15 km to the east. The OBD overlie clinopyroxene-phyric basalt dated at 2.64 ±0.01 Ma on the west. In addition to obsidian, the OBD contain relatively aphyric devitrified rhyolite, rare chert and rare Precambrian crystalline fragments. Most of the OBD rocks are subangular to angular, and are poorly sorted. Nodule sizes generally vary from 1 to 10 cm; a few are larger. Outer surfaces of the nodules are moderately oxidized and some are slightly etched.

Obsidian in OBD is extremely aphyric and visually resembles obsidian lithic fragments in the upper ignimbrite of Grants Ridge (GR) rhyolite tuff. Previous work shows that GR obsidians (≥3.28 Ma) are chemically distinct and older than Mount Taylor rhyolites (≤3.03 Ma). We obtained a composite chemical analysis of cleaned and crushed obsidian nodules from the OBD and compared results with analyses of cleaned and crushed obsidian lithic fragments from two different locations in the upper GR ignimbrite. The three analyses are virtually identical in major and trace elements, and in contents of F and Cl (about 4700 and 720 ppm, respectively). Relatively high F and Cl concentrations are characteristic of rhyolite and obsidian from GR volcanics. We also compared the 40Ar/39Ar age of nodules in OBD to obsidian lithics in one of the upper GR ignimbrite locations. Three homogenized nodules from the OBD produced an age of 3.462 ±0.008 Ma whereas the GR obsidian lithics dated several years ago returned an age of 3.28 ±0.04 Ma. A sample of obsidian from the NE flank of GR rhyolite center yielded an age of 3.498 ±0.003 Ma (all ages recalculated using the FC-2 sanidine monitor age where necessary). However, the latter obsidian is different in texture than the others. The three dates suggest that the obsidians within OBD and GR deposits originated from GR rhyolitic volcanism over a span of ≤200 kyr. Present-day Lobo Canyon is 2225 m deep near GR rhyolite center, and is laterally separated from the OBD deposits on Horace Mesa (2440 m) by about 4 to 5 km. Because the OBD deposits overlie a young basalt flanking Lobo Canyon at Horace Mesa, we speculate that ≥215 m of volcanic and sedimentary rock was carved out of Lobo Canyon in the last 2.64 Myr.

Keywords:
Mount Taylor, Grants Ridge, Horace Mesa, obsidian, Geology, Geoarchaeology, geochemistry, Ar/Ar dating, landscape evolution

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