Ash Me Again! Looking for U in All the Unusual Places at Golema Pest, Macedonia

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Continuously occupying Europe and western Asia for 300 millennia, Neanderthals survived three major glacial periods there and invented more efficient methods to flake Middle Paleolithic (MP) lithic tools, the Mousterian. Electron spin resonance (ESR) can date teeth from Neanderthal sites, like Golema Pešt, Macedonia's only MP cave, but accurate ESR ages require accurate sedimentary dose rates, especially in caves. This study measured the sedimentary radioactivity and dose rates, and ages for Golema Pest's MP layers. Reaching > 5.5 m deep, Golema Pest has > 21 distinct, flat-lying, silty-sandy matrix-supported conglomerates with plentiful, but inhomogeneously distributed, eboulis gravel. Now filling the Treska River valley, Lake Kozjak flooded the cave mouth and Sondage 1 in 2003. Layers 0-5 contain many hearths, whose many thin layers had bone, charcoal, and wood ash. Dentine from Sondage 1, near the mouth, had 10 times more U than teeth from Sondage 2, 7 m deeper in the cave. After powdering 66 sediment samples, their radioisotope concentrations were measured by neutron activation analysis and individual BETA and GAMMA dose rates calculated using Data-HPS. Then, volumetrically averaged and time-averaged sedimentary dose rates were calculated. Low radioactivity in Lake Kozjak sediment suggests that its flood waters likely did not supply the anomalously high U. The Campanian Ignimbrite (CI) cryptotephra produced abnormally high sedimentary radioisotope concentrations, and dose rates. Adding eboulis, calcined bone, and charcoal associated with the hearths did the opposite. The CI tephra may have leached U into the Sondage 1 dentines, which will be tested this year.

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