The SPICE Project: Preliminary cosmogenic ^{10}Be, ^{14}C, and ^{21}Ne production rates in quartz from the 72 ka SP lava flow, AZ, USA

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The SP Flow is a quartz-, olivine- and pyroxene-bearing basalt with an ^{40}Ar/^{39}Ar age of 72±4 ka (2σ). The flow is preserved in the arid desert climate of northern Arizona, USA. Its unweathered appearance and the lack of soil development indicate it has undergone negligible erosion and/or burial. The SPICE Project (**S**P Flow **P**roduction-Rate **I**nter-calibration Site for **C**osmogenic-Nuclide **E**valuations Project) grew out of our CRONUS-EU study at the SP flow. Here, we present preliminary, cross-calibrated production rates and production-rate ratios for ^{10}Be, ^{14}C, and ^{21}Ne in quartz from the SP flow. Error-weighted mean, local production-rate ratios are 4.4±0.3, 2.9±0.2, and 1.43±0.10 (2σ) for ^{21}Ne/^{10}Be, ^{14}C/^{10}Be, and ^{21}Ne/^{14}C, respectively. These values do not include scaling to sea-level, high latitude (SLHL). Error-weighted mean, SLHL spallogenic production rates of ^{10}Be and ^{21}Ne are 3.73±0.25 and 16.6±1.0 (2σ) at/g/yr, respectively, using time independent Lal (1991)/Stone (2000) scaling factors. These overlap within 2σ with production rates and production-rate ratios in the literature. The error-weighted mean, SLHL spallogenic production rate of ^{14}C is 9.4±0.5 (2σ) at/g/yr. This rate is significantly lower than the global average spallogenic production rate of 12.1±1.0 at/g/yr. All SPICE, SLHL production rates are even lower if time-dependent scaling factors are used. Currently, all existing ^{10}Be and ^{14}C primary production rates were calibrated on surfaces that have been exposed to cosmic rays for less than 20 ka. Between 20 and 50 ka, the geomagnetic field was weaker than it is today. Production rates of cosmogenic nuclides increase during periods of weaker geomagnetic field strength. The SPICE calibrations allow us to determine whether production rates for the past 72 ka are measurably higher than rates integrated over the past 20 ka.