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Carbonate and silicate rock standards for cosmogenic ^{36}Cl

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The number of studies using cosmogenic nuclides has increased multi-fold during the last two decades and several new dedicated target preparation laboratories and Accelerator Mass Spectrometry (AMS) facilities have been established. Each facility uses sample preparation and AMS measurement techniques particular to their needs. It is thus desirable to have community-accepted and well characterized rock standards available for routine processing using identical target preparation procedures and AMS measurement methods as carried out for samples of unknown cosmogenic nuclide concentrations. The usefulness of such natural standards is that they allow more rigorous quality control, for example, the long-term reproducibility of results and hence measurement precision, or the testing of new target preparation techniques or newly established laboratories. This is particularly pertinent for in-situ ^{36}Cl studies due to the multiplicity of ^{36}Cl production pathways that requires a variety of elemental and isotopic determinations in addition to AMS ^{36}Cl assay.

We have prepared two natural rock samples (denoted CoCal-N and CoFsp-N) to serve as standard material for in situ-produced cosmogenic ^{36}Cl analysis. The sample CoCal-N is a pure limestone prepared from pebbles in a Namibian lag deposit, while the alkali-feldspar CoFsp-N is derived from a single crystal in a Namibian pegmatite. The sample preparation took place at the University of Cologne, where first any impurities were removed manually from both standards. CoCal-N was leached in 10 % HNO_3 to remove the outer rim, and afterwards crushed and sieved to 250-500 μm size fractions. CoFsp-N was crushed, sieved to 250-500 μm size fractions and then leached in 1% HNO_3 / 1% HF until 20% of the sample were removed. Both standards were thoroughly mixed using a rotating sample splitter before being distributed to other laboratories.

To date, a total of 28 CoCal-N aliquots (between 2 and 16 aliquots per facility) and 31 CoFsp-N aliquots (between 2 and 20 aliquots per facility) have been analyzed by six target preparation laboratories employing five different AMS facilities. Currently, the internal reproducibility of the measurements underlines the homogeneity of both standards. The inter-laboratory comparison suggests low over-dispersion. Further measurements are pending and should allow meaningful statistical analysis. Both standard materials are freely available and can be obtained from Tibor Dunai (tdunai@uni-koeln.de).