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In-situ cosmogenic ^{36}Cl production rate calibration from Ca and K in basaltic flows

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One of the CRONUS-EU goals is to provide high quality calibration sites from independently dated surfaces. Several previous studies have been conducted on ^{36}Cl production rate calibration (e.g. Stone et al. 1996, Phillips et al. 2001), which, however, used different protocols and yielded ^{36}Cl production rates with up to 40% discrepancies. The objectives of this study are 1- to understand the source of these discrepancies and 2- to calibrate ^{36}Cl production rates from its target elements Ca and K.

As a first step we focused on testing the chemical protocol by performing a sequential ^{36}Cl extraction experiment on whole rock grains and Ca-rich plagioclase from the same sample. The sample was collected at Mt. Etna on a pahoehoe flow, which has a K-Ar fossil exposure time of (10$\pm$3) kyr. Cosmogenic ^{3}He was also precisely measured within cogenetic olivine phenocrysts of this sample (Blard et al. 2005) and yields an exposure time of (10.4$\pm$1.5) kyr.

Both, total Cl and ^{36}Cl concentrations from the first dissolution steps are high, 5800 ppm (whole rock) and 450 ppm (plagioclase) Cl, and 10^7 - 10^6 atoms ^{36}Cl/g of rock dissolved. After about 20% dissolution of the plagioclase sample, Cl is almost completely removed (1-3ppm) and ^{36}Cl concentrations reach a plateau value of 2*10^5 atoms/g of rock. Using the Stone et al. (1996) and Evans et al. (1997) ^{36}Cl production rates for the target elements Ca and K, respectively, this plateau concentration yields an exposure age which is in excellent agreement with K-Ar dating and cos-

mogenic ^{3}He ages. On the contrary, in the whole rock sample total Cl concentrations remain high ($>$330ppm) resulting in a considerable ^{36}Cl production from capture of low-energy neutrons by ^{35}Cl, an additional and still not well-constrained ^{36}Cl production mechanism. The resulting exposure ages from the whole rock are systematically 20-30% higher than the independent ^{3}He ages.

To obtain an accurate ^{36}Cl production rate calibration from Ca, we will present results from separated Ca-rich plagioclase of various Mt. Etna lava flows of different elevation and independently determined ages between 400 yr and 33 kyr. To constrain the ^{36}Cl production rate from K, separated sanidine (K-rich feldspar) from a 15 kyr old lava flow of volcano Payun-Matru (Argentina, 36˚S) were analysed.

Stone J.O., et al. (1996), *Geochim. Cosmochim. Acta* **60** 679-692; Phillips F.M., et al. (2001), *Chem. Geol.* **175** 689-701; Blard P.H., et al. (2005), *EPSL* **236** 613-631; Evans J.M. et al. (1997), *Nucl. Instr. and Meth. in Phys. Res. B* **123** 334-340