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MASCOT: a new mass-spectrometer facility dedicated to the analysis of cosmogenic noble gases (3He and 21Ne) from terrestrial samples (Institute of Geological Sciences - University of Bern, Switzerland).

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In the past years, terrestrial cosmogenic nuclides have been successfully used for dating exposure history of landforms and measuring erosional processes on Earth's surface. In this context, quantifications of landscape change have mainly been accomplished through the use of radioactive cosmogenic nuclides such as 10Be and 26Al, but their application has generally been restricted to Quaternary time scales because of their relatively short half-lives. The results are 10Be and 26Al concentrations that are below the detection limit of available accelerator mass spectrometers if the samples have a Late Miocene or even a Pliocene age. Contrariwise, cosmogenic noble gases such as 3He and 21Ne do not experience any radioactive decay through time, which places these isotopes in an unbeatable position for measuring paleo-denudation rates preserved in detrital material even if the ages of these deposits are up to 10 Ma and even older. These isotopes are thus keys for assessing the interplays between tectonic, climate and surface processes involved in the long-term evolution of mountain belts.
Here we report the technical specifications of a noble gas analytical system that we have developed and set up at the Institute of Geological Sciences of the University of Bern, Switzerland, with the motivations to get dates and rates of erosion processes from the measurement of cosmogenic noble gases (3He and 21Ne) concentrations from terrestrial samples. This new facility, hosted at the Institute of Geological Sciences of the University of Bern, combines a MAP215-50 mass spectrometer fitted with a new high-sensitivity channel electron multiplier with an all-metal extraction and purification line. This later system thus comprises: (i) a double vacuum resistance furnace loaded by a 22-samples carrousel, (ii) three in-vacuo crushers (iii) an ultra high vacuum pumping system (<10-8 mbar) composed of turbo-molecular, ion-getter pumps and backed by a scroll pump, (iv) the line itself made up of a series of valves, connectors, a collection of getter-pellets filled fingers and activated charcoal cold-traps and (v) a dry-cryogen free cryostat system operating at temperatures ranging between 8K and 375K for trapping remaining heavy gases and focusing He and/or Ne before analysis in the mass spectrometer. This communication will be the opportunity to present our new noble gas system's full specifications together with an overview of the associated scientific questions we want to address using this new facility.