

Name of research institute or organization:

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**Institute for Isotope Geology and Mineral Resources, ETH Zurich**

Title of project:

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Cosmogenic nuclide production rate calibration using artificial quartz and water targets.

Project leader and team:

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Prof. Rainer Wieler, project leader  
Dr. Pieter Vermeesch

Project description:

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When cosmic rays (mostly neutrons) penetrate the Earth surface, they are rapidly attenuated after 1-2m by spallation reactions with Si, O, Mg, Al,... generating cosmogenic nuclides such as He-3, Be-10, Al-26 and Ne-21. Thus, by measuring the abundance of these nuclides in rocks, it is possible to calculate how long they have been at the surface. This method has truly revolutionized the field of geomorphology since the early 1990's. One of the most important sources of measurement uncertainty are the cosmogenic nuclide production rates. We know to an approximation of ~10% how these change with latitude and elevation. The purpose of our experiment is to improve this approximation. This work funded by the European Union in the framework of the CRONUS project, which is a collaboration between 10 universities.

We have designed and built stainless-steel containers filled with 1kg of artificial quartz (SiO<sub>2</sub>). After degassing in a furnace at 800C, this quartz contains basically no He-3 or Ne-21. We then expose the containers at different latitudes and elevations during 1-2 years. All the He-3 and Ne-21 measured after this time must be cosmogenic, yielding a direct measurement of cosmogenic nuclide production rates. We have prepared 5x2 quartz targets plus an additional 5 water targets and exposed them at the following stations, during the last week of August:

Zuerich (~500m)

Davos (~1500m)

Saentis (~2500m)

Jungfraujoch (~3500m)

The fifth location is Monte Rosa (~4500m)

We will retrieve the targets after roughly one year and measure their 3-He and 21-Ne content.

Key words:

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Cosmogenic Nuclides, production rates, quartz, water, 21Ne, 3He, Cosmic rays

Collaborating partners/networks:

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Cronus-Eu network

Scientific publications and public outreach 2006:

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**Conference papers**

Vermeesch, P., Strasky, S., Baur, H., Kober, F., Schlöchter, C., Wieler, R., 2006: Cosmogenic noble gases measured in artificial quartz targets after one year of exposure in Antarctica, CRONUS-EU summer school “Applications of Cosmogenic Nuclides to Earth Surface Sciences”, Harkany, Hungary

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