

From the Geosphere to the Cosmos: ASPERA Workshop

CV&Abstract

Cosmic ray-produced radionuclides in Earth Sciences

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Curriculum Vitae :

Professor for Geology, head of CologneAMS, the new national facility dedicated for the analysis of in-situ produced cosmogenic nuclides. Research interests include the methodological development of cosmogenic nuclides for Earth Surface Sciences and their application to pertinent research questions in landscape evolution, paleoseismology and climate research. Coordinator of CRONUS-EU (FP6, MC-RTN), permanent member of the steering committee of CRONUS-Earth (NSF, USA).

Abstract:

Over the last decade in-situ produced cosmogenic nuclides have become an essential tool for Earth surface sciences; changing it from being a largely qualitative to a quantitative branch of sciences. These cosmogenic nuclides are produced in near-surface rocks by secondary cosmic ray neutrons and muons from the atmospheric reaction cascade. In-situ cosmogenic nuclides allow determining surface exposure ages of rocks, e. g., to date glacial advances or retreats, lava flows, earthquake recurrence rates, as well as constraining modes of soil production. Since nuclide production decreases quickly with depth in a rock, cosmogenic nuclides also allow measuring erosion rates, either locally or as catchment wide averages. The application of cosmogenic nuclides have allowed to quantitatively address, for the first time, a wide range of long-standing first-order problems in geomorphology, paleogeology, paleoclimatology, volcanology, paleoseismology and related fields.

The methodology is continuously refined, recently by the two international research consortia CRONUS-EU and CRONUS-Earth (Stuart and Dunai, 2009; Phillips 2009). Aim is to increase the accuracy of ages obtained, crucial to test e.g. climate models, and develop new nuclides as tools for Earth Sciences. From the work of these consortia it emerged that a detailed survey of the secondary neutron energy spectrum is required to close the remaining gaps in our understanding and fully benefit of pertinent newly derived reaction cross section data.

Stuart, F. M. and Dunai, T. J., 2009. Advances in cosmogenic isotope research from CRONUS-EU. *Quaternary Geochronology* **4**, 435.

Phillips, FM, 2009. The CRONUS-Earth Project: Current results and future plans, *Geochim. Cosmochim. Acta*, **73**, A1025.
