SYER 2: Session II

Zeit: Mittwoch 14:00–16:00 Raum: 3C

Hauptvortrag SYER 2.1 Mi 14:00 3C

Hochempfindliche Messungen atmosphärischer Spurengase: Massenspektrometrie mit selektiver Ionisation durch Ion-Molekül-Reaktionen — •Frank Arnold — Prof.Frank Arnold, Max-Planck-Institut für Kernphysik, ostfach 103980, D-69000 Heidelberg, Deutschland

Spurengase spielen eine wichtige Rolle in der Atmosphäre und nehmen Einfluss auf die atmosphärische Umwelt. Selbst Ultra-Spurengase mit atmosphärischen Molfraktionen unterhalb von einem ppt (parts per trillion) wie z.B. OH oder H_2SO_4 können sehr bedeutsam sein. In den vergangenen Jahren wurden verschiedene Messmethoden zur atmosphärischen Spurengasanalyse entwickelt. Eine besonders leistungsfähige und vielseitige Methode ist die Massenspektrometrie mit selektiver Ionisation durch Ion-Molekül-Reaktionen, die häufig auch CIMS (Chemical ionistion Mass Spectrometry) genannt wird. Sie zeichnet sich durch hohe Nachweisempfindlichkeit und hohe Zeitauflösung aus und ist daher auch für die Untersuchung von Kurzzeitprozessen (z.B. Blitze) und für den Einsatz auf schnell fliegenden Flugzeugen und Raketen geeignet. Dieser Vortrag gibt einen kurzen Überblick über die Entwicklung und den Einsatz dieser Methode. Der Fokus liegt hierbei auf Arbeiten unserer Heidelberger Max-Planck Forschungsgruppe. Wir haben zahlreiche unterschiedliche CIMS-Instrumente entwickelt und diese im Labor, an Motor-Teststänsden und in der Atmosphäre (am Boden, auf Bergmessstationen und an Bord von Flugzeugen, Ballonen, und Raketen) eingesetzt.

Hauptvortrag SYER 2.2 Mi 14:30 3C

AMS at low energies - Recent developments and applications in environmental sciences — •Marcus Christl, Arnold Müller, Lukas Wacker, Vasily Alfimov, Martin Stocker, Hans-Arno Synal, and Martin Suter — PSI/ETH Laboratory of Ion Beam Physics, Institute for Particle Physics, ETH-Zürich, Switzerland

Considerable progress has been made over the past decade in establishing long-lived radionuclide measurements on small, low energy AMS systems. Small AMS machines are cost saving alternatives for laboratories in the earth and environmental sciences and in many cases these systems now may compete with much larger machines with respect to over all efficiency, precision, and accuracy. This talk gives an overview about the most recent technical developments and demonstrates the potential of compact AMS machines for their application in the earth's and environmental sciences. Various examples will be presented covering a wide range of applications (e. g. earth's sciences, environmental monitoring, dating) as well as a wide mass range (Be-10, C-14, Al-26, I-129, Pu-, Pa-, and U-isotopes).

Hauptvortrag SYER 2.3 Mi 15:00 3C

Geochemistry of rare cosmogenic nuclides — •Friedhelm von Blanckenburg — Institut für Mineralogie, Universität Hannover, Callinstrasse 3, 30167 Hannover

Cosmogenic nuclides (mostly ^{3}He,^{10}Be, ^{14}C, ^{21}Ne, ^{26}Al, ^{36}Cl) currently fuel a fascinating scientific development boosted by Accelerator Mass Spectrometry (AMS). Cosmogenic nuclides are produced by interaction of galactic cosmic rays (mainly protons of GeV energy) with the surface of meteorites (Cosmochemistry); with molecules in the atmosphere (Environmental and Climate sciences); and with interaction of secondary cosmic rays (mainly MeV neutrons) with the uppermost meter of the Earths surface (Geosciences). The so-called "in-situ produced"cosmogenic nuclides can be used to determine, for example, exposure ages of prominent features of the Earths landscapes, such as glacial moraines or lithospheric faults. However most surfaces of the Earth are always slowly eroding, in which case erosion rates can be calculated. For nuclides produced in the atmosphere from where they are introduced into terrestrial or oceanic material their radioactive decay from an initial isotope ratio (e.g. ^{14}C/^{12}C, ^{10}Be/^{9}Be) can be used to determine ages (such as that of organic matter or of ground water). In ocean water and sediment, they mark paleo-ocean circulation and sedimentation. When measured in well-dated environmental archives, such as tree-rings (^{14}C) or ice cores (^{14}Be), the changes of production rates of atmospheric cosmogenic nuclides provide information about the past solar modulation, and its impact on climate change. These developments will be reviewed in this talk.

Hauptvortrag SYER 2.4 Mi 15:30 3C

Iodine-129 in the Environment — •Rolf Michel — Zentrum für Strahlenschutz und Radioökologie, Leibniz Universität Hannover, Germany

The natural environmental abundances of Iodine-129 were globally changed by orders of magnitude due to atmospheric nuclear explosions and by accidental and routine releases from nuclear installations. Today, the environmental I-129/I-127 ratios range from more than 10^{-6} to less than 10^{-12}. The situation in Western Europe is reviewed based on investigations of seawater from the English Channel, the Irish Sea, the North Sea, the Baltic Sea and the North-East-Atlantic. In Northern Germany, air-borne species, precipitation, surface and groundwater as well as the complete terrestrial food-chain were investigated. The iodine isotopes are in severe disequilibrium in all the environmental compartments. A differentiation by about a factor of ten between the iodine isotopes was observed for different air-borne iodine species. Time series for iodine in precipitation show a decade-long increase of I-129 fallout until the 1990ties and an ongoing constant input of I-129. In surface waters, a dilution of the fall-out iodine takes place by stable iodine which is just weakly adsorbed in the soils. The isotope ratios in soils and ground waters demonstrate a high mobility and an accumulation of I-129 in the water unsaturated soil zones and an efficient migration into water saturated soil layers and ground water. The transfer into the food chain is ruled by the complex situation in the water-soil system. In spite of the extreme anthropogenic changes, I-129 is presently not of radiological concern.