

APPLICATION OF COMPOUND-SPECIFIC HYDROGEN ISOTOPIC MEASUREMENTS TO BIOGEOCHEMICAL AND PALEOCLIMATOLOGICAL RESEARCH.

Bernasconi, S.M., Andersen, N., Paul, H.A., and McKenzie, J.A. Geology Institute, ETH-Z, Zurich, Switzerland

We are currently developing and improving an analytical system for the determination of hydrogen isotope ratios in individual organic compounds at the natural abundance level. Compounds are separated by gas chromatography using Helium as a carrier gas and pyrolyzed at high temperature to produce molecular hydrogen, which is measured via isotope ratio mass spectrometry. At present, the system allows for the measurement of molecules with up to 35 carbon atoms in complex mixtures, with a precision of approximately 1 to 5 permil. With this system we are investigating the possibility of using compound-specific hydrogen isotope analyses for reconstructing past changes in the hydrological cycle, for detecting specific sources of individual compounds in complex mixtures and for monitoring biodegradation of organic compounds in contaminated groundwaters. Compound-specific analysis is a promising tool for these research areas, as it allows for the measurement of specific compounds that can be related to a specific source. We will present case studies showing that changes in the hydrogen isotope composition of ambient water, temperature and pH strongly influence the hydrogen isotope composition of individual compounds.