The Natural Production of Organohalogen Compounds

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More than 3600 organohalogen compounds, mainly containing chlorine and/or bromine, are either produced by living organisms or are formed during natural abiogenic processes such as volcanoes, forest fires, and geothermal processes. The ocean is the greatest single source of natural organohalogens and myriad sponges, corals, seaweeds, tunicates, nudibranchs, bacteria, and other marine organisms produce such compounds. Terrestrial plants, fungi, lichen, bacteria, and insects are also significant producers of organohalogen compounds. Nearly all types of organic compounds are represented, including alkanes, aromatic hydrocarbons, phenols, pyrroles, indoles, fatty acids, terpenes, peptides, steroids, alkaloids, acetogenins, furans, and dioxins. Some of the halogenated byproducts of the mammalian immune system, which uses chlorine and bromine to fight infection, have been identified. Dioxins are now recognized to have several natural sources. The first examples of natural bioaccumulative compounds have been discovered in seabirds. Clearly, nature employs halogen as a basic building block to construct essential molecules for survival of the particular organism. The notion that these thousands of unique organohalogens are isolation artifacts or are the result of anthropogenic activities can now be dismissed. This presentation will discuss recent developments as to the origin and abundance of these natural halogenated chemicals.

Geochemical Characteristics of the Mantle Plume at the Eifel

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Introduction

The Eifel with its Tertiary and Quaternary volcanic fields is not only the youngest volcanic province in Central Europe but also one of the most geodynamically active area between the European Alps and the North Sea. These geodynamic phenomena are triggered by the presence of a mantle plume, which has been identified as a columnar low P-velocity anomaly in the upper mantle with a lateral contrast of up to 2 %. This structure is about 100 km wide, it extends to at least 400 km depth and is equivalent to about 150-200 K excess temperature (Ritter et al. 2001). One of the surface expressions of volcanism and geodynamic activity is the presence of numerous mineral and CO_2-gas rich springs and dry CO_2-gas emanations.

Results and Discussion

At present the Eifel districts are among the major CO_2-gas producing regions in Europe. There is an overabundance of CO_2-gas rich springs, which cover a much larger area than the Tertiary and Quaternary volcanism. Isotopic compositions of carbon, helium, neon and argon, as well as REE, anion and cation concentrations have been determined in highly CO_2-gas rich groundwaters following a cross-section covering both the rim and the central part of the mantle plume. In general, the isotope and concentration data show distinct geochemical differences between the East and the West Eifel districts, with considerably higher enrichments of the mantle signature in the West Eifel than in the East Eifel. Furthermore, rare gas isotope data provide unambiguous evidence for the presence of a plume type noble gas component in CO_2-gases from the southern section of the West-Eifel, as their Ne isotopic signature is similar to that of the Hawaiian plume. In contrast, MORB-like noble gas signatures prevail in the East- and the Hocheifel. Another important feature is the extensive occurrence of CO_2 emanations outside of the volcanic West Eifel. Thus, even though CO_2 and magmas might originate from similar mantle depths, CO_2 at the Earth‘s surface often serves as a better indicator for active mantle processes than volcanism because it is produced at the very beginning of melting, well before melt segregation occurs, and the ascent of CO_2-gas to the surface is not stopped at the crustal base due to loss of buoyancy (Griesshaber et al 2002).

Griesshaber E., Nüsslein M., Baumüller D. and Job R. (2002): Carbondioxide fluxes from the mantle plume in the Eifel. Manuscript in preparation.

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