

Anthropogenic contributions of ^{129}I and ^{85}Kr to global reservoirs: Current distribution patterns and projected increases

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^{129}I and ^{85}Kr are two isotopes whose presence in global surface reservoirs is due primarily to nuclear reprocessing activities. A knowledge of the partitioning of these isotopes in surface reservoirs is critical to our understanding of how release and storage of these isotopes should be handled presently and in the future.

Long-lived ^{129}I (half-life=15.6 Myr) partitions primarily into shallow soil and seawater. While its residence time in the atmosphere is short, repeated cycling of iodine between surface waters and the atmosphere has resulted in its distribution far from point sources. Downwelling of surface waters in the North Atlantic presently transports ^{129}I to deep waters which provide a temporary sink for anthropogenic iodine. In contrast, the relatively short-lived ^{85}Kr (half-life=10.76 yr) partitions primarily into the atmosphere and its dispersal is a result of wind patterns in the troposphere. We compare the present distribution of these two isotopes and model their increase into the future when the bulk of nuclear reprocessing is projected to move from Western Europe to Asia. We also discuss the effect of speciation of ^{129}I and stable ^{127}I in the environment, and disequilibrium between these two isotopes.

Combined use of Raman, ToF-SIMS and AFM imaging for characterizing the surface reactivity of sea salts

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Sea salt particles are typically emitted in the atmosphere through by breaking waves and bursting bubbles at the ocean surface where Cl^- , Na^+ , Mg^{2+} , K^+ and SO_4^{2-} are the most abundant ions. It is well established that sea salts can react with gaseous species to form complex aerosols [1, 2]. Such reactive uptakes on the surface of particles during their atmospheric residence time can significantly alter their optical properties and affect their ability to act as cloud condensation nuclei. In addition, some products may be photochemically active at solar wavelengths and may affect the oxidative properties of the atmosphere [3]. Finally, in the marine atmosphere fatty acids (FA) are known to be present as particles and/or as a coating on sea salt particles which could influence sea salt reactivity [4]. *In situ* observation of the atmospheric processing of the surface of particles can be performed in laboratory by Raman microspectrometry (RMS) and Atomic Force Microscopy. The combined use of both techniques is a powerful tool to determine the morphology and the distribution of molecular species within individual micrometer-size particles [5]. Moreover, the first layers at the surface of particles (few nm) can be analyzed using Time-of-Flight Secondary Ion Mass Spectroscopy (ToF-SIMS) [6]. In this study, laboratory experiments were conducted to simulate heterogeneous reaction at the surface of sea salt particle (NaCl) coated with FA and exposed to gaseous pollutants (NO_2). As expected, formation of nitrate salts on the surface of NaCl was evidenced and influence of FA demonstrated at the surface scale. Finally, by using RMS imaging in the UV range (266 nm and 325 nm), the photochemistry of formed nitrates and influence of FA on their photo-reactivity was also studied. This work demonstrated the the potential of the combination of RMS, AFM and ToF-SIMS imaging for studying the heterogeneous chemistry of the particle surfaces.

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