Microcosm studies investigating the fate of mercury in contaminated sediments and potential remediation options

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Three stratigraphically adjacent soils were sampled from a site in the south of England known to suffer from historic mercury contamination. Anoxic microcosms were set up containing differing quantities of organic carbon to promote microbial activity and half the samples were then treated with mercury (II). Biological, chemical and geochemical indicators were then monitored for 4-6 months to determine (1) the impact of mercury on a range of terminal electron accepting processes, and (2) the fate of the metal as the microcosms aged. Contrasting results were obtained with the three soils, linked primarily to mercury sorption characteristics at the start of the experiment. Significant differences between the soil types were also evident as the microcosms aged and when mercury was selectively extracted using a series of washes of increasing strength [1]. However a significant portion of the mercury was not accounted for using this technique and further experimental work was carried out to quantify mercury volatilisation into the headspace and to apportion this to methyl-mercury and elemental mercury fractions.

Specific soil horizons sorbed only half of the 40ppm mercury added as Hg (II), suggesting potential pathways for mercury migration in groundwaters at the site. In order to address this issue, microbial and mineralogical remediation agents have been tested in the microcosms to remove residual mercury from solution. The positive results from these experiments will be used to form the basis of a remediation strategy at the site.

[1] Bloom, N., Preus, E., Katon, J. & Hiltner, M. (2003) *Anal. Chim. Acta*. **479** 233-248.

Large scale nitrogen isotope variation in the solar system

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Refractory elements in solar system objects available for analysis show homogenous isotopic ratios that indicate efficient mixing between gas and dust at the 10^{-4} level. In contrast, there is increasing evidence that some of the most volatile elements display large isotopic variations. The D/H ratio varies by a factor of 5 between the protosolar nebula gas (PSN) value and values characterising the Earth and most primitive meteorites, and by a factor of ~10 between the PSN and comets. Analysis at CRPG Nancy (France) of solar wind (SW) collected by the Genesis mission has shown that the SW $^{15}N/^{14}N$ ratio is lower by a factor of 1.6 with respect to terrestrial N and to most chondrites, and by a factor of ~3 relative to cometary HCN and CN. This result shows first that modern SW N is isotopically similar to Jupiter's atmosphere and TiN in CAI, both representing presumably the PSN composition for nitrogen. Thus it demonstrates that the solar composition did not evolve with time for elements heavier than boron. Second, hydrogen and nitrogen show comparable radial heavy isotope enrichments, with cometary matter being 2 times isotopically heavier than inner solar system bodies in both cases. This requires inner planets and asteroïds to originate from a common, well homogenized, reservoir that once existed there.