

TREE



Transfer - Exposure - Effects:

integrating the science needed to underpin radioactivity assessments for humans and wildlife

Interactions Between Anionic Radionuclides (^{129}I , ^{79}Se and ^{99}Tc) and Geocolloids

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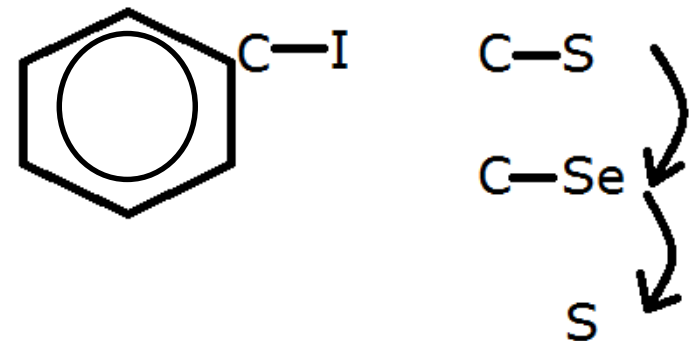
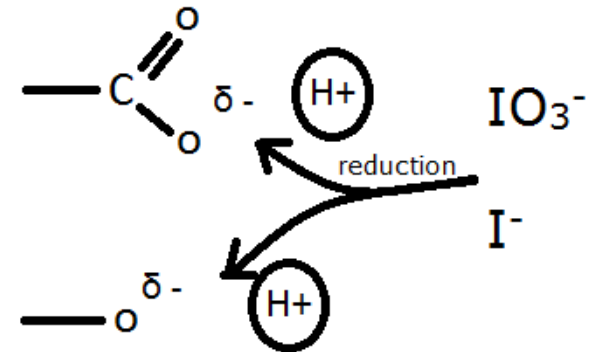
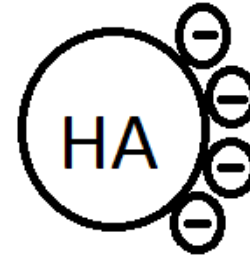
Aim

To develop predictive models for the fate of ^{129}I , ^{79}Se and ^{99}Tc in soils and aquatic systems by resolving underlying mechanisms and reaction rates.



Reaction Mechanisms

- Interaction with humic substances
- Organic matter content
- Iodide/iodate
- Selenite/selenate
- Pertechnetate
- pH dependent kinetics



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Size Exclusion Chromatography (SEC) Linked to ICP-MS

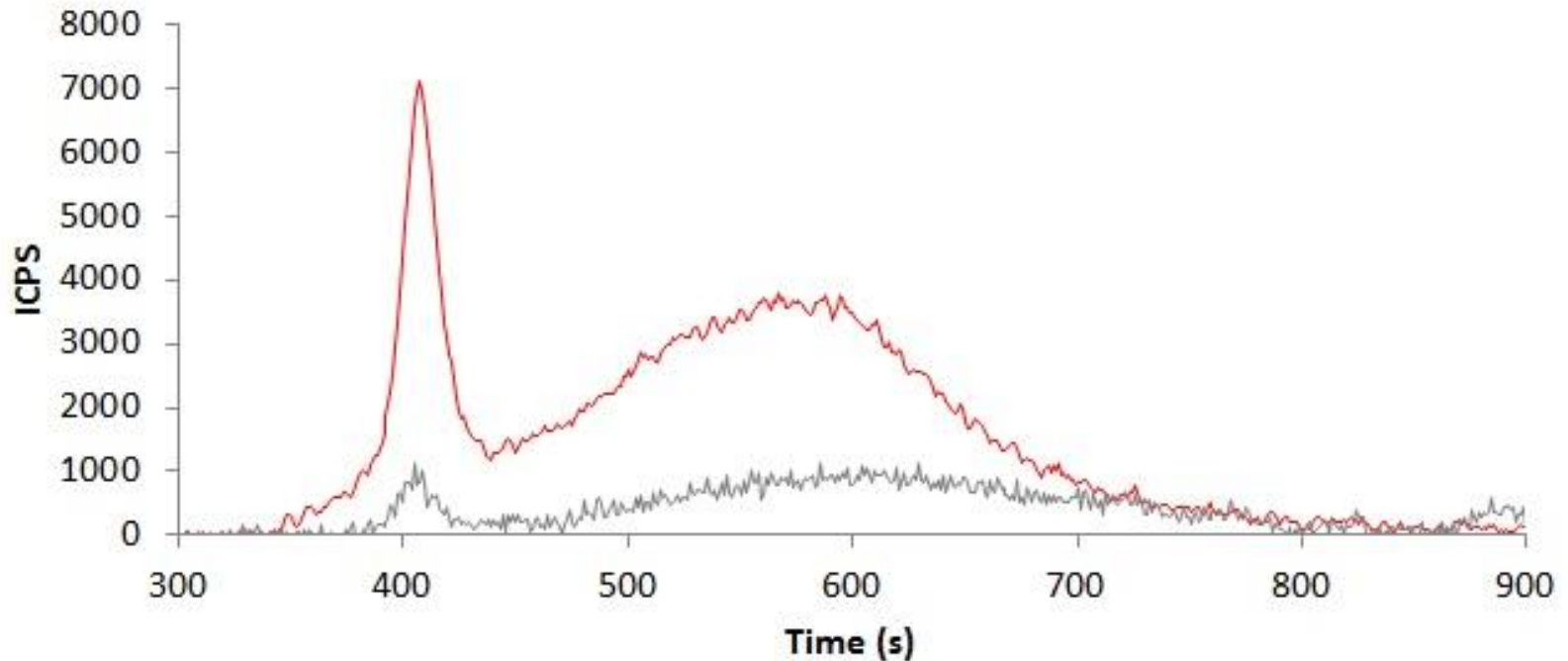


Figure 1. Organic-I size exclusion chromatogram for ^{127}I (red line) and ^{129}I (grey line) for a humic acid solution spiked with iodide and iodate and incubated for 77 days.



Fulvic Acid Soil Solution

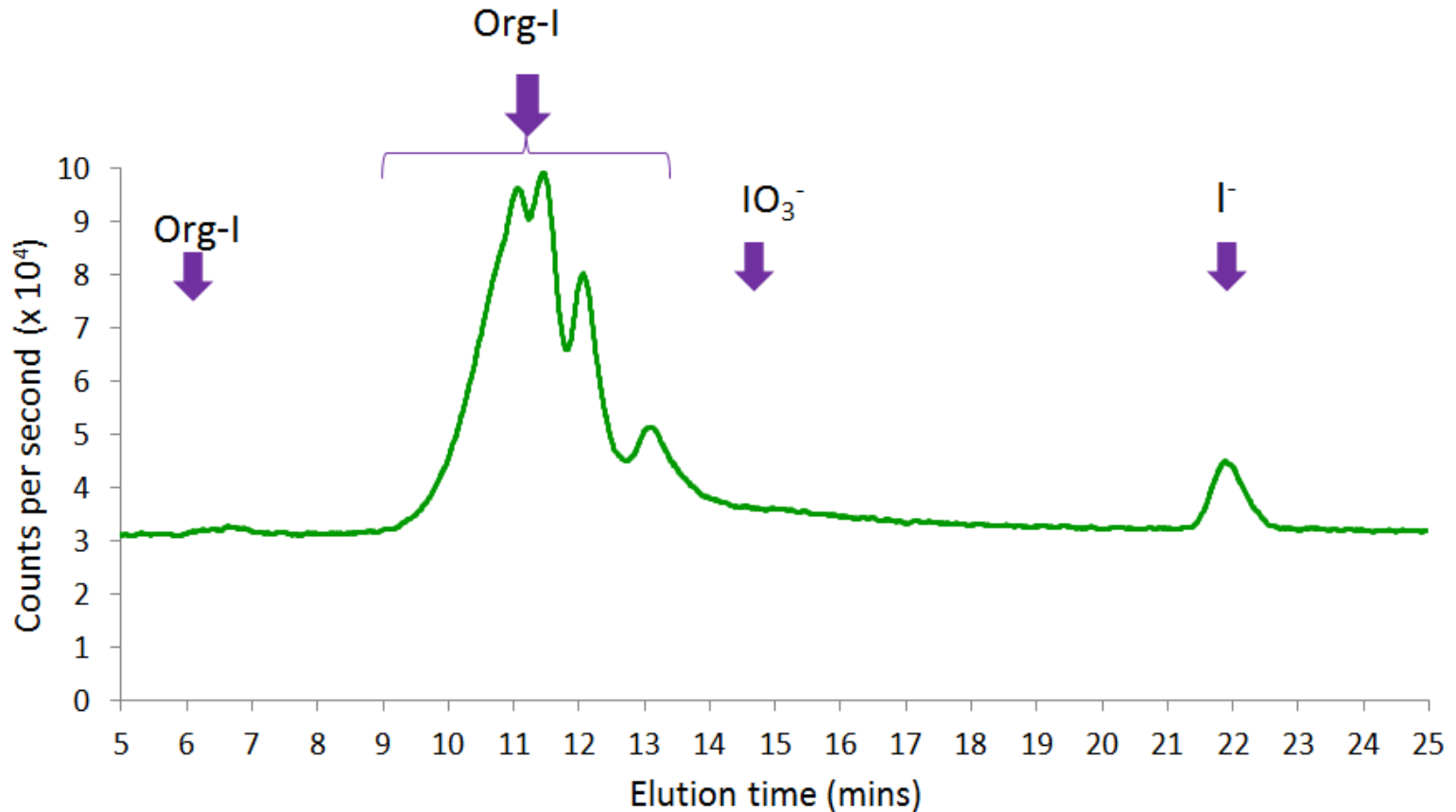


Figure 2. Size exclusion chromatograms of ^{127}I in three soil solutions showing four clear peaks where iodine is bonded to organic matter.

X-Ray Absorption Spectroscopy (XAS)

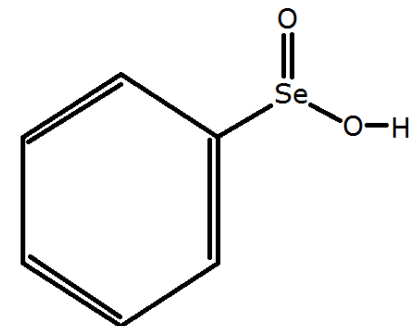
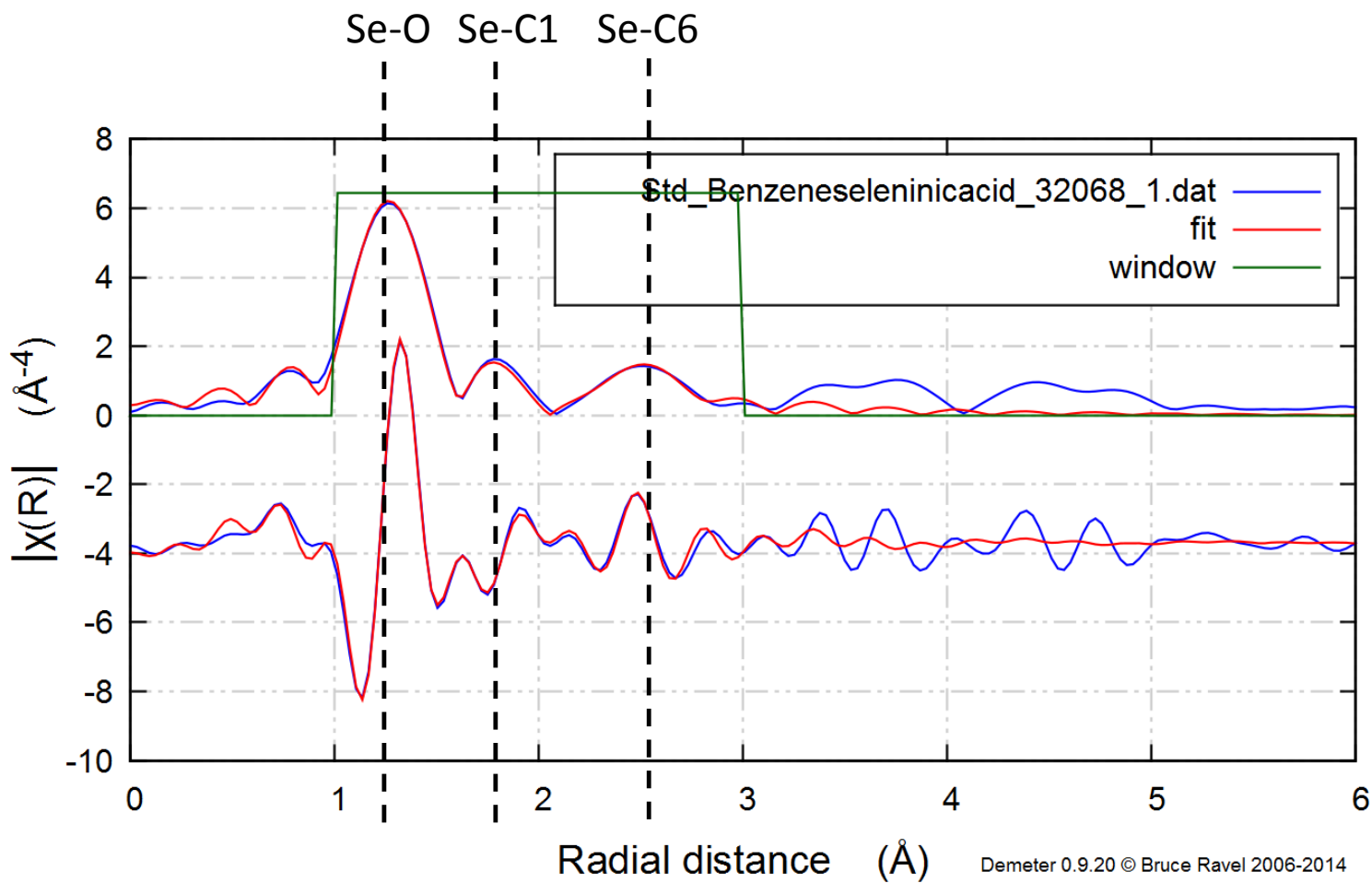


Figure 3. EXAFS spectra for selenium standard in the form of benzene seleninic acid.

Kinetic Model Schematic

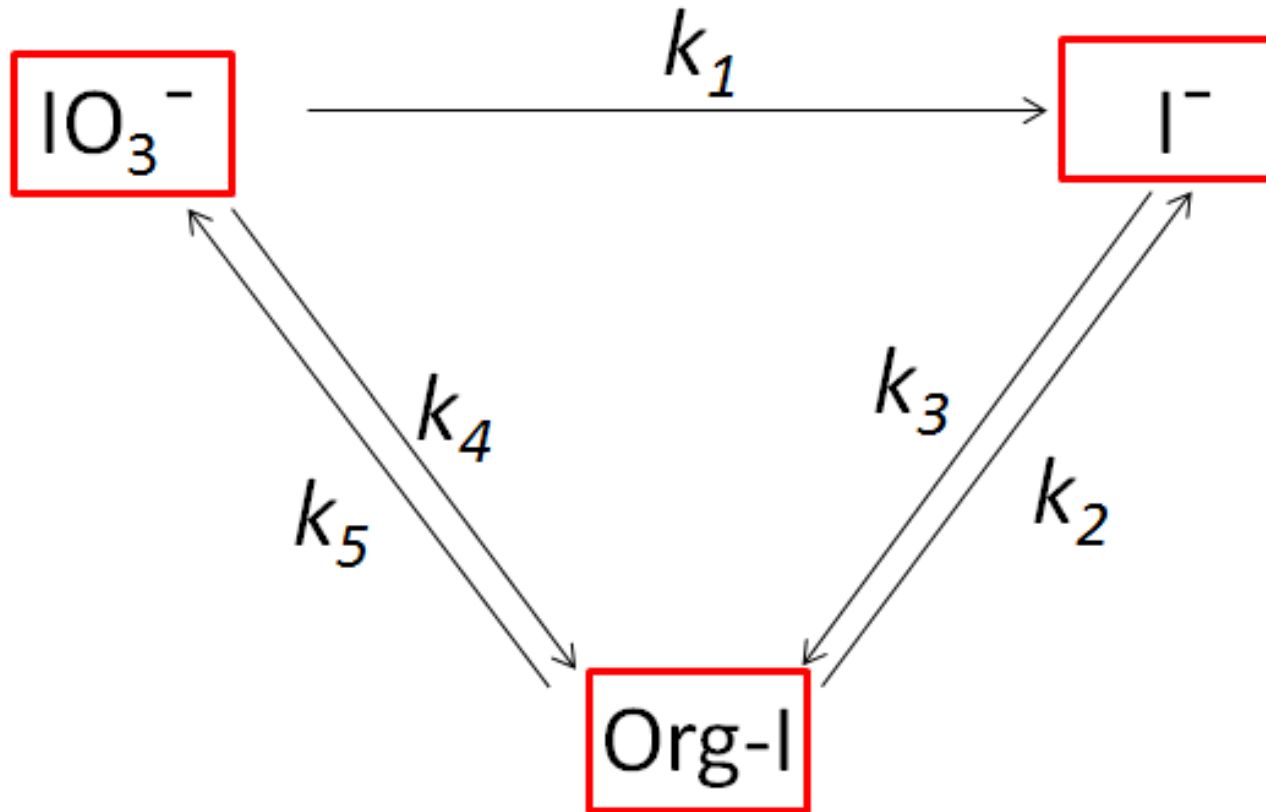


Figure 4. Conceptual model describing iodine transformations of spiked ^{129}I in the presence of HA. Rate constants k_1 – k_5 describe first order rate equations.

Future Work

Started PhD on the 1st October 2014

Progress so far:

- Literature review started
- Undergone ICP-MS training
- EXAFS training course at the Diamond Light Source
- Humic and Fulvic acid preparation

Immediate future:

- Continued humic and fulvic acid preparation
- Size Exclusion Chromatography training
- Starting incubation experiments

