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Department of Marine Sciences
Presents a Seminar by

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From pollution to your plate: the environmental cycles of selenium and mercury

Human activities have perturbed the environmental cycles of selenium (Se) and mercury (Hg), two trace elements that are important for food safety. Selenium an essential metalloid, with up to 1 billion people estimated to have too low dietary intakes. Mercury is a heavy metal that bioaccumulates in the marine food chain, leading to toxic levels in commercial fish. In my talk, I will present advances in modelling these elements in the environment and the human impact on these cycles.

Selenium is volatilized to the atmosphere from the marine and terrestrial biospheres, volcanoes, and anthropogenic activities (e.g., fossil fuel combustion). However, very little quantitative information is available regarding the fluxes and burden of Se in the atmosphere. Using atmospheric chemistry modeling, Bayesian inference methods, and available Se observations, we constrained the global emissions of Se (29 and 36 Gg/yr), showing that atmospheric inputs of Se to agricultural soils and the marine environment may be larger than previously expected. Over the last three decades, Se deposition has been declining in North America and Europe. Declining atmospheric inputs to agricultural soils in the future may potentially elevate the risk for dietary Se deficiency.

Terrestrial ecosystems, especially forests, take up approximately one third of all mercury (Hg) emissions to the atmosphere, thereby reducing the burden of Hg entering the ocean and eventually the marine food chain. Land use change disturbs the terrestrial Hg sink and enhances the release of Hg from soils through erosion and volatilization. Using atmospheric and soil erosion models, we quantify the impact of Amazon deforestation and global-scale reforestation scenarios on Hg cycling. We demonstrate that deforestation is an overlooked anthropogenic source of Hg pollution, while reforestation has a modest benefit for reducing the inputs of Hg to the ocean.

Host: Robert Mason

Time & Date: 11:00 am, Friday, March 17, 2023

Place: Lowell Weicker Building, Seminar Room 103 (or WebEx)

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