Tellurium environmental behaviour at the continent-ocean interface: preliminary scenarios for hypothetical radionuclide releases

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Tellurium (Te) radionuclides are product of nuclear fission emitted during accidental nuclear power plant (NPP) events (i.e., Chernobyl – 1986, Fukushima - 2011). Different short-term half-life radioisotopes may produce important radioactive emissions (atmospheric ^{132}Te half-life of 3.2 days: ~1150 PBq at Chernobyl and ~180 PBq at Fukushima) comparable to the most monitored radionuclides after NPP accidental events (^{137}Cs and ^{131}I, with ~85 PBq and ~1700 PBq at Chernobyl, ~37 PBq and ~160 PBq at Fukushima) [1]. Prediction of radionuclide environmental dispersion needs understanding of their biogeochemical cycles and relies on the presumed analogy between the chemical behaviour (e.g., solubility, speciation, etc.) of stable and radioactive isotopes of a given element [2]. Stable Te is also a Technology Critical Element (TCEs) and emerging contaminant but few studies deal with its fluvial-estuarine behaviour despite its ubiquity in aquatic environments [3]. Analytical limitations add to the reasons for its rather unknown biogeochemical cycle [4], crucial to environmental dispersion modelling of Te dispersion and reactivity.

We aim to predict the environmental fate and potential dispersion of Te radioisotopes in case of accidental NPP events in the Gironde Estuary (France). Grain-sized corrected concentrations suggest Te affinity to Suspended Particulate Matter (SPM), controlling partitioning at the watershed scale and estuarine particle residence times. Partitioning and freshwater discharge, controlling the dynamics of the Maximum Turbidity Zone (MTZ; SPM >1g/l) and SPM residence times, will play a major role in radioprotection scenarios, considering the potential risk of upstream transport of radioactive Te particles to Bordeaux during summer draught.

[1] Steinhauser (2014) *Sci Total Environ* **470-471**, 800-817. [2] Takata (2016) *Sci Total Environ* **543**, 315-325. [3] Wu (2014) *Chin J Oceanol Limn* **32(2)**, 444-454. [4] Fornadel (2014). *J Anal Atom Spectrom* **29**, 623-637