Arctic atmospheric Hg speciation and isotope observations

Jeroen Sonke, laboratoire Geosciences Environnement Toulouse, Centre National de Recherche Scientifique (GET-CNRS)

Jeroen.sonke@get.omp.eu

Toulouse, 5.11.2018

WP2: In-situ component for organic contaminants, mercury and other heavy metals

T2.2: Hg monitoring in polar regions and evaluation of the atmospheric mercury lifecycle

D2.2.1: GMOS observations: Improved GMOS SOPs for atmospheric Hg(II) measurements in the Arctic and updated GMOS database for Arctic atmospheric Hg(II) observations
D2.2.3: GMOS observations: New Arctic atmospheric Hg isotope monitoring data set

Document version number: 1.0

Hg levels in arctic biota are among the highest globally, and affect arctic wildlife and indigenous populations. Understanding how that Hg gets there, and how arctic Hg exposure will evolve with ongoing arctic warming is of tremendous importance if we want to understand cross-border impacts of Hg emissions and the role of climate change on a global scale. Modern 3D coupled ocean-atmosphere-continent models of the global Hg cycle, used to assess climate change impacts, are essential, yet in their infancy due to complex and ill-understood Hg cycling. Our overall objective is to resolve a final and key outstanding enigma in the Arctic Hg cycle: the pronounced summertime maximum in atmospheric elemental Hg^0 levels. We will sample and measure novel, year-round, Hg stable isotope signatures of atmospheric Hg^0. Hg isotopes have proven essential in fingerprinting Hg sources and transformation processes. We expect to be able to identify the origin of the summertime Hg^0 phenomenon, thereby unblocking a major hurdle in Hg model development and application. Weekly sampling of atmospheric Hg^0 on activated carbon sorbents, and of Hg^{II} on cation exchange membranes (CEMs) at Zeppelin (Svalbard) and Villum (Greenland) research stations will be made during 2018 and 2019. Hg will be recovered from sorbents and CEMs at CNRS-GET for Hg isotope analysis by multi-collector ICPMS. Zeppelin and Villum are equipped with automated atmospheric Hg^0 , CO, and ozone analyzers that are needed for data interpretation. We work with Hg modelers at MIT, Harvard, HZG and LATMOS to confront our latest field observations with models, and drive model development.

Financial support is provided by the French Institut Polaire Emil Victor (IPEV), programme No 1208.