Isotopic compositions of Hg in cross-hemisphere marine aerosols reveal different Hg^0 redox reactions

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Elemental mercury (Hg^0) is oxidized in the atmosphere into reactive mercury (Hg^{II}) which is particle-reactive and deposits rapidly. Constraining both sources and the main oxidation pathways of Hg is thus crucial to better model Hg dispersal and ecosystem loading. However, the major oxidation pathways of Hg^0 remain unclear, in particular in the Ocean dominated Southern Hemisphere where measurements remain scarce preventing an efficient validation of different atmospheric model with limit Hg data set. Here we present new data for both Hg and S-multiple isotopic compositions in total suspended marine aerosols collected shipboard from a cross-hemisphere round-trip cruise between Shanghai (China) and Antarctica. The goals are to understand the key processes that control the formation of Hg_p. Our results show a latitudinal gradient of both Hg mass-independent isotope fractionation (odd- and even-MIF) and $\Delta^{33}S$ in marine aerosols along the transect, which likely result from a transition from one to another oxidation pathways. The implication of different oxidation pathways would also explain the observed both positive $\Delta^{33}S$ and $\Delta^{200}Hg$ peaks during the outward trip to the Antarctic.