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Estimating mercury emission outflow from East Asia using CMAQ-Hg

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Abstract. East Asia contributes to nearly 50% of the global anthropogenic mercury emissions into the atmosphere. Recently, there have been concerns about the long-range transport of mercury from East Asia, which may lead to enhanced dry and wet depositions in other regions. In this study, we performed four monthly simulations (January, April, July and October in 2005) using CMAQ-Hg v4.6 for a number of emission inventory scenarios in an East Asian model domain. Coupled with mass balance analyses, the chemical transport of mercury in East Asia and the resulted mercury emission outflow were investigated. The total annual mercury deposition in the region was estimated to be 821 Mg, with 396 Mg contributed by wet deposition and 425 Mg by dry deposition. Anthropogenic emissions were responsible for most of the estimated deposition (75%). The deposition caused by emissions from natural sources was less important (25%). Regional mercury transport budgets showed strong seasonal variability, with a net removal of RGM (7–15 Mg month⁻¹) and PHg (13–21 Mg month⁻¹) in the domain, and a net export of GEM (60–130 Mg month⁻¹) from the domain. The outflow caused by East Asian emissions (anthropogenic plus natural) was estimated to be in the range of 1369–1671 Mg yr⁻¹, of which 50–60% was caused by emissions from natural sources. The emission outflow represented about 75% of the total mercury emissions in the region, and would contribute to 20–30% of mercury deposition in remote receptors.

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