Atmos. Chem. Phys. Discuss., 9, C7822–C7823, 2009
www.atmos-chem-phys-discuss.net/9/C7822/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "An investigation of the origins of reactive gaseous mercury in the Mediterranean marine boundary layer" *by* F. Sprovieri et al.

Anonymous Referee #1

Received and published: 3 December 2009

General Comments: This paper provides valuable data for RGM in the MBL. However, interpretation procedure (approach) of results is not concise. For example, in section 4, high Hg event was listed event by event. It is recommended that high Hg events are grouped and analyzed according to similar characteristics such as air mass back trajectories etc. In addition, separate analysis of diurnal variation of RGM with different air mass or wind sectors (as well as different season) is recommended with/without high Hg event data. Recently, Hg oxidation by halogen, especially Br is believed to be a candidate for one of strong oxidants of gaseous elemental Hg in the MBL as well as polar environment. Detailed diurnal variation profile can provide valuable information (i.e., time of morning increase of RGM) on Hg oxidation including strong oxidants (e.g,

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O3 and OH). Although the role of OH in the oxidation of element Hg is highly uncertain due to inconsistency of its reaction rate constant and oxidation products, it is believed to be very important oxidant in the Hg oxidation. In this paper, calculation method of OH concentration was not clear. According to main context (page, 24828, lines 3-4), OH was estimated based on O3 and relative humidity. I am very concerned with OH calculation method. The MBL in the Mediterranean is highly affected by the plumes from European nations. OH concentration can be correctly estimated based on O3 and relative humidity which can be used in very clean environment such as the remote MBL. However, OH oxidation by CO, NOx, and VOCs in the polluted environment should be considered for OH simulation. In addition, ship emission can affect air quality including NOx and O3 levels in the coastal area as well as in the MBL according to recent studies (Song et al., 2009, Atmos. Environ., Marmer and Langmann, 2005, Atmos. Environ; Vutukuru et al., 2008 Atmos Environ., etc.). Therefore, the method for the estimation of OH level should be verified for Hg oxidation analysis, which is key element of this paper. Quantification of primary and secondary production of RGM is recommended to be included based on model simulation although it is not very accurate due to several uncertain factors. It can provide the magnitude of primary RGM from anthropogenic sources.

Specific Comments: 1) Page 24821, lines 25 – page 24822, line 8: How the model results are sensitive to aerosol loading, aerosol composition, replacement time? 2) Page 24823, lines 25-27, Page 24843, Fig.3 caption: autumn 2005 -> summer 2005 3) Section 4.2: Summary table (including conc. of Hg species, etc.) for high Hg events is recommended 4) Page, 24831, lines 9-17: Different data (Hedgecock et al, 2005) and different chemical mechanisms (between this study and Hedgecock et al., 2005) showed similar IOA. More detailed explanation for this is recommended. What can we learn from this?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 24815, 2009.