

Interactive comment on “Atmospheric wet deposition of mercury and other trace elements in Pensacola, Florida” by W. M. Landing et al.

Anonymous Referee #2

Received and published: 29 January 2010

The topic of this manuscript is appropriate for the journal. The authors have a fairly large data set for trace metals in event rain samples and have applied a statistical treatment of the data to identify possible source terms. The use of the TE/Hg ratios to determine the “%Hg from coal” is creative and is a technique that this reviewer has not observed in prior published Hg literature. The paper is worthy of publication but there are some issues the authors should address. The manuscript needs some re-writing to make some areas of the text less confusing. Throughout the manuscript the authors use the term “significant” or “significantly” without providing the actual statistics to support their claim of significantly higher or significantly lower. If there are statistics, then provide them in parenthesis following the statement. If there are no statistics, then choose another word to describe a large or noteworthy difference that does not indicate statistical significance. The authors use anthropomorphic words and this should

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be corrected. For example “this study looks at”, when I read the work “look” it implies having eyeballs/eyesight, which uses human terminology to describe an inanimate scientific study.

Specific comments are provided below.

The abstract changes from past to present tense Why split the abstract into 2 paragraphs (one is 4 sentences long and the other is 3 sentences long)? Since the authors do not discuss the nutrients and major ions in this paper, they could omit that sentence and just have a one paragraph abstract.

Section 27652, Lines 7-12 are not clearly written. Lines 7-8 states “ Thus, a major source of mercury to rainfall in the Pensacola area appears to be via local and regional combustion of coal.” Then lines 8-12 state “ Our data demonstrate that coal combustion in the SE US pollutes the regional airshed with volatile elements such as mercury, arsenic, antimony, selenium, tin , and non sea salt sulfate, but that a significant fraction of the rainfall mercury appears to be the result of long range transport”. How can all three (local, regional, long range) be the dominant source? What is the major source; local and regional emission of Hg, Hg from long range transport (perhaps 5-6 states away), or Hg from the global hemispheric pool (which is Hg from everywhere) that is “scrubbed” out of the atmosphere during the almost daily summer convective thunderstorm activity (which also accounts for the high amount of precipitation during the summer) in Florida and then the air shed resupplied with Hg from the global hemispheric pool via wind patterns that move air in a strong flow from the SE to the SW across FL (trade winds). Also note the use of the term “significant” without statistics.

Section 27653 Lines 1-5. Emissions are quantified for the Crist plant, International paper boiler, medical waste incinerator, and a landfill in the area. Lines 4-5 state that “A significant source of atmospheric mercury and trace elements is wild fires, which occur frequently in the region.”. The authors should provide a reference for this statement or provide the quantity of Hg and trace metals emitted during the wild fires. They do

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acknowledge further in the paper (section 27657) that there is a Cd, P, Zn component, that they cannot explain, and that they are analyzing aerosol samples from controlled burns, to try to verify this component, and that is good, but they don't have an actual reference in section 27653 to support their assertion that wildfires contribute a significant amount of Hg and other trace metals in this region. They might want to re-write the sentence to say something like, "although the emissions have not been quantified, burning in the area might release large amounts of Hg and other trace metals. Other studies by ????? et al., have demonstrated . . .". There are some publications on Hg release during biomass burning of rainforests and large scale forest fires.

Section 27654 Lines 5-10 discuss bottles and changing collars/funnels about every 6 months. This seems to be a slight lapse in QA/QC. This changing should occur on a routine, fixed schedule, not just "about every 6 months. It is understandable to change when you have bird droppings or other debris, but there should be a fixed change out schedule. Although it is difficult to "blank a rain sampler" were collar/bottle blanks checked and if so, what were the blanks?

Sections 27654 and 27655 Hg and ICPMS analysis. What were the recoveries? That is part of QA/QC

Section 27660 This section discusses the % Hg from coal, as quantified by using the Hg/TE ratio, TE deposition, and Hg deposition. This is the most creative part of the paper. The authors might want to redefine it and instead of saying % Hg from coal, they might want to say "% Hg from local sources". There are several reasons for considering this; (1) although the coal plant emits the most with respect to the local emissions inventory there are other sources (landfill, incinerator, automobiles and other vehicles, and possibly biomass burning) in the region, so it is not all from coal, (2) the Hg in the global hemispheric background pool is a mixture of natural and anthropogenic sources (of these coal burning from other countries is a major contributor). It is my impression that the authors are trying to quantify the amount Hg in rain that is derived from the local anthropogenic inventory relative to what might, come from the global pool, which

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contains natural emissions and anthropogenic elemental gaseous Hg emissions that have traveled hemispherically, become oxidized to Hg²⁺ and rained out in their region. A large part of the Hg in the that comes from other long range or global sources is most likely from coal, so the authors might want to say % Hg from local sources, or % Hg from local emissions, and define "local emissions" within a certain kilometer radius of your sample sites.

The text on figures 3-7 is too small. The graphs should be redone with larger font so one can see the axis, scale etc.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 27649, 2009.

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