From:	Axelrad, Don
To:	gilmourc@si.edu
Subject:	FW: REMSAD/GEOS-Chem
Date:	Tuesday, September 01, 2009 10:39:22 AM
Attachments:	Holmes Mercury oxidation by Br 2009.pdf

Cindy,

This is Chris Holmes GEOS-Chem Hg modeling of atm dep across the US.

He estimates on average that 18% of wet + dry Hg atm dep on the 48 USA states is from USA sources.

This confirms some other modeling (e.g. REMSAD), and I'm trying to schedule a REMSAD conf call for next month - if Bill Landing stays on dry land. I'll invite Dave K. to that.

These model results have implications for Florida's Hg TMDL.

Don

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-----Original Message-----
From: Axelrad, Don
Sent: Monday, August 31, 2009 6:12 PM
To: Miller, Denise; Frydenborg, Russel; Mandrup-Poulsen, Jan; Atkeson, Thomas; Robert Stevens (stevens.robert-k@epamail.epa.gov)
Cc: Joyner, Daryll
Subject: FW: REMSAD

FYI Email immediately below and attached seminar from Chris Holmes.

See in particular the last slide (#13); GEOS-Chem Hg simulation of mercury deposition on the USA from USA sources.

Don Axelrad

-----Original Message-----
From: newenglishman@gmail.com [mailto:newenglishman@gmail.com] On Behalf Of Chris Holmes
Sent: Saturday, August 29, 2009 6:35 PM
To: Axelrad, Don
Cc: ems@seas.harvard.edu; holmes2@fas.harvard.edu; wlanding@fsu.edu; cpollman@aqualuxlucis.org
Subject: Re: REMSAD

Don and others,

Let me clarify my numbers. I turned off all anthropogenic emissions in the model between 25-50N and 70-125W. This covers the contiguous US and border regions of Canada and Mexico. I calculated the deposition over the same area. Anthropogenic emissions within that region caused 18% of total deposition (16% was a typo) within the region.

While I think the model version shows in the figure was reasonable, it was an early and preliminary model version. Other estimates of the domestic emission contribution to US deposition have been around 30%, including an earlier study with different chemistry in GEOS-Chem. I regard the 18% number as being within the range of what a reasonable global model can produce, but not our best estimate. I will redo the calculation with the new GEOS-Chem chemistry when we have integrated all of

our model improvements to the atmosphere, ocean and soil cycling.

I'm happy to join the conference call about REMSAD and contribute as I'm able. Are the attached REMSAD results totals for one year?

Regards,

-Chris

Christopher Holmes
Department of Earth and Planetary Sciences Harvard University

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Cambridge, MA 02138

617-384-7813

http://www.people.fas.harvard.edu/~holmes2/

On Thu, Aug 27, 2009 at 2:34 PM, Axelrad, Don <Don.Axelrad@dep.state.fl.us> wrote:

> Chris and Elsie,
>
> Re your last slide from the China seminar (slide #13; attached PDF);
> "Overall 16% due to US emissions"; do you mean that for the 48 states
> that US Hg atmospheric emission sources are responsible for only 16%
> of total Hg deposition?
>
> We are planning a conf call to discuss REMSAD model results (attached)
> for Florida, in 5-6 weeks (if Bill Landing stays on dry land that long).
> Are you interested in participating?
>
> Cheers,
>
> Don
>
>
> Donald M. Axelrad, Ph.D.
> Florida Department of Environmental Protection
> Office: (850) 245-8072
> Mobile: (850) 443-4626
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> From: newenglishman@gmail.com [mailto:newenglishman@gmail.com] On
> Behalf Of Chris Holmes
> Sent: Thursday, August 06, 2009 9:16 PM
> To: Curt Pollman
> Cc: wlanding@fsu.edu; Axelrad, Don
> Subject: Re: Revised GEOS-Chem modeling
>
> Hi Bill and Curt,
> I just realized that I overlooked this email after I returned from China.
> I've attached my slides from the meeting in China. These include a one
> figure that shows mercury deposition predicted by the model. I'm still
> evaluating aspects of the model with bromine chemistry, so the figures
> should be treated as preliminary. As you pointed out, the results I
> presented in China had lower wet deposition over FL than is observed.
> Based on the seasonal cycle and temperature profiles, I think that is
> because of the way the model treats riming (more below). I hope to
> have a better simulation around the end of August.
>
> I'll try to respond to your questions about model error due to
> chemistry, but of course this is a very tricky issue which deserves a
> lot more time. We do find significant changes to the predicted
> deposition depending on whether
> Hg(0) is oxidized by Br or OH. If we hold everything else constant,
> the model with Br predicts lower Hg deposition to the Gulf Coast
> region. There are many other important uncertainties in the model that
> have an equally large effect on Hg wet deposition in that region
> though. The key ones are: (1) the gas-particle partitioning of Hg(II),
> (2) moist convection parameterization in the meteorological model and
> (3) scavenging efficiency of Hg(II) species by riming and frozen
> precipitation. At this time, I'm using the seasonal cycles at MDN
> sites to constrain (3) and another grad student at Harvard is looking
> into (2). I'm happy to describe these issues in greater detail if you would like.
>
> But the bottom line of model performance isn't as bad as I have made
> it sound. When it comes to using GEOS-Chem as a boundary condition for
> a regional model like REMSAD, I think the large (>1000km) scale
> features are the most important--let me know if you feel differently.
> On this scale the models with different oxidation mechanisms have
> fairly similar gradients of Hg(0) and Hg(II). The vertical profiles
> with increasing
> Hg(II) in the upper troposphere are also quite similar. Plumes are
> also transported similarly in the different models
>
> If you have plots of the Hg concentrations that you use as boundary
> conditions for REMSAD, I can generate new ones with my version of
> GEOS-Chem and we can see how different the two are.
>
> Regards,
> -Chris
>
> Christopher Holmes
> Department of Earth and Planetary Sciences Harvard University
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> Pierce Hall, Room 110 I
> 29 Oxford St.
> Cambridge, MA 02138
>
> 617-384-7813
>
> http://www.people.fas.harvard.edu/~holmes2/

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>
> On Tue, Jun 23, 2009 at 9:32 AM, Curt
> Pollman<cpollman@aqualuxlucis.org>
> wrote:

>> Bill:

>> Thanks for continuing to follow up on this. I am keenly interested
>> in the outcome.

>> Curt
>>
>> ___
>> Curtis D. Pollman, Ph.D.
>> CEO & Chief Scientist
>> Aqua Lux Lucis, Inc.
>> 352.222.4039
>> cpollman@aqualuxlucis.org
>>
>> On Jun 22, 2009, at 5:31 PM, William Landing wrote:
>>
>> Chris:
>>
>> We have been looking at REMSAD output for Florida where they used
>> GEOS-Chem to establish "background" Hg deposition to the US. If the
>> earlier GEOS-Chem modeling didn't include the Br chemistry, how
>> reliable are those calculations? We would like to establish some
>> dialog with you about how the Br reactions change background
>> deposition for the Gulf of Mexico and Florida.
>>
>> Best Regards,

>> Bill
>>
>> **********
>> William M. Landing, Ph.D.
>> Environmental Chemistry and Chemical Oceanography Department of
>> Oceanography, Florida State University
>> 117 N. Woodward Ave., Tallahassee, FL 32306-4320 850-644-6037, FAX
>> 850-644-2581; wlanding@fsu.edu http://ocean.fsu.edu/;
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