HLWYM HEmails

From: Brittain Hill
Sent: Monday, September 19, 2005 12:54 PM
To: Donald Hooper
Subject: RE: some TEPHRA issues

You may want to follow up on Dick's email suggestion to Roland this morning, regarding use of HYSPLIT instead of TEPHRA in the TPA code. This will likely take on a life of its own following the ACNW presentation, as I forecast that certain committee members will be enamored with a particle tracking approach that they're familiar with. Y'all should be prepared to discuss how brownian motion doesn't help understand the dynamics of dense volcanic plumes, and that such a code can't explain simple observations such as 1-3 cm particles at 5 km downwind from a 2-km high eruption plume. Just because the mathematics of atmospheric turbulence are included doesn't mean that the model is more realistic... must demonstrate that such turbulence significantly affects the advective or diffusive component of buoyant plumes.

Selah.
Britt

>>> Don Hooper <dhooper@cnwra.swri.edu> 09/19/05 12:36 PM >>>
Thanks. Seeing the logic and thought behind this helps. I think we can keep the selected basin areas as is. - DH

-----Original Message-----
From: Brittain Hill [mailto:BEH1@nrc.gov]
Sent: Monday, September 19, 2005 7:59 AM
To: dhooper@cnwra.swri.edu
Subject: Re: some TEPHRA issues

Hola amigo!

Your email caught me on my CWS (compressed work schedule) day off. Sweet deal - work 9-hr days for M-H, take first Friday of pay period off, work 8-hr on 2nd Friday. Imagine that - some actual credit for actual hours worked!

Please let me know about the potential summing error. Ugh - if true, I"m disappointed that such a thing went unchecked by Brandi.

Regarding the truncated catchment area, my logic was to question at what point would the tephra deposit result in negligible mass of tephra, and negligible changes in erosion rate. At order of magnitude scales, the analogs data suggests that 1mm of tephra is probably a reasonable cutoff, as lesser amounts (e.g., 0.1 mm) would represent a discontinuous deposit that is easily trapped in interstices at the soil surface. Again by analogy, 20 km was a supportable cutoff for many 1mm eruptions, and ensured the RMEI location was sampled if warranted.

Now, if you increase the area of the tephra catchment basin to some distant value (i.e., use the entire basin as potential source), the problem becomes at what point do you stop using the accelerated erosion rates for the tephra deposit? TEPHRA calculates a negligible amount of mass (e.g., <10^10 kg/m2) for darn near every grid orthogonal to the axis of primary dispersion, and out along axis for 100's of km if you let it. Natural consequence of the ADE formulation in Suzuki. THe end result is you start counting grid points in the basin as occupied by tephra, thus, this grid cell should have accelerated erosion rates. However, the mass of tephra is completely negligible in that cell. End result is that the erupted mass in the tephra basin is diluted/spread over

an artificially enlarged area, reducing the amount of time the deposit persists with the accelerated erosion rates.

What Dick discussed is correct in the mathematical sense. But geological sense is needed herein. Geological reasoning (1mm deposit at 20 km cutoff) provides some realistic constraints on the behavior of 98-99% of the mass in the tephra eruption. Trying to capture that last 1-2% results in some pretty significant effects for deposit dilution and removal rate.

Similarily for the TEPHRA cutoff of 0.12 kg/m3, for an average tephra deposit density of 1200 kg/m3, a 0.1mm-thick deposit represents a trace deposit of mass. Since most tephra particles are >0.1mm (even at 20 km), representing deposits less than one grain-layer thick doesn't seem very plausible, albeit some such condition could exist for highly discontinuous trace deposits. Based on analogy, such discontinuous trace deposits rarely last for more than a rain storm, as they are readily incorporated into the soil due to infiltration. That was my reasoning for truncating distributions at 0.1mm (i.e., 0.12kg/m2).

Certainly, you can run the code to include all deposits, including those to mathematically precise levels of absurd inaccuracy (10^-10 kg/m2). But such things represent trace aerosol depoits, which are readily mixed with the soil even in areas such as the Amargosa Desert. Anspaugh et alii would be rightly critical of tracking that trace mass the same way you're tracking huge particles from thick deposits.

Keep your model geologically-informed before being performance-based!

Hope your visit to MO went well -- will try calling this afternoon - would like to learn more about Sunset field work, too!

Magmatically,
Britt

Brittain E. Hill, Ph.D.
Ph (301) 415-5002
Senior Technical Advisor for Repository Science Fax (301) 415-5399
US Nuclear Regulatory Commission
BEH1@nrc.gov
MS T-8E33a, NMSS/HLWRS/TRD
Washington, DC 20555-0001

>>> Don Hooper <dhooper@cnwra.swri.edu> 09/16/05 12:51 PM >>>
Britt,

I hope you're getting used to the new commute and office arrangements, but it sounds like that house is nice to come home to.

Nathan has been working with the TEPHRA code. He has uncovered a possible coding error in which it seems like the impacted grid squares were accidentally summed twice. This is being verified. The redistribution works borrows from these data, so I will probably need to update my redistribution model runs (again!). And PA will need the new information, of course.

If we do have to make a revision, I am suggesting moving the truncated fluvial catchment basin that is used in TEPHRA to the full basin (815 km2).
Your email of August 8th addressed the 20 km cutoff in the catchment basin.
I understand why you did this, but this would settle Codell's concern raised during an ASHREMOB presentation by Roland (and I prefer the full basin).
The eolian basin can probably be left as is. Nathan says this is not a drastic coding change.

And, within TEPHRA, what is the source or reasoning for that 0.12 value?

The old voice in the back of my mind says this is familiar, but I can't place it. Brandi and Nathan don't know either (see below).

On the positive front, it looks like Nathan found the solution of the zeroes (and lack of zeroes in other columns) in the TEPHRA lookup table. Remember this? For eolian and fluvial, values less than 0.12 are changed to zero.
However, for the columns regarding the RMEI/receptor, this is not done and these columns have "non-zero" values.

Back to work (mucho trabajo),

Don Hooper

****
Donald M. Hooper
CNWRA, Bldg. 189
Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238-5166

Phone/Voice mail: (210) 522-6649
FAX: (210) 522-5155
E-mail: DHooper@swri.org
****

16sep05

Hearing Identifier: HLW_YuccaMountain_Hold_EX
Email Number: 1391

Mail Envelope Properties (s32eb50e.034)

Subject: RE: some TEPHRA issues
Sent Date: 9/19/2005 12:54:29 PM
Received Date: 9/19/2005 12:55:08 PM
From: Brittain Hill

Created By: Brittain.Hill@nrc.gov

Recipients:
"Donald Hooper" <dhooper@cnwra.swri.edu>
Tracking Status: None

Post Office: NRNWMS05.NRC.GOV

Files	**Size**	**Date & Time**
MESSAGE	6816	9/19/2005 12:55:08 PM

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received: