HLWYM HEmails

From: Donald Hooper
Sent: Thursday, April 19, 2007 6:52 PM
To: Keith Compton
Subject: FW: Comment #36, review of TPA User Guide Chap. 16 (ASHPLUMO/ASHRMOVO)

Keith:

Here's email covering the need for NRC guidance on the Kd's.

-Don

-----Original Message-----
From: Don Hooper [mailto:dhooper@cnwra.swri.edu]
Sent: Monday, April 16, 2007 1:59 PM
To: Ronald Janetzke; 'Christopher Grossman'
Cc: 'John Trapp'; 'plaplante@cnwra.swri.edu'
Subject: Comment #36, review of TPA User Guide Chap. 16 (ASHPLUMO/ASHRMOVO)

Ron J. and Chris G.:

RE: Comment #36, NRC review of TPA User Guide Chapter 16 (ASHPLUMO/ASHRMOVO)

36. Pages 16-16 thru 16-27, distribution coefficient in volcanic ash: Not clear why all of these parameters need to be sampled in the reference case. Recommend setting these to an appropriate central value and only using the distribution when sensitivity studies of the igneous case are being carried out. Setting all of these to distributions may increase TPA run times, already a significant issue, due to the need to increase the number of realizations above the number of sampled parameters in order to obtain correlations. This suggested change to the tpa.inp file needs to be addressed by the TPA code folks (Janetzke and Grossman) before being implemented. If the change to a central value is implemented, the current distribution type and parameter should be put into the remarks column with a sentence to indicate that the distribution is appropriate for use in sensitivity studies. A sentence or justification for the central value should be added as well to the remarks column. If the change is implemented then Section 16.7 should be changed (add a sentence) to reflect this added capability (user supplied cdf can be used to test for sensitivity) for understanding module performance.

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Reply, discussion, and questions for comment #36 (with help from Pat LaPlante):

The issue of sampling the Kd's has some history and it impacts both DCAGW and ASHRMOVO applications. The origin of the current approach to sample both ASHRMOVO and DCAGW implementations can be traced back to the March 2005 integrated (CNWRA/NRC) ISI team reviews of the TPA code input parameters. Pat LaPlante made a recommendation for consistency in the soil leaching implementations to sample the Kd's for both irrigated soil and ash. The Kd inputs fall under DOSE2 ISI and both DOSE2 and DOSE3 teams were included in the e-mail discussion. Britt Hill supported sampling both sets. Pat wrote the "consensus review" and the responsibility for the Kd inputs for both ASHRMOVO and DCAGW was passed to Paul Bertetti, who put some time into getting the distributions right for the latest and code user manual milestone.

Later that year (2005) upon demonstrating the updated TPA code to NRC, Tim McCartin expressed his view that we NOT sample the Kds and use mean values (in general use of mean values will increase expected doses). As we moved into development of TPA 5.1, Pat mentioned Tim's issues to Bret Leslie (in the context

of drafting the DCAGW user manual) and the gist of his response was to not make any changes unless they were absolutely needed.

Now, the NRC comments on User Guide Chapter 16 are suggesting we go back to constants. Sampling may be the more technically defensible approach given the uncertainty in the values, also it appears we have gone over this issue in the past and changing it now would appear to be a time sink.

Pat LaPlante's proposed approach (from March 2005):

- Both DCAGW and ASHRMOVO use Kds from the same source data (Sheppard and Thibault, 1990 ... a large compendium of values found in the literature with Kd distribution statistics for a variety of elements).

- The DCAGW implementation samples Kds from distributions derived from the source data. Source data indicates Kds are lognormally distributed so TPA implementation samples a lognormal distribution. To define the distribution, TPA requires a range consisting of the $x < 0.1$ and $x > 99.9$ percentiles of the distribution; however, this generates a range of values that greatly exceeds the range reported in the data (by as much as 3 or 4 orders of magnitude on the high tail and about 1 on the low tail). A truncated lognormal would be more appropriate but this type of distribution is not offered as an input option in the TPA code.

- ASHRMOVO uses essentially the same mathematical model for leaching and the same source data for Kd's as the DCAGW implementation, however, constant geometric means are used instead of sampled distributions. Even though conceptually the two implementations deal with different leaching scenarios (one with contaminated soil, the other contaminated ash that may become "soil" after some elapsed time), because the same source data and leaching equations are used it would seem reasonable to use a similar approach to the input parameters for the TPA code. The large uncertainties in Kds reported in the literature would suggest sampling to propagate this uncertainty in the PA would be preferable and more likely to contain the "true value" of the Kd for volcanic ash than a constant. Some have argued for constants in the past noting that there is not sufficient data on leaching in volcanic ash to justify defining a distribution. Use of geometric means as constants will favor higher Kd values than the majority of sampled values from a lognormal distribution (thus, use of a constant is generally more conservative).

Recommended Approach (from Pat LaPlante, March 2005):

First, sample Kds in both DCAGW and ASHRMOVO modules. If the geometric means are applicable for ash modeling then the distributions used to calculate those means should also be applicable. The wide lognormal distribution range problem can be solved by using the TPA code's "user-defined distribution" feature to define a truncated lognormal distribution. This feature requires as input the parameters necessary to define the cumulative distribution function for the desired distribution. Osvaldo Pensado has developed an efficient approach for defining the cumulative distribution function for a truncated lognormal using the Kd distribution information provided in Sheppard and Thibault (1990). The resulting distribution is truncated at the minimum and maximum values reported in Sheppard and Thibault (1990), with shape defined by the mean and standard deviation of log transformed values (also reported in Sheppard and Thibault, 1990).

Finally, the original comment #36 discussion asked for input from Janetzke and Grossman, so how are we going to move forward on this?

-Don Hooper

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