HLWYM HEmails

From: Randall Fedors [rfedors@cnwra.swri.edu]
Sent: Friday, April 29, 2005 10:49 AM
To: Osvaldo Pensado; George Adams; Goodluck Ofoegbu; Ronald Janetzke; 'Douglas Gute'; Oleg Povetko
Cc: Sitakanta Mohanty
Subject: RE: More thermal results

You said: "My point is that it is unlikely to have a single low conductivity value (say 0.15 W/m-K) throughout the repository, and that is what the TPA code does."

But I thought multiple realizations can reflect spatial variability. The sparse results resulting from the low thermal conductivity values get swamped by the numerous realizations at higher conductivity values. Don't realizations represent spatial variability? (Aren't realizations conceptually mapped to spatial variability?).

Some small portion of the repository may exhibit the high temperatures. But, by using repository averages in the range, you are pre-supposing that these higher temperatures will never occur.

--Randy

-----Original Message-----
From: Osvaldo Pensado [mailto:opensado@cnwra.swri.edu]
Sent: Friday, April 29, 2005 9:22 AM
To: rfedors@cnwra.swri.edu; gadams@cnwra.swri.edu; 'Goodluck Ofoegbu'; 'Ronald Janetzke'; 'Douglas Gute'; 'Oleg Povetko'
Cc: 'Sitakanta Mohanty'
Subject: RE: More thermal results

My point is that it is unlikely to have a single low conductivity value (say 0.15 W/m-K) throughout the repository, and that is what the TPA code does.

To define a distribution function, the question should be phrased differently: for one particular evolution state (called realization in TPA jargon), what is the average value of the thermal conductivity representative of the whole repository system?

What is the uncertainty in this average value?

I am asking for a second rank statistic. Most of us are familiar with means and standard deviations. The concept that is not so popular is that means (and any other statistic) can also be defined by distributions. If P is the distribution of x, and Pm is the distribution of mean(x); Pm is narrower than P.

Is there a way to make a connection between thermal conductivity values (say low, mean, high) and repository subareas? I may have an idea on defining an average thermal conductivity if so.

> -----Original Message-----
> **From:** Randall Fedors [mailto:rfedors@cnwra.swri.edu]
> **Sent:** Friday, April 29, 2005 8:24 AM
> **To:** opensado@cnwra.swri.edu; gadams@cnwra.swri.edu; 'Goodluck Ofoegbu'; 'Ronald Janetzke'; 'Douglas Gute'; 'Oleg Povetko'
> **Cc:** 'Sitakanta Mohanty'
> **Subject:** RE: More thermal results
>
> The discussion continues….
>
> The logic is still escaping me on what the range is suppose to reflect. The mean of the range reflects a representative repository-wide value. The uncertainty in the nature (texture, topology, …) of the rubble

pile and the spatial variation are two important reasons why rubble effective thermal conductivity should be a sampled parameter. The length scale where spatial variation in effective thermal conductivity becomes important for estimating temperature is similar or smaller than the length scale at which we would expect to see significant spatial variation in rubble properties. Stated otherwise, a subarea-averaged value for effective thermal conductivity removes the low values, but gets one into trouble when it comes to a basis for the sampled distribution.

Until someone can find a basis for the rubble fragments all being large fragments with sparse fine material, we cannot ignore the DOE measured values for the invert material.

I previously mentioned that we could use the DOE interpretation of their measurements. The measurements averaged ~0.15 W/m-K, so they rounded that up to 0.2 W/m-K for use in their thermohydrology models. DOE did not discuss a rationale for rounding up, but one could call on the steel framework set into the aggregate or call on upscaling.

--Randy

-----Original Message-----
From: Osvaldo Pensado [mailto:opensado@cnwra.swri.edu]
Sent: Thursday, April 28, 2005 6:34 PM
To: gadams@cnwra.swri.edu; 'Goodluck Ofoegbu'; 'Randall Fedors'; 'Ronald Janetzke'; 'Douglas Gute'; Oleg Povetko
Cc: Sitakanta Mohanty
Subject: More thermal results

Find attached stochastic results from 100 realizations with the adjusted burnup.dat and the activating drift degradation. As you can see, WP temperatures are not so high when averages are computed.

The last scatter plot is a relationship between the maximum WP temperature (under drift degradation) and the thermal conductivity of the backfill. There is a very steep dependence at the low end of the distribution range in conductivity. The high temperature problem could be addressed by shifting the low end of the conductivity range to a higher value (if some rationale could be developed).

My rationale is that repository scale results with a single value of the thermal conductivity make no sense. There will be spatial variability in the thermal conductivity; thus, extreme values will never be realized, but average conductivity values. Is there a way to define a distribution of average values accounting for spatial variability? A distribution of average values will be narrower than the distribution of all possible conductivity values.

Certainly, the introduction of the passive ventilation concept will help, but it may not be necessary if we could define a narrower distribution for the conductivity.

I guess we will need some buy in from the NRC to incorporate the passive ventilation concept.

Is it for sure that a passive ventilation period will be implemented? Do we have some means to define the extent of heat dissipation during the passive period?

-----Original Message-----
From: George Adams [mailto:gadams@cnwra.swri.edu]
Sent: Thursday, April 28, 2005 4:24 PM
To: Osvaldo Pensado; Goodluck Ofoegbu; Randall Fedors; Ronald Janetzke; Douglas Gute
Subject: PASSIVE VENTILATION

All,

I'm including some plots and the code changes to incorporate passive ventilation. I haven't modified the algorithm in NFENV.F for calculating relative humidity based on having a passive ventilation period. This is something that needs to be considered. Also, I didn't add a check to make sure the time for passive ventilation was less than or equal to the time of repository closure.

The following are the changes to include a passive ventilation period:
1) I added the parameter FactorForPassiveVentilationHeatLoss[] to account for the heat loss during the passive period like FactorForVentilationHeatlosses[] is used for the active ventilation period. If the value is set to 0, then there is no ventilation heat loss included in the calculation for thermal flux.
2) I added the parameter TimeOfPassiveVentilation[yr]. This value should be less than or equal to TimeOfRepositoryClosure[yr], but I don't perform the check in the code. From time=0 to time = TimeOfPassiveVentilation[yr], active ventilation is occurring. From TimeOfPassiveVentilation[yr] to TimeOfRepositoryClosure[yr], passive ventilation is occurring.
3) I didn't make any changes to mechfail. Degradation starts at TimeOfRepositoryClosure[yr].

Also, I used the burnup.dat file that was part of tpa5.0.0t to generate the plots. I didn't include the new burnup.dat file.

George

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Created By: rfedors@cnwra.swri.edu

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