HLWYM HEmails

From: David Pickett [DXP1@nrc.gov]
Sent: Thursday, May 02, 2002 3:36 PM
To: William L Dam
Cc: John Bradbury; dpickett@swri.edu
Subject: colloid size in TSPA-SR

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Colloid size distribution is used in TSPA-SR only in the UZ transport abstraction. Two processes are affected, and they are applied only to irreversible colloids. What is not clear to me is how large an effect they have on overall transport of irreversibly attached radionuclides. If fracture transport dominates and the 2nd effect below is small, the overall effect may be small. In addition to the TSPA-SR Model report references below, info may be found on the following pages in the TSPA-SR report: 3-145, 3-148, 3-151, and 3-153.

1. Colloid filtration at matrix unit interfaces.
At the boundary between matrix units, colloids can be removed from flow by filtration. In FEHM, the matrix unit's pore size is sampled and compared against the colloid size distribution (see p 374-375 and 384-386 of TSPA-SR Model report). The colloid size distribution used is based on the irreversible colloids in Mertz's ANL AMR (ANL-EBS-MD-000020 Rev 00); this is appropriate because filtration is applied only to irreversible colloids. A distribution was chosen that takes the ANL data and extends it down from 6 nm to 1 nm at the lower end (Table 6-88, p 385, in TSPA-SR Model report).

2. Size exclusion at fracture-matrix interface Colloids are not modeled to undergo matrix diffusion, but they may move from fracture to matrix via advection. FEHM includes a size exclusion effect. An "expected colloid size of 100 nm" is assumed, and compared against matrix pore size distribution (see p 387 and Table 6-92 of TSPA-SR Model report). Thus, a colloid size distribution is not used. The basis for 100 nm is ANL-NBS-HS-000026 REV 00, Table 5. This is the "Particle Tracking..." AMR.

It is obvious how assumptions regarding colloid sizes directly affect these model processes. Thinking out loud (and plagiarizing) here are other ways neglect of smaller colloids could effect TSPA results:

1. Underestimation of radionuclide release via waste fom colloid. However, a measured Pu-239 concentration is used, rather than a measurement of colloids.

2. Underestimation of radionuclide release via reversible attachment to three colloid types. Mass concentrations of colloids are used, but it may be that these are calculated based on counting techniques.

3. Underestimation of radionuclide transport via reversible attachment to three colloid types (Kc model), because available colloid surface area is underestimated.

4. Overestimation of retardation factor (Rc) for irreversible colloid transport. Based on C-Wells results, which may have underrepresented small sizes. Future alluvial data should be evaluated from this perspective.

There are probably more....

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