Comment on eq 7:

I suppose there's some directionality associated with this summation, like net fluxes in and out. I think the volumetric flow through the xylem at a point z_i should be described as

$Q_{axial,i} = Q_{radial,I}$ (If mathtype works, $Q_{axial,i} = Q_{radial,i}$)

where (for the 1D case):

$Q_{axial,i}$ = pi $a_{root,i}^2$ d($q_{axial,i}$) ($Q_{axial,i} = \pi a_{root,i}^2 \, d(q_{axial,i})$)

and

$Q_{radial,i}$ =2 pi $a_{root,i}$ $q_{axial,i}$ dl_i ($Q_{axial,i} = 2\pi a_{root,i} \, q_{radial,i} dl_i$)

where the q's are volumetric water fluxes (m^3_{water} s^{-1} $m^{-2}_{surface}$)

Thus, when we substitute it together, we get:

pi $a_{root,i}^2$ d($q_{axial,i}$) = 2 pi $a_{root,i}$ $q_{axial,i}$ dl_i

($\pi a_{root,i}^2 \, d(q_{axial,i}) = 2\pi a_{root,i} \, q_{radial,i} dl_i$)

(1/2) $a_{root,i}$ d($q_{axial,i}$) / dl_i = $q_{axial,i}$

($\frac{1}{2} a_{root,i} \frac{d}{dl_i}(q_{axial,i}) = q_{radial,i}$)

or

(1/2) $a_{root,i}$ ($q_{axial,i+1,i}$ - $q_{axial,i,i-1}$) / dl_i = $q_{axial,i}$

($\frac{1}{2} a_{root,i}(q_{axial,i+1,i} - q_{axial,i,i-1})/dl_i = q_{radial,i}$)

My main point here is that there should probably be some application of divergence theorem that is a bit brushed under this summation. The Laplacian comes out:

d($q_{axial,i}$) / dl_i = d(k_x d H_x/dl_i) / dl_i .

Or more generally (if applicable):

div($q_{axial,i}$) = div(k_x grad(H_x))

($\nabla \cdot (q_{axial,i}) = \nabla \cdot (k_x \nabla H_x)$)

I know that it's not quite that simple because of the directions that the fluxes come in and up the root, but It would just be nice to see some of the details in the summation/ derivation to understand better the terms in the Laplacian.

Comment on eq 22:

If this is the same as dl_i from earlier, make the notation consistent.

Line 330 in the marked document highlighting figure 3:

Are the lateral roots considered in the Voronoi mesh? If so, state this in the text explicitly. If not, is that reasonable?

Equation 32:

So the fluxes into or out of the soil are linearly related to the root flux. That makes sense. Is there a relationship between the soil fluxes and the soil and pararhizal zone? Perhaps the scales of the models are different, but this might be worth pointing out.

Equation 39:

I think it might be good to state this in more common language. Just state that the total potential can be represented by the potential at the perirhizal interface subtracted by the soil flux.

Line 396 just after eq 40:

There's some minor points of notation that I find a bit confusing. Q is typical for volumetric flow [m^3_{water} s^{-1}] and q is usually volumetric water flux [m^3_{water} $m^{-2}_{surface}$ s^{-1} ~ m/s]. Distinguishing these more clearly in the notation would be helpful for the reader, given that there are a lot of fluxes floating around.

Line 436 in the marked document (first sentence in section 2.7):

Conductance is a coefficient on a time derivative. Conductivities are coefficients on gradients (spatial derivatives). I think these should be conductivities.