Contribution ID: **20** Type: **Oral Presentation**

From the non-linear Darcy law for immiscible two-phase flow in porous media to constitutive equations for each fluid species

Wednesday, 2 June 2021 19:50 (15 minutes)

There is growing evidence that the flow velocity $\vec{v}_p$ of an immiscible fluid mixture flowing in a porous medium depends on the local pressure gradient to a power in the range 1.5 to 2 when capillary and viscous forces compete [1]. The relative permeability equations relate the flow velocity of each immiscible fluid species, $\vec{v}_w$ and $\vec{v}_n$, to a gradient in the corresponding pressure field. These equations allow the mapping $(\vec{v}_w, \vec{v}_n) \rightarrow \vec{v}_p$. However, the opposite mapping, $\vec{v}_p \rightarrow (\vec{v}_w, \vec{v}_n)$ is not unique. Hence, attempts at generalizing the relative permeability equations to account for the non-linear behavior of $\vec{v}_p$ cannot use $\vec{v}_p$ as a starting point. Hansen et al. [2] have defined a co-moving velocity $\vec{v}_m$ which is related to but not equal to the velocity difference between the two fluid species and provided a transformation $(\vec{v}_p, \vec{v}_m) \rightarrow (\vec{v}_w, \vec{v}_n)$, making it possible relate the non-linear behavior of $\vec{v}_p$ to non-linearities in the behavior of $\vec{v}_w$ and $\vec{v}_n$. We use a dynamic network model [3] and relative permeability data from the literature to explore this mapping and what it means.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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Session Classification: MS6-A

Track Classification: (MS6-A) Physics of multi-phase flow in diverse porous media