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# Preferential pathways along individual fracture planes and their effect on large scale transport in coupled fracture systems

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Subsurface applications often require large scale models of coupled fracture matrix systems. In fractured sedimentary formations, also the coupling of fractures and matrix has to be taken into account. This coupling of fracture system and sedimentary matrix is strongly controlled by the fracture aperture. Still, solute transport along individual fractures does not take place uniformly but along preferential pathways. We investigate the influence of these preferential pathways on large scale solute transport. By explicitly modeling flow and particle tracking in individual fractures, we develop a new effective transport aperture, which is weighted by the aperture along the preferential paths. We show that this new Lagrangian aperture is consistently larger than existing definitions of effective flow and transport apertures. Finally, we apply our results to a fractured sedimentary formation in Northern Switzerland and show the need for a better understanding of preferential pathways in coupled fractured systems.