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Numerical evaluation of thermal dispersion in porous media MAY-FUN LIOU, NASA Glenn Research Center, ISAAC GREBER, Case Western Reserve University — The term "thermal dispersion" is used to refer the thermal transport enhancement occurring when fluid undergoes mixing as it traverses the tortuous paths around the solid phase in a porous medium. The effect of the resulting hydrodynamic mixing can be high compared with the molecular diffusion at high Reynolds numbers, especially when the heat conductivity of the solid phase in a porous medium is low. A previously described numerical method (APS/DFD 56, 57) for directly simulating flow over micro-structured porous media by solving the coupled three dimensional Navier-Stokes and heat conduction equations is applied within the porous fluid-solid system. The method does not require any imposed thermal dispersion model; the dispersion effects are be directly calculated at pore scale, without any additional interfacial conduction condition between solid and solid phases. The numerically obtained thermal dispersion conductivity tensor, which represents the heat transfer caused by hydrodynamic mixing of the interstitial fluid, is examined at various Reynolds numbers or Peclet numbers.

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