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Computation of dendritic crystal growth in supercooled water using a level-set method[1] ANTONIO CRISCIONE, DANIEL KINTEA, ILIA V. ROISMAN, SUAD JAKIRLIC, Technical University of Darmstadt, ZELJKO TUKOVIC, University of Zagreb, CAMERON TROPEA, Technical University of Darmstadt — Over the last decades various computational approaches have been developed to simulate solidification and interfacial pattern formation phenomena. For the solution of the time-dependent moving boundary problem, which governs the dendritic crystal growth, the phase-field method has been usually used in simulations to avoid the difficulties of tracking a sharp boundary. In the present work a computational model is developed by using a level-set method. The relevant numerical algorithm is implemented into the open source software OpenFOAM. The heat transfer equations are solved in both the liquid and solid phase independently from each other. At the interface a Dirichlet boundary condition for the temperature field is imposed and a ghost-face method is applied to ensure accurate calculation of the normal derivative needed for the jump condition, i.e. for the interface-velocity in the normal direction. For the sake of updating the level set function a narrow-band around the interface is introduced. Within this band, whose width is temporally adjusted to the maximum curvature of the interface, the normal-to-interface velocity is appropriately expanded. The steady-state results are in agreement with the microscopic solvability theory.

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