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Numerical modeling of a compressible multiphase flow through a nozzle URSZULA NIEDZIELSKA, JASON RABINOVITCH, GUILLAUME BLANQUART, California Institute of Technology — New thermodynamic cycles developed for more efficient low temperature resource utilization can increase the net power production from geothermal resources and sensible waste heat recovery by 20-40%, compared to the traditional organic Rankine cycle. These improved systems consist of a pump, a liquid heat exchanger, a two-phase turbine, and a condenser. The two-phase turbine is used to extract energy from a high speed multiphase fluid and consists of a nozzle and an axial impulse rotor. In order to model and optimize the fluid flow through this part of the system an analysis of two-phase flow through a specially designed convergent-divergent nozzle has to be conducted. To characterize the flow behavior, a quasi-one-dimensional steady-state model of the multiphase fluid flow through a nozzle has been constructed. A numerical code capturing dense compressible multiphase flow under subsonic and supersonic conditions and the coupling between both liquid and gas phases has been developed. The output of the code delivers data vital for the performance optimization of the two-phase nozzle.

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