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Direct Numerical Simulation of low-temperature ablation by turbulent flows[1] RYAN CROCKER, YVES DUBIEF, University of Vermont, CHRISTOPHER WHITE, University of New Hampshire — The present study is motivated by the understanding and modeling of the dynamic interactions between a turbulent fluid transporting an erosive agent, and an erodible surface. As the erosive agent causes changes in the geometry of the wall-boundary conditions, turbulence may rapidly evolve into a non-equilibrium state and may further accelerate ablation. To investigate this complex process, a direct numerical simulation (DNS) algorithm is designed to simulate the temporal and spatial evolution of a surface subjected to low-temperature ablation caused by turbulent flow. The ablative wall is fully discretized and the interface fluid/wall is modeled by a level-set method combined with flow and thermal immersed boundary methods. After a discussion of numerical challenges and their solutions, low Reynolds turbulent ablation flows are used to illustrate the complexity of the problem with a focus on emerging turbulent and topographical scales as ablation proceeds.

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