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A cut-cell immersed boundary technique for fire dynamics simulation MARCOS VANELLA, The George Washington University, RANDALL MCDERMOTT, GLENN FORNEY, National Institute of Standards and Technology — Fire simulation around complex geometry is gaining increasing attention in performance based design of fire protection systems, fire-structure interaction and pollutant transport in complex terrains, among others. This presentation will focus on our present effort in improving the capability of FDS (Fire Dynamics Simulator, developed at the Fire Research Division, NIST. https://github.com/firemodels/fds-smv) to represent fire scenarios around complex bodies. Velocities in the vicinity of the bodies are reconstructed using a classical immersed boundary scheme (Fadlun and co-workers, J. Comput. Phys., 161:35-60, 2000). Also, a conservative treatment of scalar transport equations (i.e. for chemical species) will be presented. In our method, discrete conservation and no penetration of species across solid boundaries are enforced using a cut-cell finite volume scheme. The small cell problem inherent to the method is tackled using explicit-implicit domain decomposition for scalar, within the FDS time integration scheme. Some details on the derivation, implementation and numerical tests of this numerical scheme will be discussed.

Marcos Vanella
George Washington Univ

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