Abstract Submitted
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Mathematical Modeling of Wildfire Dynamics[1] KEVIN DEL BENE, DONALD DREW, Department of Mathematical Sciences, RPI — Wildfires have been a long-standing problem in today's society. In this paper, we derive and solve a fluid dynamics model to study a specific type of wildfire, namely, a two dimensional flow around a rising plume above a concentrated heat source, modeling a fire line. This flow assumes a narrow plume of hot gas rising and entraining the surrounding air. The surrounding air is assumed to have constant density and is irrotational far from the fire line. The flow outside the plume is described by a Biot-Savart integral with jump conditions across the position of the plume. The plume model describes the unsteady evolution of the mass, momentum, energy, and vorticity inside the plume, with sources derived to model mixing in the style of Morton, et al.[1956]. The fire is then modeled using a conservation derivation, allowing the fire to propagate, coupling back to the plume model. The results show that this model is capable of capturing the complex interaction of the plume with the surrounding air and fuel layer.

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