

1096-VG-2413 **Minjeong Kim***, min.kim@ucdenver.edu, University of Colorado Denver, and **Jan Mandel**,
jan.mandel@ucdenver.edu, University of Colorado Denver. *Traveling wave solutions of
reaction-diffusion fire model with fuel depletion.*

We present a highly simplified PDE-based wildland fire model as a nonlinear reaction diffusion equation, coupled with a fuel depletion equation without diffusion. We observe that a physical behavior, such as a traveling combustion wave, can be achieved by such simple model, and identify the coefficients of the PDEs from field measurements. We reduce a traveling wave solution of the PDE system to a system of ODEs by the phase-space method. However, because of the fuel depletion, we obtain a more difficult shooting problem in a 3D phase space instead of a standard 2D argument, such as, for example, for the Komogorov-Fisher equation. We study traveling wave solutions by a geometric analysis in the phase space using the invariant manifold approach. We prove that a traveling wave cannot exist under certain conditions, which yields inequalities relating the coefficients of the PDEs and the traveling wave speed. This research was partially supported by NSF grant EGS-0835579. (Received September 17, 2013)