

“Forecasting wind-driven wildfires using an inverse modeling approach” by O. Rios, W. Jahn & G. Rein.

General comments

The paper by Rios *et al.* presents a numerical study of wildfire spread dynamics using a front tracking algorithm, a physical model for the rate of spread (Rothermel) and data assimilation. Data assimilation is based on observations of the fire front location at different times. The data assimilation algorithm uses a (standard) tangent linear model that minimizes the distance between simulated and observed fire front locations and thereby provides optimal choices for the unknown parameters of the rate of spread model. The algorithm is tested in simple academic tests in which the observations are numerically generated and for which the true state of the system is known.

Specific comments

The paper is interesting and while limited in scope (the study is a preliminary feasibility study and is similar to previous work already published by other groups), it provides a good illustration of the potential of data assimilation techniques when applied to wildfire spread problems. I have only one minor comment and recommend publication in *NHESSD*.

My main comment is about the use of the terminology “invariants”. These “invariants” are defined in the text as combinations of physical parameters used in the rate of spread model. These parameters may change as a function of spatial location and/or time; therefore the use of the terminology “invariant” is confusing and does not seem to be justified. The authors should clarify the basis for their choice of word or adopt a more accurate terminology.

Technical corrections

Additional minor points are listed below:

- (p. 6927, line 2) spelling: “airborne” (instead of “air-born”)
- (p. 6036, line 12) wording: “The tests are performed for different values of parameters” (instead of “varying different parameters”)