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Geoscientific Model Development Discussions

Interactive comment on "Physical parametrisation of fire-spotting for operational fire spread models: response analysis with a model based on the Level Set Method" *by* Inderpreet Kaur et al.

Inderpreet Kaur et al.

gpagnini@bcamath.org

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The referee asked for a sensitivity analysis of model. We performed such analysis as a separate paper and now submitted elsewhere. Here is the link to the arxiv version:

https://arxiv.org/pdf/1809.05430.pdf

Best regards, The authors

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Surrogate-based global sensitivity analysis for turbulence and fire-spotting effects in regional-scale wildland fire modeling

A. Trucchia[a,b,*], V. Egorova[a], G. Pagnini[a,c], M. C. Rochoux[d,**]

[a]*BCAM – Basque Center for Applied Mathematics, Alameda de Mazarredo 14, E-48009 Bilbao, Basque Country, Spain*
[b]*University of the Basque Country UPV/EHU, Barrio Sarriena s/n, 48940 Leioa, Basque Country, Spain*
[c]*Ikerbasque – Basque Foundation for Science, Calle de María Díaz de Haro 3, E-48013 Bilbao, Basque Country, Spain*
[d]*CECI, University of Toulouse, CNRS, CERFACS, 42 Avenue Gaspard Coriolis, 31057 Toulouse cedex 1, France*

Abstract

In presence of strong winds, wildfires feature nonlinear behavior, possibly inducing fire-spotting. We present a global sensitivity analysis of a new sub-model for turbulence and fire-spotting included in a wildfire spread model based on a stochastic representation of the fireline. To limit the number of model evaluations, fast surrogate models based on generalized Polynomial Chaos (gPC) and Gaussian Process are used to identify the key parameters affecting topology and size of burnt area. This study investigates the application of these surrogates to compute Sobol' sensitivity indices in an idealized test case. The wind is known to drive the fire propagation. The results show that it is a more general leading factor that governs the generation of secondary fires. This study also compares the performance of the surrogates for varying size and type of training sets as well as for varying parameterization and choice of algorithms. The best performance was achieved using a gPC strategy based on a sparse least-angle regression (LAR) and a low-discrepancy Halton's sequence. Still, the LAR-based gPC surrogate tends to filter out the information coming from parameters with large length-scale,

*Email: atrucchia@bcamath.org
**Email: melanie.rochoux@cerfacs.fr

Fig. 1.