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Quantifying and reducing shape and topological uncertainties in front-tracking problems

Friday, December 1, 2017 10:00 AM (30 minutes)

In this talk, we will present a front shape similarity measure adapted to the framework of data assimilation, where uncertainties in the quantities of interest are not only of amplitude-type but also associated with shape and topological uncertainties. The front shape similarity measure derives from image processing and is based on the Chan-Vese contour fitting functional. It can be successfully applied to quantify uncertainties in the quantities of interest, to analyze input-output sensitivities through the use of a Polynomial Chaos surrogate, and to reduce uncertainties through the use of data assimilation, in particular via a joint state-parameter estimation algorithm.
The front shape similarity measure will be illustrated through the example of wildfire [REF], where a front paradigm is used to represent the evolution of the burning area delimitation that moves, undergoes shape and topological changes under heterogeneous orography, biomass fuel and micrometeorology. In this context, the measure is promising to directly assimilate mid-infrared images and design data-driven wildfire modeling strategies.

[REF] M.C. Rochoux, A. Collin, C. Zhang, A. Trouvé, D. Lucor & P. Moireau: Front shape similarity measure for front position sensitivity analysis and data assimilation, ESAIM: Proceedings and Surveys, under review.

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