Sensitivity Analysis for some Water Pollution Problem

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Sensitivity analysis employs some response function and the variable with respect to which its sensitivity is evaluated. If the state of the system is retrieved through a variational data assimilation process, then the observation appears only in the Optimality System (OS). In many cases, observations have errors and it is important to estimate their impact. Therefore, sensitivity analysis has to be carried out on the OS, and in that sense sensitivity analysis is a second order property. The OS can be considered as a generalized model because it contains all the available information. This presentation proposes a method to carry out sensitivity analysis in general.
The method is demonstrated with an application to water pollution problem. The model involves shallow waters equations and an equation for the pollutant concentration. These equations are discretized using a finite volume method. The response function depends on the pollutant source, and its sensitivity with respect to the source term of the pollutant is studied. Specifically, we consider:
• Identification of unknown parameters, and
• Identification of sources of pollution and sensitivity with respect to the sources.
We also use a Singular Evolutive Interpolated Kalman Filter to study this problem. The presentation includes a comparison of the results from these two methods.
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