

Abstract Submitted  
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**Ensemble-based data assimilation and optimal sensor placement for scalar source reconstruction**<sup>1</sup> VINCENT MONS, QI WANG, TAMER ZAKI, The Johns Hopkins University — Reconstructing the characteristics of a scalar source from limited remote measurements in a turbulent flow is a problem of great interest for environmental monitoring, and is challenging due to several aspects. Firstly, the numerical estimation of the scalar dispersion in a turbulent flow requires significant computational resources. Secondly, in actual practice, only a limited number of observations are available, which generally makes the corresponding inverse problem ill-posed. Ensemble-based variational data assimilation techniques are adopted to solve the problem of scalar source localization in a turbulent channel flow at  $Re_\tau = 180$ . This approach combines the components of variational data assimilation and ensemble Kalman filtering, and inherits the robustness from the former and the ease of implementation from the latter. An ensemble-based methodology for optimal sensor placement is also proposed in order to improve the condition of the inverse problem, which enhances the performances of the data assimilation scheme.

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Vincent Mons  
The Johns Hopkins University

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