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Adjoint-optimization algorithm for spatial reconstruction of a scalar source[1] QI WANG, Johns Hopkins University, YOSUKE HASEGAWA, The University of Tokyo, CHARLES MENEVEAU, TAMER ZAKI, Johns Hopkins University — Identifying the location of the source of passive scalar transported in a turbulent environment based on remote measurements is an ill-posed problem. A conjugate-gradient algorithm is proposed, and relies on eddy-resolving simulations of both the forward and adjoint scalar transport equations to reconstruct the spatial distribution of the source. The formulation can naturally accommodate measurements from multiple sensors. The algorithm is evaluated for scalar dispersion in turbulent channel flow ($Re_\tau = 180$). As the distance between the source and sensor increases, the accuracy of the source recovery deteriorates due to diffusive effects. Improvement in performance is demonstrated for higher Prantl numbers and also with increasing number of sensors.

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