

## Combining EnKF and Multi-Resolution Analysis for Efficient Assimilation into Adaptive-Mesh Models

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**Key Words:** *Ensemble Kalman Filter, Multi-resolution Analysis, Adaptive Mesh Model.*

This contribution introduces new approaches for efficient data assimilation into adaptive mesh models with the ensemble Kalman filter (EnKF) [1]. The EnKF is combined with a wavelet-based multi-resolution analysis (MRA) scheme [2, 3] with the aim of reducing the computational complexity of the EnKF while retaining the accuracy of its solution. The wavelet representation of the solution enables us to use a different adaptive mesh for each member of the EnKF ensemble. The analysis step of the EnKF is then performed by involving coarsening, refinement, and projection operations on the members. Depending on the choice of these operations, five variants of the MRA-EnKF are introduced and tested on the one-dimensional Burgers equation with periodic boundary condition. The numerical results suggest that, given an appropriate tolerance value for the coarsening operation, four out of the five proposed schemes significantly reduce the computational complexity of the data assimilation system by up to 50 percent with marginal accuracy loss with respect to the EnKF solution. Overall, the proposed framework offers the advantage of both reducing computational cost, and the flexibility of choosing the suitable context-oriented MRA schemes to optimize the performance of the assimilation system.

### REFERENCES

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