Parameterization of Turbulent Mixing Models Derived from Microstructure Data Processing. Applications to Environmental Research

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Abstract: Non-local models represent an alternative theoretical framework to evaluate the effects of turbulent mixing.

Non-local models have some advantages over local models based on turbulent diffusion coefficients, as they can describe a wider range of mixing processes. However, these type of models have not been widely used because the high complexity and the difficulty for obtaining reliable parameterization.

A new parameterization of non-local mixing model derived from microstructure data processing is proposed. The proposed method obtains from microstructure data the coefficients of the transilient matrix, which is the discrete descriptor used in the non-local mixing model.

The parameterization is based on the analysis of Thorpe displacement (dT) profiles and is decomposed in three main steps:

1) turbulent patch identification based on wavelet denoising and error analysis
2) turbulent patch characterization based on displacement distribution analysis
3) data averaging.

The proposed method has been applied to field data. The final results seems to indicate that the estimated transilient coefficients, and the mixing parameters derived from them, are in accordance with those expected from the background external forcing and the observed thermal structure.