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Evaluation of Transport Properties by Exchange Matrix Method

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This work is devoted to the study of transport properties of materials in chaotic two-dimensional stirring using, Spencer & Wiley matrix method. This study is important for applying in problems of pollutants transport (such as petroleum patches) in tidal flows. In order to construct this special exchange matrix we use an approximation of such flows suggested by Zimmerman, who adopted the idea of chaotic advection, first put forward by Aref. Then for a quantitative estimation of the transport properties we explore a coarse-grained density description introduced by Gibbs and Welander. Such coarse-grained representations over an investigation area, show a “residence place” for the pollutant material at any instant. The exchange matrix can show transport of patches or particles from any place in the area under consideration to an arbitrary location in the tidal sea and time if it happens.

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