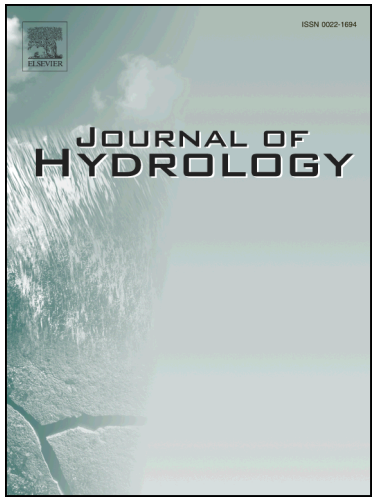

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Concentration moments based analytical study on Taylor dispersion: open channel flow driven by gravity and wind

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Abstract

As an extension of our recent study (Li et al. Taylor dispersion in wind-driven current. Journal of Hydrology 555, 697-707), an analytical study based on spatial concentration moments is performed on contaminant transport in a gravity induced open channel flow under wind effect. The zeroth to the fourth order spatial concentration moments are derived to describe the temporal evolution of spatial concentration distribution, fitted by the fourth order Hermite polynomials. In initial stage, convection dominates the contaminant transport, leading to a large non-uniformity of vertical concentration. As time passes, the contaminant transport gradually evolves to an asymptotic pattern following a diffusion-like model of Taylor dispersion. The combined influence of gravity and wind effect on contaminant transport is investigated: the tailwind effect will accelerate the development of Taylor dispersion as well as the transport of contaminant, while the conveyance capacity is weakened

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