نویسنده:

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خلاصه مقاله:

Analytical solutions have been obtained for both conservative and non-conservative forms of one-dimensional transport and transport-dispersion equations applicable for pollution as a result of a non-conservative pollutant-disposal in an open channel with linear spatially varying transport velocity and nonlinear spatially varying dispersion coefficient on account of a steady unpolluted lateral inflow in accordance to the channel. A logarithmic transformation in the space variable has been applied in order to derive a general solution of the transport equation for spatially variable initial pollutant distribution and upstream time-dependent pollutant concentration. The logarithmic transformation reduces both conservative and non-conservative forms of transport-dispersion equation to a form with constant coefficients that is solvable by analytical methods. An analysis of these solutions indicates that only the solution of a conservative form of the governing equation yields appropriate results that are conceptually acceptable in a real physical situation. The solution lends to analyze the damping effect of such transport on the pollutant with an initial Gaussian profile, in contrast with that of the initial quasi-Gaussian profile available in the literature. It is noteworthy to mention that the solution of conservative form of the transport equation implies that mass of the non-conservative pollutant in the channel decreases with an increase in time, and finally reaches to a constant value that is a ratio of product of the transport velocity coefficient and upstream concentration to the coefficient of decay of the pollutant.

کلمات کلیدی:

Transport, dispersion, logarithmic transformation, one-dimensional, non-conservative pollutant

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