Hydrol. Earth Syst. Sci. Discuss., 8, C3596–C3597, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C3596/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Spatial variation of the longitudinal dispersion coefficient in an estuary" *by* D. C. Shaha et al.

Anonymous Referee #1

Received and published: 23 August 2011

Authors present a fine set of valuable measurements and determine 1-dimensional dispersion coefficients with that set using the 1-dimensional advection diffusion equation. The 1-dimensional dispersion coefficient lumps the effect of shear in the water velocities through cross sections in a diffusion type coefficient: integral(vC) = average(v) * average(C) + integral{ deviation(v) * deviation(C) } is approximated with average(v) * average(C) – D * average(dC/dx). Already the calamitous spill models for rivers indicate the shortcoming of such a lumping. The shape of concentrations from calamitous spills in rivers is far from Gaussian. It has a long tail due to so-called dead-zones. Also in estuaries shortcomings can be identified. Unfortunately the contribution of the authors does not mention any of these limitations, just that it is a 'primary tool', which is certainly true. It would be very valuable if the authors would continue their research

with 3D modeling of their river stretch of interest. In follow-up publications they can then show that for the 3D model to reproduce their extensive dataset well, it is necessary to represent the shape of the bed in sufficient detail. That will be tedious work, but the reward is that salinity measurements will be reproduced with even much greater accuracy without a dispersion coefficient at all. Such a model will then also be fit to address means of influencing the salinity intrusion by changes in the shape of the bed. With the top-of-the-line model Delft3D gone 'open-source', it is possible to use competent 3D models for such a study free of charge.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 7757, 2011.