Hydrology and Earth System Sciences Discussions

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Interactive comment on "Buffering of the salinity intrusion in estuaries by channel convergence" *by* P. S. Gay and J. O'Donnell

Anonymous Referee #1

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This paper describes a very simple of 1D model of along channel salinity dispersion that demonstrates the influence of channel geometry. The authors compare their theoretical work to observations of salinity intrusion length scales from three east coast estuaries. I find the motivation for this paper somewhat muddled, and the results weak. I recommend that this paper should not be published.

My first concern with this paper is that the mechanism for along-channel salt dispersion is not clearly stated. Equation 1 implies (assuming constant K) that gravitational circulation is the dominant mechanism responsible for bringing salt up-estuary (see Kranenburg 1986, Ralston et al 2008). Many recent papers have shown (Lerczak and Geyer, 2004, and many papers by Valle-Levinson) that cross-channel bathymetric vari-

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ations can have a strong influence on along-channel salt dispersion. Thus, assuming that the salinity dispersion is driven entirely by gravitational circulation may be flawed.

More generally, the recognition that cross-sectional area has a strong influence on estuarine structure has been demonstrated in many recent papers. It is not clear to me what this paper adds to that existing body of work. Recent papers by MacCready (2007) and Ralston et al. (2008) show time-dependent models that encompass the physics of the present analytical model and more. It seems that many of the assumptions (constant K, gravitational circulation the only source of dispersion, estuary in steady state balance with river flow, etc) could be investigated with a slightly more complicated model. The simple model (equation 1) does not offer any insight into the system.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 6007, 2009.

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