

Along-channel Variability of Total Exchange Flow in a Narrow, Well-mixed Estuary: Influence of the M4 Tide by Manuel Díez-Minguito and Hans Burchard.

This article presents an analysis of exchange fluxes in the Guadalquivir River based on a comprehensive set of long-term current and salinity time series data from 7 stations located along the river. The analysis focuses on periods of low river flow, when water transport is dominated by tidal current dynamics. The proposed topic is of considerable interest and can provide valuable complementary information for understanding current processes affecting the Guadalquivir River, such as the progressive salinization of inland waters, which is particularly pronounced during periods of low river flow. The available database is well-suited to yield truly conclusive results from the analysis. So, the research topic proposed in the article is relevant, and the results derived from this article have the potential for great scientific interest.

However, I honestly believe that the current version of the article can be improved, and I recommend reviewing several aspects of the work that should be addressed before proceeding with its acceptance for publication. The following lines outline the main issues and suggestions that I believe the authors should consider:

1. The advantages of estimating exchange flows using the TEF method compared to traditional Eulerian estimates in the Guadalquivir estuary should be explained. I have the impression that the same results could be obtained using averages based on Eulerian estimates. If this is not the case, it should be justified how the TEF method improves exchange flow estimates in this estuary.
2. Why isn't the TEF method applied directly to the observations before applying it to the synthetic series constructed from the tidal harmonic components M_2 and M_4 ? What motivates not applying the method to the original observed signals? I think it's interesting to decompose the contribution of the different tidal constituents in the exchanges, following the procedure presented in the article, but after presenting the actual estimates considering the total signal. In that sense, I think it's also interesting to evaluate the contribution of the next tidal constituent S_2 and the reduced water component MS_4 originating from the interaction between constituents M_2 and S_2 .
3. The TEF method is presented as if it were applied to a two-layer estuary, when the Guadalquivir is a well-mixed estuary, and this is especially true during the low-discharge periods that are the focus of the analysis. It should be made clear that in this case the method is applied to a vertically mixed estuary, and the presentation and discussion of the results should be adapted to this actual configuration.

I strongly believe that the questions arising from the last three paragraphs must be answered in a new version of the article before it can be considered for publication in OS.