

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-247

Hui Wu (Referee)

Referee comment on "Effect of tides on river water behavior over the eastern shelf seas of China" by Lei Lin et al., Hydrol. Earth Syst. Sci. Discuss.,
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In this paper the authors investigated the tidal effects on freshwater transport in shelf seas of China with a numerical model. The results indicated that tide slows down the shelf currents and increases the time scale of freshwater retained in the shelf seas. Then the authors argued that only parameterizing the tidal mixing in model cannot faithfully reflect the actual tidal effects, thus they suggest the climate models should include the tidal forcing in an explicit way. Over all the scientific point of this paper is very clear and the conclusion is well supported by the model results. I enjoyed in reading this paper and recommend to accept it after some revisions.

1) My major concern is on the dynamics. The authors attribute the slowdown of shelf current under tidal effects to the enhanced bottom stress. This mechanism was discussed too in their earlier paper (Lin et al., 2020, JGR) by citing the results of previous papers. I should say that this mechanism applies more or less to barotropic region only. In stratified region, tidal can also adjust the baroclinic structure thus affect the currents in other ways. It is a complicated process and the authors cannot simply attribute it to the enhanced effective friction. More discussions are necessary besides the sensitivity experiments, and also the authors should cite the seminal paper instead of just Lin et al. (2020).

2) Between Line 285-290 the authors stated that "the decrease in coastal currents results in a smaller gradient of sea surface height across the continental shelf, thus weakening Yellow Sea Warm Current in the control run compared to the no-tide run". This mechanism needs justification because 1) under the tidal effects the currents is no longer geostrophic 2) it is unclear why the decreased SSH gradient would weaken the YSWC, mechanism and citations are needed. I understand such a mechanism could be discussed in previous results, but here you might give a clear explanation.

3) Line 190 "suggesting the YSCWM region could trap river water for several years". YSCWM is in the bottom, how could it trap the surface river water? Mechanism should be given.

4) Can you provide a more in-depth explanation as to why tides induced more dispersed transport pathways for the Yellow and Yalujiang Rivers, but more concentrated transport pathways for the Changjiang River? It is very interesting to know the underlying mechanism.