Review of egusphere-2022-1495

I consider this a very relevant paper. It is well written and reports on extensive field observations in the Saigon tidal river, which I consider very valuable. Also the conclusion that the plastic travels faster than the fresh water component of the tidal flow is relevant. But the calculation of the tidal volumes and efficiencies is, unfortunately, doubtful because of erroneous or unclear mathematics. So, until this unclarity is solved, we cannot judge if this conclusion is correct.

Thank you very much for your constructive feedback on the manuscript. We appreciate your inputs which will lead to the improvement of the manuscript. We agree that the equations used were at times unclear. Here, we clarify our initial delivery ratio equation, and will do so as well in a revised version of the manuscript, which we will submit once we receive additional reviews. Considering your feedback on our calculations, we suggest three different equations (eq. 1, 4 and 6) to express the delivery ratio and present in this rebuttal the main results using these equations (see Tables R1 and R2 in this file). Independently from the equations used, our main findings that plastic net exports are limited due to tidal dynamics and that plastic travels faster than water remain valid (Table R1). Unless fundamental flaws are highlighted regarding the calculation of delivery values using the total volume (the sum of flood and ebb volumes), we will keep our initial definition of delivery ratio, now formulated in equation 1 of this rebuttal.

In line 155, the authors mention that ebb flow is positive and flood flow is negative. Fair enough. But in that case, the integral of the tidal volumes, V_ebb and V_flood, should also be positive and negative.

Thank you for pointing that out. Indeed, the volumes during ebb and flood phases (V_E and V_F) are respectively positive and negative. Some of our previous equations used absolute values, some did not. We have now harmonized our equations and do not use absolute values anymore. We will make sure that we are consistent on this aspect in a revised version of the manuscript.

This makes the calculation of the delivery ratio unclear. This calculation should then be:

d_r= Delta(V)/V_tidal or

d_r= (V_ebb+V_flood)/(V_tidal)

V_tidal should be the average of the ebb and flood volumes: (Vebb-Vflood)/2.

If, instead the absolute volumes of the ebb and flood flow are taken, then the equation becomes:

d_r= 2*(V_ebb-V_flood)/(V_ebb+V_flood)

This would be:

In the case of plastic transport: the delivery of plastic to downstream in relation to the tidal transport of plastic.

In the case of river flow: the delivery of fresh water over the tidal volume or (Q_fresh*T)/(Tidal volume), which is approximately equal to the ratio between the fresh water velocity and the average ebb or flood tidal velocity.

One would expect these two delivery ratios to be the same, but interestingly they are not.

Now three things are wrong in Eq.(6)

First, the negative sign in the numerator and the positive sign in the denominator, unless absolute values of the volumes are implied, but then Eq.(9) would be wrong; it should then have a minus in the numerator.

Indeed, we used absolute values in equation 6, and signed values in equation 9. We will revise this. We choose to not report absolute values.

Second the factor 2. There should be a factor 2 in the numerator of Eq.(6)

Regarding the factor 2 in equation 6, we think this depends on what we consider to be our volume of reference. Our goal with introducing this equation was to provide a metric to assess the reduction in transport/flow due to tidal dynamics. Figure R1 provides an overview of the terms used in the equations presented below.

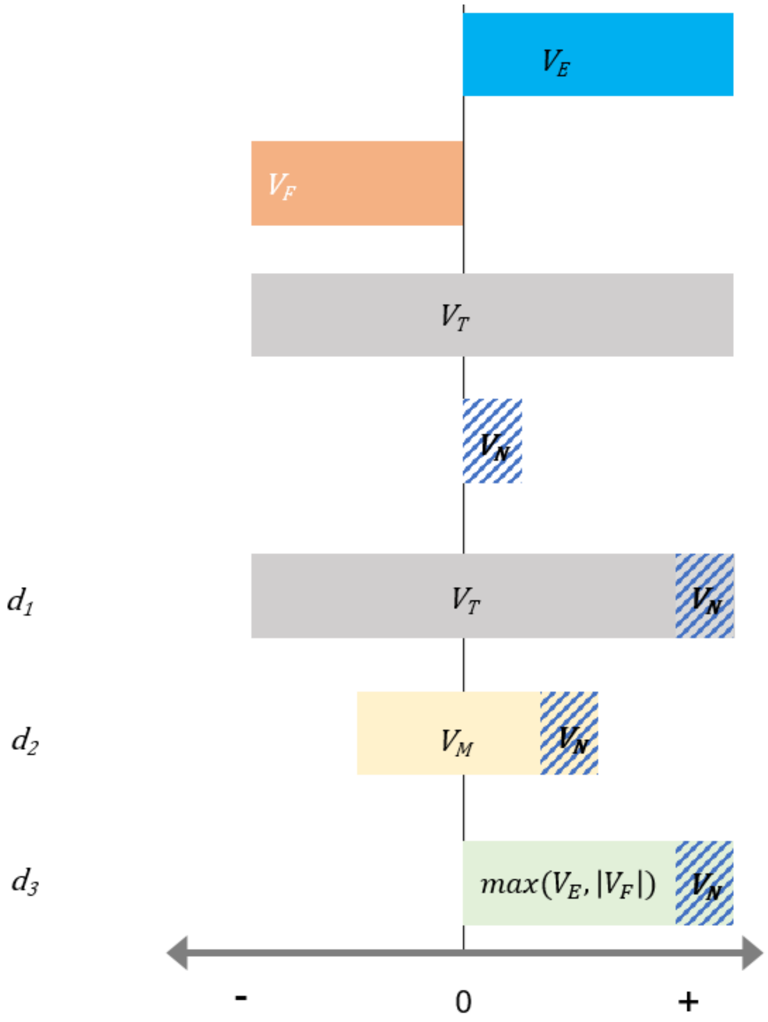


Figure R1. Schematic graph on variables for delivery ratio (*d*) calculation. V_E: volume during ebb phase, V_F: volume during flood phase, V_N: net volume, V_T: total volume, V_M: mean tidal volume.

Our initial idea was to calculate the delivery ratio as follows:

$$d_1 = \frac{V_N}{V_T} \tag{1}$$

V_N is here the net volume and V_T the total volume passing through a cross-section during a tidal cycle (Figure R1). Since V_E is positive and V_F is negative, we calculate V_N using the following equation:

$$V_N = V_E + V_F \tag{2}$$

Similarly, we calculate the V_T by using:

$$V_T = V_E - V_F \tag{3}$$

Apart from the initial unclarity in the delivery ratio equation, we hypothesized that a potential issue with using V_T as our denominator in eq.1 could be that V_E and V_F can be seen as not being independent of each other, because part of V_E is likely to be circulated in V_F and vice-versa. We also considered your suggestion, to use the mean tidal volume (V_M) instead:

$$d_2 = \frac{V_N}{V_M} \tag{4}$$

$$V_M = \frac{V_T}{2} \tag{5}$$

An issue however arises when using the mean tidal volume as the denominator: delivery values can exceed unity in the case of plastics. We would like to constrain the delivery values to be comprised between -1 and 1. A value of zero would indicate no net transport over the tidal cycle and a value of 1 or -1 indicates that the total volume of plastic has been transported downstream or upstream, respectively.

We therefore suggest the following equation as another option:

$$d_3 = \frac{V_N}{\max(V_E, |V_F|)} \tag{6}$$

By taking the maximum value between the plastic volume during ebb and the absolute plastic volume during flood, we constrain our delivery values between -1 and 1, because the denominator cannot be smaller than the numerator in such case.

Please note that the calculation of d_3 over the entire monitored period (values reported in Table R1) required additional choices regarding how V_E and V_F are calculated. This could be either done for each tidal cycle individually, or for the entire period of interest. We used the following equations to calculate d_3 over the entire monitoring period:

$$d_3 = \frac{\sum_{i=1}^{6} V_N}{\sum_{i=1}^{6} \max\left(V_E, |V_F|\right)}$$

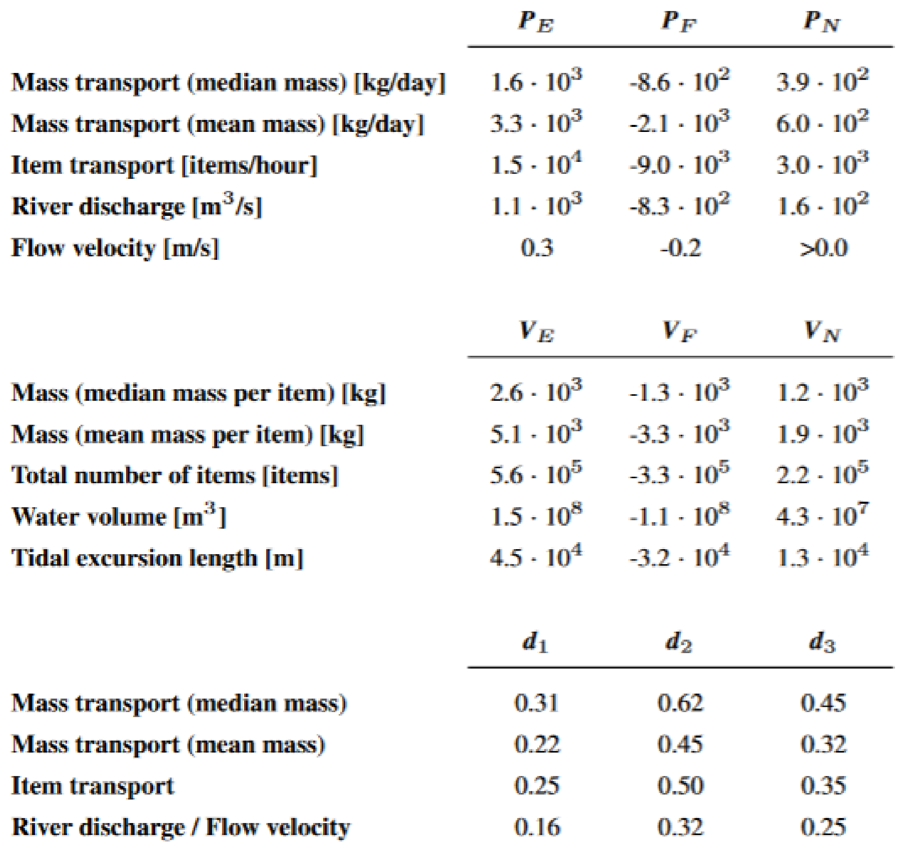
(7)

In this way, we use the sum for the maximum value between V_E and V_F for each tidal cycle, instead of using the maximum between V_E and V_F calculated over the entire period. We considered this a suitable choice, given that in our case, there is an alternation between flood and ebb-dominant cycles. Thus using the sum of maximum values between V_E and V_F for each tidal cycle seemed a more accurate way for estimating the maximum volume between V_E and V_F.

Figure R1 helps to explain the three different equations proposed, which we needed for our conceptualization and might help future reviewers.

We summarize here the results in Table R1 and R2, with the three delivery values calculated as presented above. We have found some errors in the division between ebb and flood phases in our data, therefore our net transport values (P_N) and d_1 have also slightly changed compared to those reported in the submitted manuscript. But the changes are minimal. As you will notice, certain values of d_2 are above unity. This was found to be the case for the delivery value of item transport during the first tidal cycle, as well as the fifth tidal cycle (Table R2).

Table R1. Summary statistics for plastic, flow velocity and discharge. P_E: transport during ebb phase. P_F: transport during flood phase, P_N: net transport, V_T: total volume, V_M: mean tidal volume, V_E: volume during ebb phase. V_F: volume during flood phase. V_N: net volume.

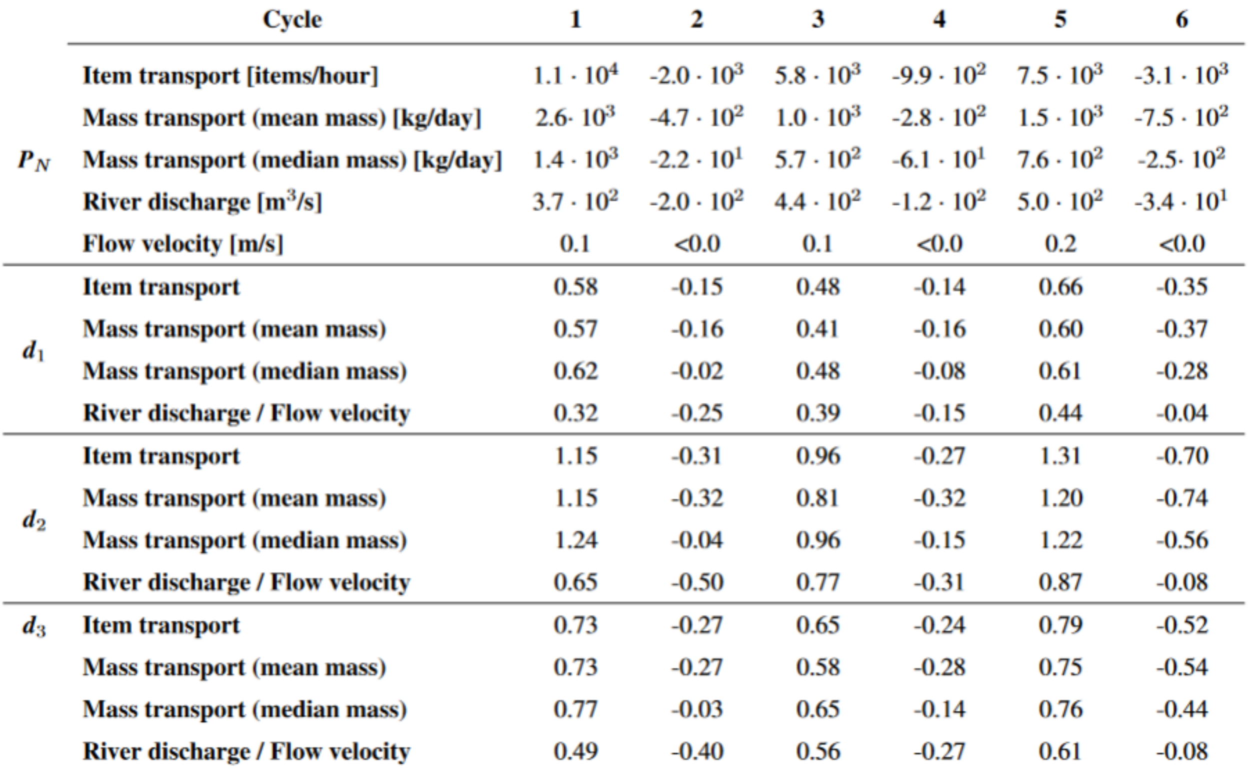


	P_E	P_F	P_N
Mass transport (median mass) [kg/day]	$1.6 \cdot 10^{3}$	$-8.6 \cdot 10^{2}$	$3.9 \cdot 10^{2}$
Mass transport (mean mass) [kg/day]	$3.3 \cdot 10^{3}$	$-2.1 \cdot 10^{3}$	$6.0 \cdot 10^{2}$
Item transport [items/hour]	$1.5 \cdot 10^{4}$	$-9.0 \cdot 10^{3}$	$3.0 \cdot 10^{3}$
River discharge [m^3/s]	$1.1 \cdot 10^{3}$	$-8.3 \cdot 10^{2}$	$1.6 \cdot 10^{2}$
Flow velocity [m/s]	0.3	-0.2	>0.0

	V_E	V_F	V_N
Mass (median mass per item) [kg]	$2.6 \cdot 10^{3}$	$-1.3 \cdot 10^{3}$	$1.2 \cdot 10^{3}$
Mass (mean mass per item) [kg]	$5.1 \cdot 10^{3}$	$-3.3 \cdot 10^{3}$	$1.9 \cdot 10^{3}$
Total number of items [items]	$5.6 \cdot 10^{5}$	$-3.3 \cdot 10^{5}$	$2.2 \cdot 10^{5}$
Water volume [m^3]	$1.5 \cdot 10^{8}$	$-1.1 \cdot 10^{8}$	$4.3 \cdot 10^{7}$
Tidal excursion length [m]	$4.5 \cdot 10^{4}$	$-3.2 \cdot 10^{4}$	$1.3 \cdot 10^{4}$

	d_1	d_2	d_3
Mass transport (median mass)	0.31	0.62	0.45
Mass transport (mean mass)	0.22	0.45	0.32
Item transport	0.25	0.50	0.35
River discharge / Flow velocity	0.16	0.32	0.25

Table R2. Net plastic transport, flow velocity and river discharge and associated delivery ratios by tidal cycle. Each tidal cycle lasts 12 hours and 25 minutes. P_N: net transport.



	Cycle	1	2	3	4	5	6
P_N	Item transport [items/hour]	$1.1 \cdot 10^4$	$-2.0 \cdot 10^3$	$5.8 \cdot 10^3$	$-9.9 \cdot 10^2$	$7.5 \cdot 10^3$	$-3.1 \cdot 10^3$
	Mass transport (mean mass) [kg/day]	$2.6 \cdot 10^3$	$-4.7 \cdot 10^2$	$1.0 \cdot 10^3$	$-2.8 \cdot 10^2$	$1.5 \cdot 10^3$	$-7.5 \cdot 10^2$
	Mass transport (median mass) [kg/day]	$1.4 \cdot 10^3$	$-2.2 \cdot 10^1$	$5.7 \cdot 10^2$	$-6.1 \cdot 10^1$	$7.6 \cdot 10^2$	$-2.5 \cdot 10^2$
	River discharge [m^3/s]	$3.7 \cdot 10^2$	$-2.0 \cdot 10^2$	$4.4 \cdot 10^2$	$-1.2 \cdot 10^2$	$5.0 \cdot 10^2$	$-3.4 \cdot 10^1$
	Flow velocity [m/s]	0.1	<0.0	0.1	<0.0	0.2	<0.0
d_1	Item transport	0.58	-0.15	0.48	-0.14	0.66	-0.35
	Mass transport (mean mass)	0.57	-0.16	0.41	-0.16	0.60	-0.37
	Mass transport (median mass)	0.62	-0.02	0.48	-0.08	0.61	-0.28
	River discharge / Flow velocity	0.32	-0.25	0.39	-0.15	0.44	-0.04
d_2	Item transport	1.15	-0.31	0.96	-0.27	1.31	-0.70
	Mass transport (mean mass)	1.15	-0.32	0.81	-0.32	1.20	-0.74
	Mass transport (median mass)	1.24	-0.04	0.96	-0.15	1.22	-0.56
	River discharge / Flow velocity	0.65	-0.50	0.77	-0.31	0.87	-0.08
d_3	Item transport	0.73	-0.27	0.65	-0.24	0.79	-0.52
	Mass transport (mean mass)	0.73	-0.27	0.58	-0.28	0.75	-0.54
	Mass transport (median mass)	0.77	-0.03	0.65	-0.14	0.76	-0.44
	River discharge / Flow velocity	0.49	-0.40	0.56	-0.27	0.61	-0.08

Independent of the selected delivery ratio equations, our main conclusions are still supported. The delivery of plastics is higher than that of water for all d_1, d_2 and d_3 values (Table R1). Ebb dominated cycles have positive delivery values (net downstream transport) whereas flood dominated cycles are characterized by negative delivery values (net upstream transport) (Table R2). Also, our finding that the net plastic transport is limited by tidal dynamics remains correct, as delivery values over the entire monitored period were all found to be below unity. The extent of the reduction in transport is however variable depending on the calculation method chosen. Because we want to constrain delivery values between +1/-1 and 0, we consider d_2 to not be a suitable option. We thus suggest to keep using d_1. We are interested to hear from you whether we may have overlooked any fundamental shortcomings in the conceptualization of the delivery ratio. If fundamental flaws are highlighted in using d_1 (see eq. 1), d_3 could be a suitable alternative.

Third the unnecessary (and silly) addition of 100% in Eq.(6). As the authors should be aware, 100%=1, so there is no need to multiply by 100%. If a delivery value is 18%, then that is the same as 0.18.

We just wanted to emphasize that we expressed the delivery as a percentage. We will remove this from the equation, as we agree it is an unnecessary addition, and now express delivery values as a fraction.

Fortunately, it seems as if the equations are wrong, but the calculations are right. A quick look at the calculations in Table 1 suggests that they are correct.

2*3.1/(15+8.6)=0.27

2*170/(1100+790)=0.18

We did not report in the previously submitted version of Table 1 nor in other parts of the manuscript the volumes we estimated. We reported the transport rates during ebb and flood, as well as net transport rates. We realize this is probably confusing to the reader. We initially did not report those values because literature on river plastic reports concentrations or transport rates. In a revised version of Table 1, which will be similar to Table R1 we will add the volumes as well. For the other tables, due to space limitations, we will not add the volumes. But we will report those in Annex.

The delivery ratio of the flow velocity is calculated as 0.18. This seems to me a realistic value for the ratio between the freshwater volume and the tidal volume, so it seems as if the calculations are right. In that case the equations provided are wrong and the calculations are correct. But without more detailed insight I cannot conclude either way.

Then the interesting question remains why the plastic has a higher delivery ratio than the fresh water. My hypothesis would be that this has to do with the lateral distribution of the floating plastic. Floating plastic has the tendency to concentrate mid-stream, particularly during ebb (from my own observations in many tidal rivers). In midstream the surface flow velocities are largest. The concentration of floating objects (also water hyacinth) in mid-stream is due to the helix movement of water in river bends where floating objects are brought together. At slack time the water slacks earlier near the banks which causes a lateral movement of the surface water towards the banks. At flood flow, the floating objects are spread over the width and may even be trapped in the banks. The net transport of floating objects is then less. Maybe you can check if your observations confirm this. In any case, the data suggest that the plastic is discharged faster to the ocean than the average (freshwater) flow velocity suggests.

Thank you for this very interesting remark about the plastic lateral distribution. We have done some additional analysis to explore the plastic and flow velocity lateral distributions, as well as their relationships. Ultimately, we wanted to check: 1) whether the mid-stream segment (e.g.: the segment where the flow velocity is the highest) coincides with the segment where plastic transport peaked, for the ebb and flood phases; 2) whether plastic transport is more widely spread over the width for the flood phase than during the ebb phase. For your reference, we have plotted the lateral distribution of plastic transport and flow velocity per tidal cycle, for ebb and flood (Figure R2). We also estimated the relative plastic transport per segment (expressed in relative contribution to the mean cross-sectional transport rate) (Table R3).

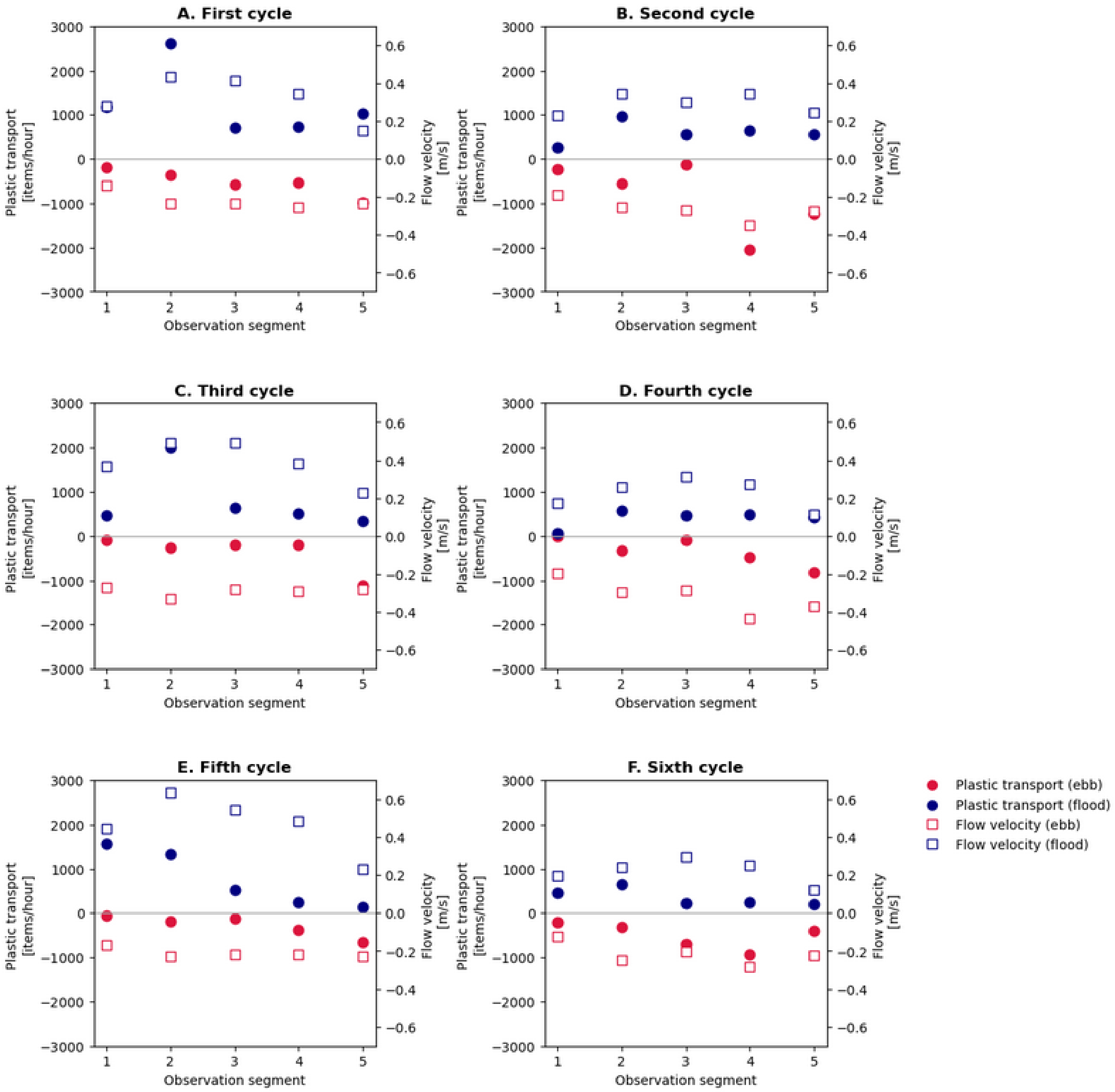
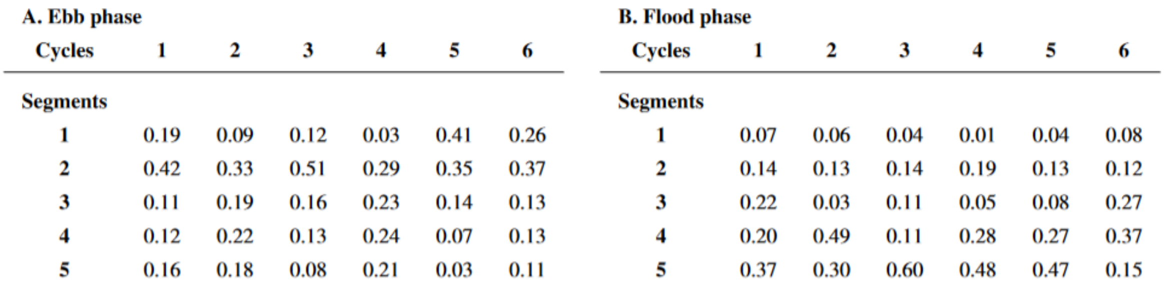


Figure R2. Lateral distribution of plastic transport and flow velocity for the six tidal cycles considered.

Regarding the first point, for both ebb and flood, in 50% of the tidal cycles the peak flow velocity and plastic transport occurred at the same segment (Table R3). During the ebb phase, plastic transport typically peaked at segment 2 or 3; for the flood phase, at segments 4 or 5. We also calculated the percentage of observation rounds (14 to 23 per tidal cycle) for which the peak flow velocity and plastic transport occurred at the same segment: 67% for ebb and 72% for flood. In addition, we calculated the Spearman's correlation coefficient between flow velocity and plastic transport for all observation rounds. We found low Spearman's rho values (0.35 and 0.32 for ebb and flood, respectively; p-value < 0.01), and no considerable difference between ebb and flood. Note that these results are very different than those presented in our manuscript in Figure C1, Appendix C. In Figure C1 we present the relationship between discharge and plastic transport averaged across the cross-section. In summary, based on our observations, we cannot conclude that plastic transport is more concentrated mid-stream during the ebb phase than during the flood phase.

Table R3. Relative lateral distribution of plastic transport per observation segment with respect to the mean cross-sectional transport



A. Ebb phase

Cycles	1	2	3	4	5	6
Segments						
1	0.19	0.09	0.12	0.03	0.41	0.26
2	0.42	0.33	0.51	0.29	0.35	0.37
3	0.11	0.19	0.16	0.23	0.14	0.13
4	0.12	0.22	0.13	0.24	0.07	0.13
5	0.16	0.18	0.08	0.21	0.03	0.11

B. Flood phase

Cycles	1	2	3	4	5	6
Segments						
1	0.07	0.06	0.04	0.01	0.04	0.08
2	0.14	0.13	0.14	0.19	0.13	0.12
3	0.22	0.03	0.11	0.05	0.08	0.27
4	0.20	0.49	0.11	0.28	0.27	0.37
5	0.37	0.30	0.60	0.48	0.47	0.15

For the second point, we investigated the distribution of plastic transport over the cross-section during both flood and ebb phases (Figure R3). We calculated the RMSE for both ebb and flood, and found that plastic transport during the ebb phase is more uniformly distributed than during the flood phase (RMSE: 0.095 and 0.19 for ebb and flood, respectively). This proves the opposite of the initial hypothesis, e.g. that plastic transport is more uniformly distributed across the river width during the flood than the ebb phase.

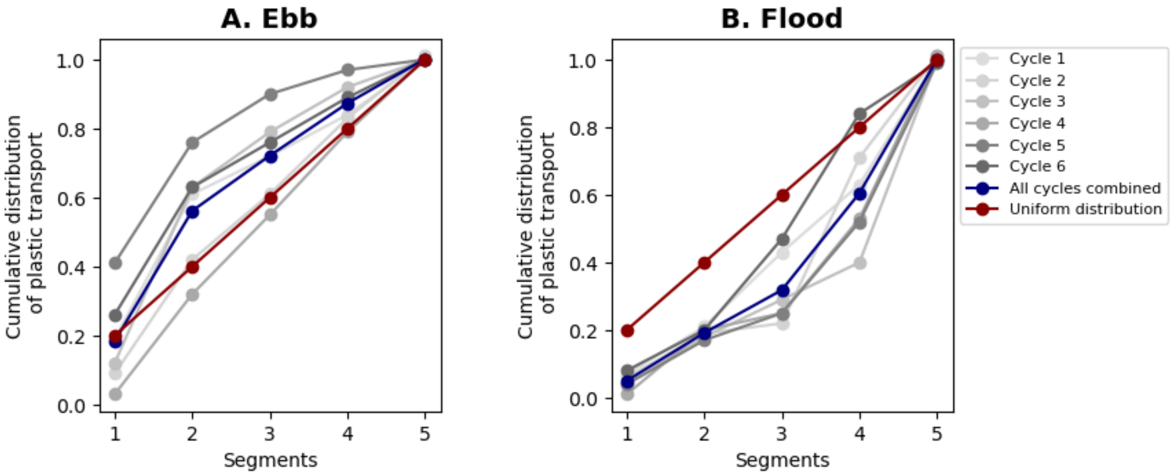


Figure R3. Cumulative relative distribution of plastic transport across the river width, for ebb (A) and flood (B) tidal phases.

Considering these elements, we cannot conclude than the lateral distribution of floating plastic transport might explain the higher delivery values for plastic compared to freshwater. In our case, the explanations provided in section 4.3, namely that 1) other factors than flow velocity, such as wind influence floating plastic transport, and 2) entrapment of plastic items downstream of the monitored site could explain the higher delivery ratio values found compared to water. However, we agree that in other cases, the plastic lateral distribution could be a factor affecting the net transport and delivery of plastic transport, thus we will mention this in a revised version of the discussion section.

In line 310 the authors observe that the travel times of plastic in estuaries is long. This is not surprising since estuaries have an exponential shape (see Savenije, 2012) with cross-sectional areas orders of magnitude larger than the river cross-section. The section of observation in the Saigon River is rather far from the ocean, so the increase of the cross-sectional area is still modest compared to the river width, but further down the widening is much more and hence the delivery ratio will reduce substantially as one moves downstream. Generally, in alluvial estuaries the net downstream velocity is much smaller than that of the river feeding the estuary. So, retention times in estuaries are long and there is nothing special about it. But what is surprising is that the delivery ratio of the plastic is higher than the net freshwater transport. That is an interesting finding!

Thank you for your remarks. Indeed, there is nothing special about long retention times in estuaries. However, observation-based studies of plastics in estuaries are very scarce and global river plastic models have so far entirely neglected tidal dynamics. Thus we believe it is important to stress these results to the reader. We agree that finding higher delivery of plastics compared to net freshwater is an interesting finding.

In Section 4.3 the authors discuss this issue. I think the explanation of entrapment (particles getting temporarily stuck during the flood flow) is realistic, but I would like the authors to ponder on the lateral distribution of the floating plastic. The fact that the floating plastics have a higher delivery ratio than submerged plastic supports my idea of the lateral distribution playing a role. I guess that your observations at the bridge with 5 observation sections could be used to investigate this hypothesis.

See our previous answer on this point.

In lines 446-447 the authors suggest that it is the tidal movement that hampers the transport of the plastic. This is not true. It is the exponential shape of the estuary that enhances travel times. As one moves downstream, the cross-sectional area increases exponentially and the delivery ratio will decrease proportionally, because the tidal volume is directly proportional to the cross-sectional area (see Savenije, 2012).

Many thanks for this comment. We agree that the formulation in lines 446-447 is misleading and we will modify it in a revised version of the manuscript.

Ultimately, we would like to convey these main points regarding the overall influence of tidal dynamics on plastic transport:

1) Plastic is not just emitted from rivers into the ocean. The tidal dynamics impact the transport, increasing retention times, and this increases the likelihood of (temporary) trapping. This has not been included in plastic transport models and emission estimates, and it should be.

2) The retention time along the estuary depends on the freshwater discharge, and the estuarine geometry. We could hypothesize that closer to the river mouth, the flow velocities decrease due to a widening of the estuary. This might lead to an increase in deposition of floating plants on the riverbanks. This point requires additional research at different locations within the estuary and was beyond scope for this first study that looked at the impact of tides on plastic transport. We will elaborate this in the discussion with concrete suggestions for future research.

Following your comment, we think it would be better to change the manuscript's title. Our submitted manuscript was entitled "Tidal dynamics limit river plastic transport". We plan on changing this title to the following: "River plastic transport affected by tidal dynamics", to better reflect the findings and relevant processes highlighted in our work. In the absence of tides, the net outflow would be equal to the freshwater discharge. Similarly, and without considering deposition and remobilization dynamics, the net volume of plastics being transported in a tidal system would be equal to the volume of plastics transported downstream in a system not affected by tides. There is no 'reduction' in volume due to the tidal prism. However, because of bidirectional flows, water and floating plastics are transported over longer distances for the same period of time compared to a freshwater system of reference. Indeed, the sum of the ebb excursion and the flood excursion tidal excursion is almost six times higher than the difference between ebb and flood excursion (representing the integral of flow velocity) (Table R1). Lotcheris et al. (2023) tracked floating plastic trajectories in the Saigon river, a few weeks after the measurements presented in this manuscript, for the same measurement location. They used a Lagrangian approach, with GPS trackers mimicking the trajectories of floating macroplastics at the river surface. They found that the total distance travelled by plastics is on average ~2 times higher than the net plastic travelled distance. The lower difference between net and total travelled distances found for plastics than for water (2 versus 6) also highlights the frequent deposition of plastics. Frequent stopping and deposition of floating plastics were directly observed in observational studies such as Lotcheris et al., Newbould et al. (2021), Duncan et al. (2020), Mani et al. (2023), Tramoy et al. (2020).

The longer distances travelled by plastics in a tidal system compared to a non-tidal one mean that items have a higher likelihood of interacting with the river environment. This could lead to deposition mechanisms, as also observed in Lotcheris et al. (2023). However, changes in water level and flow velocity could also lead to the re-mobilization of plastic items that were previously deposited at river infrastructure, in floating or riparian vegetation and on riverbanks. In that sense, the delivery values do not just give information on the tidal rivers capacity to transport items, but could also indicate changes in the amounts of transported plastics between the ebb and flood phase. In our analysis, we found higher delivery values of plastics compared to water for almost all tidal cycles (with the exception of the fourth cycle, see Table R2). The higher delivery ratio for plastics compared to water could be caused by either deposition of items downstream of the measurement location, or re-mobilization of items upstream of the measurement location.

In summary, we will nuance our initial statement that tidal dynamics limit river plastic transport and rephrase it in a revised version of the manuscript. We suggest to reformulate as follows:

1) Plastics in tidal rivers travel for longer distances than in non-tidal systems. With longer travelled distances, floating plastics are more likely to interact with the river environment, get deposited and re-mobilized compared to plastics transported in a freshwater system. Considering a fixed river domain, changes in plastic amounts during ebb and flood phases are expected due to deposition and re-mobilization mechanisms, which have been observed in a wide range of river systems.

2) Our observations highlight these changes in plastic amounts during ebb and flood phases (caused by deposition and re-mobilization), as we found higher delivery ratios for plastics than water. Fundamental differences in plastic transport compared to water movement (for instance wind influence) could partially explain the higher delivery ratio found for plastics than for water. However, the significant and consistent differences observed strongly suggest that the transported amounts of plastics change throughout the tidal cycles. Further studies could seek to quantify the likelihood of deposition and re-mobilization of floating plastics, in order to account for changes in plastic quantities in transport over tidal cycles.

Minor observations:

Line 200. The “total river surface length” (the integral of the tidal velocity) is called the “tidal excursion”. The ebb excursion is larger than the flood excursion, the difference being the integral of the freshwater velocity. As one moves further downstream the difference between these two excursions becomes smaller until, near the estuary mouth, the difference can hardly be observed anymore.

Thank you for noticing this. This is well noted and we will correct this in a revised version of the manuscript.

Reference:

Savenije, H.H.G., 2005, 2012. Salinity and Tides in Alluvial Estuaries, Elsevier. Completely revised 2nd edition in 2012, available from www.salinityandtides.org.

References in this rebuttal:

Duncan, E.M., Davies, A., Brooks, A., Chowdhury, G.W., Godley, B.J., Jambeck, J., Maddalene, T., Napper, I., Nelms, S.E., Rackstraw, C., Koldewey, H., 2020. Message in a bottle: Open source technology to track the movement of plastic pollution. PLOS ONE 15, e0242459. doi:10.1371/journal.pone.0242459. publisher: Public Library of Science (PLoS).

Lotcheris, R., Schreyers, L., and van Emmerik, T., 2023. Plastic does not simply flow into the sea: River transport dynamics affected by tides and floating plants. Submitted to Environmental Pollution. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4449742

Mani, T., Hawangchu, Y., Khamdahsag, P., Lohwacharin, J., Phihusut, D., Arsiranant, I., Junchompoo, C., Piemjaiswang, R., 2023. Gaining new insights into macroplastic transport ‘hotlines’ and fine-scale retention-remobilisation using small floating high-resolution satellite drifters in the Chao Phraya river estuary of Bangkok. Environmental Pollution 320,121124. doi:10.1016/j.envpol.2023.121124.

Newbould R.A., Powell D.M. and Whelan M.J., 2021. Macroplastic Debris Transfer in Rivers: A Travel Distance Approach. Frontiers in Water 3:724596. doi: 10.3389/frwa.2021.724596

Tramoy, R., Gasperi, J., Colasse, L., Silvestre, M., Dubois, P., Nous, C., Tassin, B., 2020. Transfer dynamics of macroplastics in estuaries – New insights from the Seine estuary: Part 2. Short-term dynamics based on GPS-trackers. Marine Pollution Bulletin 160, 111566. doi:10.1016/j.marpolbul.2020.111566. publisher: Elsevier BV.