



## Discussion

## Reply to discussion of “Measurements of sheet flow transport in acceleration-skewed oscillatory flow and comparison with practical formulations” by D.A. van der A, T. O'Donoghue and J.S. Ribberink

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## ABSTRACT

This is a reply to the discussion by Camenen and Larson (Coastal Eng., 58, 2011, 131–134) of “Measurements of sheet flow transport in acceleration-skewed oscillatory flow and comparison with practical formulations” by D.A. van der A et al. (Coastal Eng. 57, 2010, 331–342). The authors of the original paper (Van der A et al., 2010) thank the discussers for their interest in and comments on the work presented in the paper.

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- In our paper we compared our new measurements of net sand transport rate with net transport rates predicted using a number of practical sand transport models, all of which include account of “acceleration effects”. The discussers (Camenen and Larson, 2011) note that comparison was not made with Camenen and Larson (2007), which can also predict net sand transport rate for acceleration-skewed flow. It was not our intention to compare our measurements with all existing practical sand transport formulae that include acceleration effects. In fact, besides the Camenen and Larson (2007) formula and those addressed in our paper, there are other models which include acceleration effects (e.g. Puleo et al., 2003; Zhao and Kirby, 2005; Guard et al., 2007; Van Rijn, 2007; Suntoyo et al., 2008), some of which use approaches that are similar to those used in the models included in our comparison.
- The discussers say that it would have been interesting to compare predicted net transport rates as calculated by the various practical formulae with the measured net transport rates of Watanabe and Sato (2004), in addition to comparing with our new net transport measurements. However, since most of the formulae were actually calibrated against the Watanabe and Sato (2004) data (Watanabe and Sato, 2004; Silva et al., 2006; Nielsen, 2006; Gonzalez-Rodriguez and Madsen, 2007), it would not have been appropriate to also include the Watanabe and Sato data in our comparison. Moreover, as indicated by Gonzalez-Rodriguez and Madsen (2007), we need to stress that there is some doubt about the reliability of Watanabe and Sato's (2004) results for coarse grain sands.
- The discussers mistakenly presume that there is an error in our Fig. 7 of Van der A et al. (2010), arguing that a negative net transport is not possible from the Drake and Calantoni (2001) formula because  $\langle u^3 \rangle = 0$  for “pure” acceleration-skewed flows. However, while  $\langle u^3 \rangle = 0$  for the target flows in the tunnel, the measured actual flows deviated somewhat from the target (theoretical), as indicated in our Table 1 in Van der A et al. (2010). For some experiments the actual flow contained a degree of velocity-skewness (i.e.  $R \neq 0.5$ ). Cases in our Fig. 7 for which the net transport rate is negative correspond to conditions with  $R \approx 0.49$ , which results in  $\langle u^3 \rangle < 0$  and leads to a negative velocity-related transport. Due to the relatively high acceleration threshold for acceleration-related transport to become significant in Drake and Calantoni (2001), there is no significant acceleration-driven positive sand transport to counteract the negative transport caused by the velocity skewness for these particular cases, which results in the negative net transport rates seen in our Fig. 7 for the Drake and Calantoni (2001) predictions. Note that our paper makes clear that it is the measured actual flow that is used as input to the predictive formulae, not the target flow.
- The discussers present details of the calculation of friction factors using their formula and they compare friction factor results with corresponding results based on Nielsen (2006) and Silva et al. (2006). Although interesting, the analysis presented does not constitute a discussion of our work.
- We note an error in the discussers' Eq. (5): Swart's (1974) “conventional” friction factor  $f_w$  is missing on the right-hand side of their Eq. (5).
- The discussers say that it does not seem entirely correct to distinguish between the performance of Drake and Calantoni (2001) and Hoefel and Elgar (2003), since both formulae are

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essentially the same, except for the values of the coefficients. We acknowledge the similarity in the two formulations, however, the coefficients are also considered part of the formulations, hence our distinction between the two.

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