

2 **Discussion of “Clear-Water Local Scour around Pile Groups in Shallow-Water Flow”**
 3 **by Ata Amini, Bruce W. Melville,**
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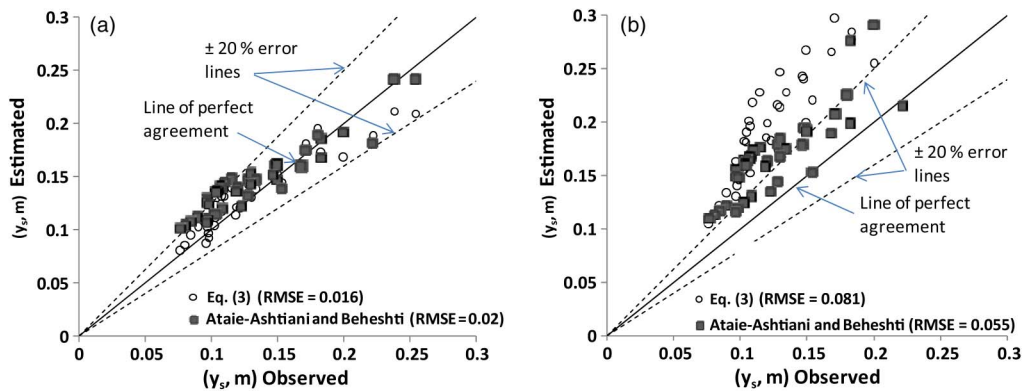
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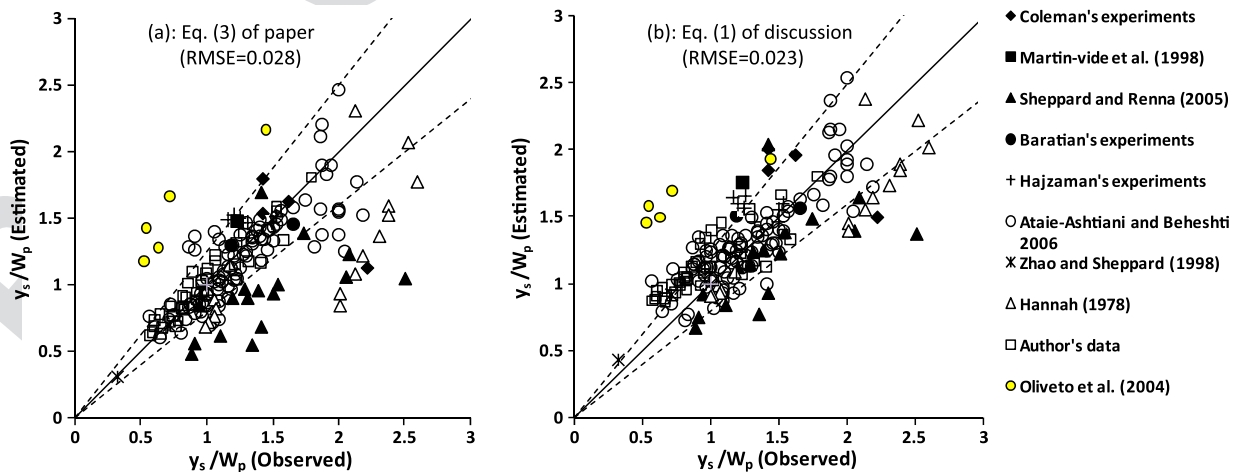
17 The authors reported experimental results of scour measurements
 18 around pile groups with varying pile spacing and arrangements.

The authors also conducted some experiments on submerged pile groups and pile groups of nonuniform spacing. However, no analysis has been included in the paper on the effect of nonuniform pile spacing. They suggested Eq. (4) for estimation of scour depth at pile groups. In the equation $K_h = 1$ for unsubmerged pile groups, K_{Smn} could be obtained from Eq. (3), and Y_{Seq} is the local scour depth at a single, unsubmerged cylindrical pier of diameter equal to nD , which should be estimated by using existing empirical methods presented for single piers. However, it is not explained by the authors which existing method (e.g., the HEC-18 procedure or the New Zealand pier scour equation) the correction factor K_{Smn} should be applied to.

The discussers aim to complement the authors’ analysis by using some new independent data and some existing data that were not considered by the authors. For discussion on Fig. 6(a), the observed scour depths (y_s) in the authors’ experiments were compared, and the scour depths were estimated using two methods presented by the authors and Ataie-Ashtiani and Beheshti (2006) in Fig. 1 of this discussion. The method of normalization in Fig. 6 of the paper for design scour depth by different values of Y_{seq}



F1:1 **Fig. 1.** Comparison of observed and predicted scour depth at unsubmerged pile groups tested by the authors using Eq. (3) of the paper and the method
 F1:2 presented by Ataie-Ashtiani and Beheshti (2006); Y_{Seq} calculated based on (a) HEC-18 procedure; (b) New Zealand pier scour equation



F2:1 **Fig. 2.** Comparison of observed and predicted scour depths at unsubmerged pile groups reported by different researchers using Eq. (3) of the paper
 F2:2 and Eq. (1) of this discussion; Y_{Seq} is calculated based on HEC-18 procedure

Table 1. Details of Baratian and Hajzaman's Experiments used in Fig. 2

T1:1	Data	Run	d_{50} (mm)	y (m)	U/Uc	D (m)	S_n (m)	S_m (m)	m	n	y_s (m)
T1:2	Baratian's (2007) experiments	1	0.6	0.140	0.78	0.016	0.048	0.065	3	2	0.038
T1:3		2	0.6	0.144	0.764	0.016	0.032	0.04	3	2	0.048
T1:4		3	0.6	0.142	0.773	0.016	0.032	0.04	3	2	0.053
T1:5	Hajzaman's (2008) experiments	1	0.6	0.127	0.739	0.0221	0.03	0.045	3	2	0.0581
T1:6		2	0.6	0.130	0.730	0.0221	0.03	0.045	3	2	0.066
T1:7		3	0.6	0.143	0.723	0.0158	0.03	0.045	3	2	0.0393
T1:8		4	0.6	0.143	0.719	0.0158	0.03	0.045	3	2	0.0474
T1:9		5	0.6	0.145	0.728	0.0158	0.03	0.036	4	2	0.0394
T1:10		6	0.6	0.139	0.730	0.0158	0.03	0.036	4	2	0.0367
T1:11		7	0.6	0.142	0.740	0.0216	0.03	0.036	4	2	0.0661
T1:12		8	0.6	0.139	0.748	0.0216	0.03	0.036	4	2	0.0519

the abscissa and ordinate is inconsistent and confusing, because the authors normalized the measured scour depth around a pile group (y_s on the abscissa) by Y_{seq} measured around the same pile group with zero pile spacing, whereas they normalized the calculated scour depth (y_s on the ordinate) by estimated Y_{seq} using existing empirical equations for a pier of diameter nD . Fig. 1 is replotted from Fig. 6(a) of the paper without normalization. Fig. 1(a) is based on the HEC-18 method of computation of Y_{seq} , whereas in Fig. 1(b), the New Zealand pier scour equation (Melville 1997) was used for calculating scour depth around a pier of diameter nD with correction factor K_{Smn} for pile groups. The root mean square errors (RMSE) for the two methods are also presented in Fig. 1.

Fig. 2 of this discussion compares the measured and estimated scour depths normalized by $W_p = nD$ for different laboratory data using the HEC-18 method of computation of Y_{seq} and K_{Smn} obtained from both Eq. (3) of the paper and Eq. (1) of this discussion as

$$K_{smn} = 0.7[m^{0.38}n^{-0.95}(S/D)^{-0.387}] + 0.42 \quad (1)$$

In Fig. 2, data for Coleman's experiments are reported by Sheppard and Renna (2005). Data for the Baratian (2007) and Hajzaman (2008) experiments are listed in Table 1. These experiments were performed in a laboratory flume, the details of which can be found in Ataie-Ashtiani et al. (2010). One data set reported by Martin-Vide et al. (1998) and five data sets reported by Oliveto et al. (2004) were also used for comparison.

The comparison of scour depths predicted by different methods with the experimental observations of the authors and other existing data and reported data in this discussion indicate that the advantages of using one method over another are minor.

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