

Supplementary Materials

Intra-reef surface complexity of the oyster *Saccostrea glomerata* and its influence on surrounding flow

James Barclay^{1*}, Jan Hitzegrad², Kara Keimer², Brendan Lanham¹, Andrew W.M. Pomeroy¹, Oliver Lojek²,
Nils Goseberg^{2,3}, Rebecca L. Morris¹

¹School of Biosciences, University of Melbourne, VIC 3010, Australia

²Leichtweiß-Institute for Hydraulic Engineering and Water Resources, Technische Universität Braunschweig,
Braunschweig, Germany

³Coastal Research Center, Joint Research Facility of Leibniz University Hannover and Technische Universität
Braunschweig, Hannover, Germany

*jbbarcl@student.unimelb.edu.au

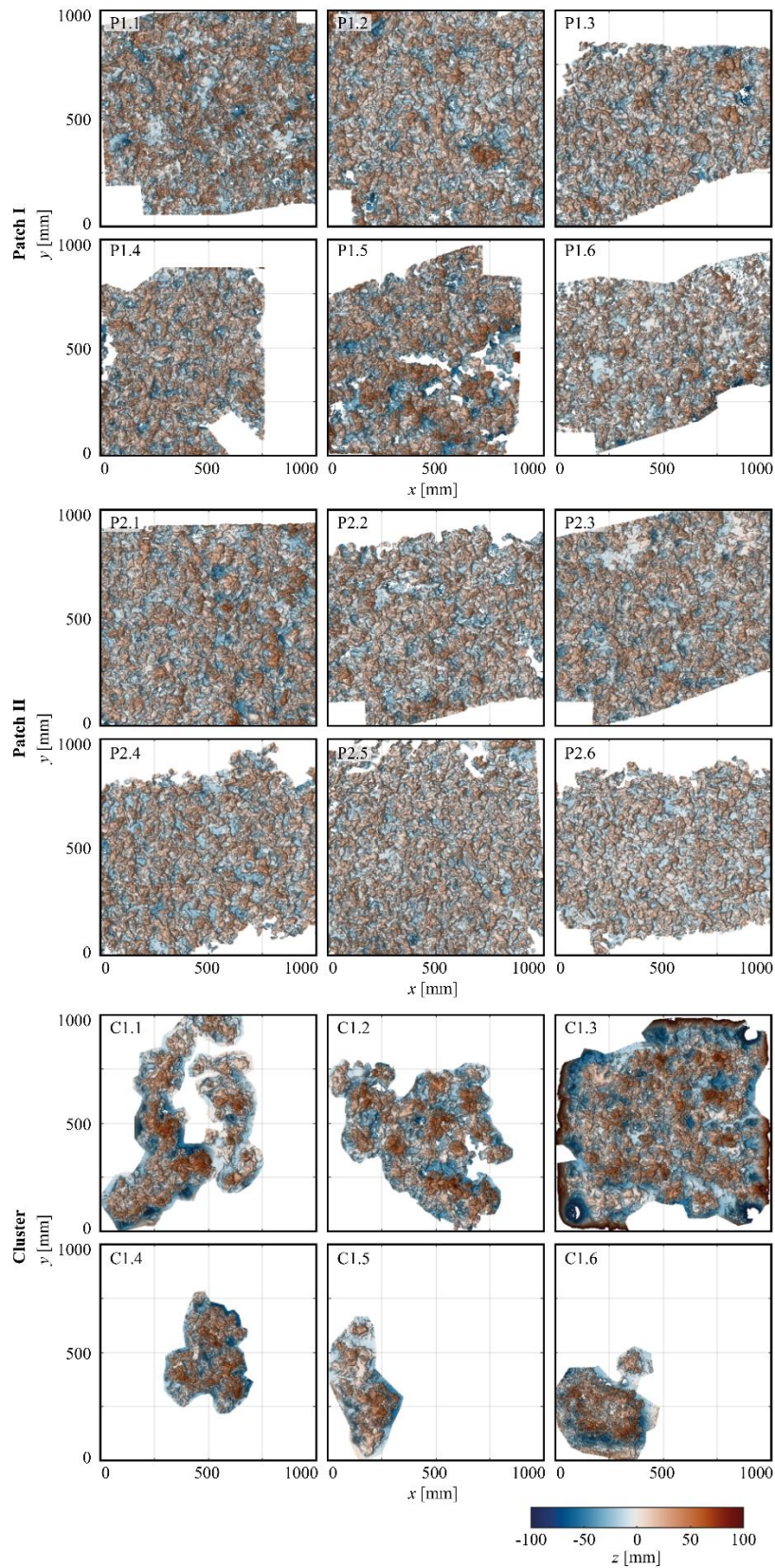


Figure S1. Visualizations of the digital elevation models (DEMs) of 18 oyster samples, six Patch I (PI), six Patch II (PII) and six Cluster (C). The colour scale specifies the surface level in the z -axis, represented in mm, which has been centred around a zero mean. The x - and y -axis represent length in mm. Areas that have been left blank are to ensure a consistent homogenous surface during the analysis.

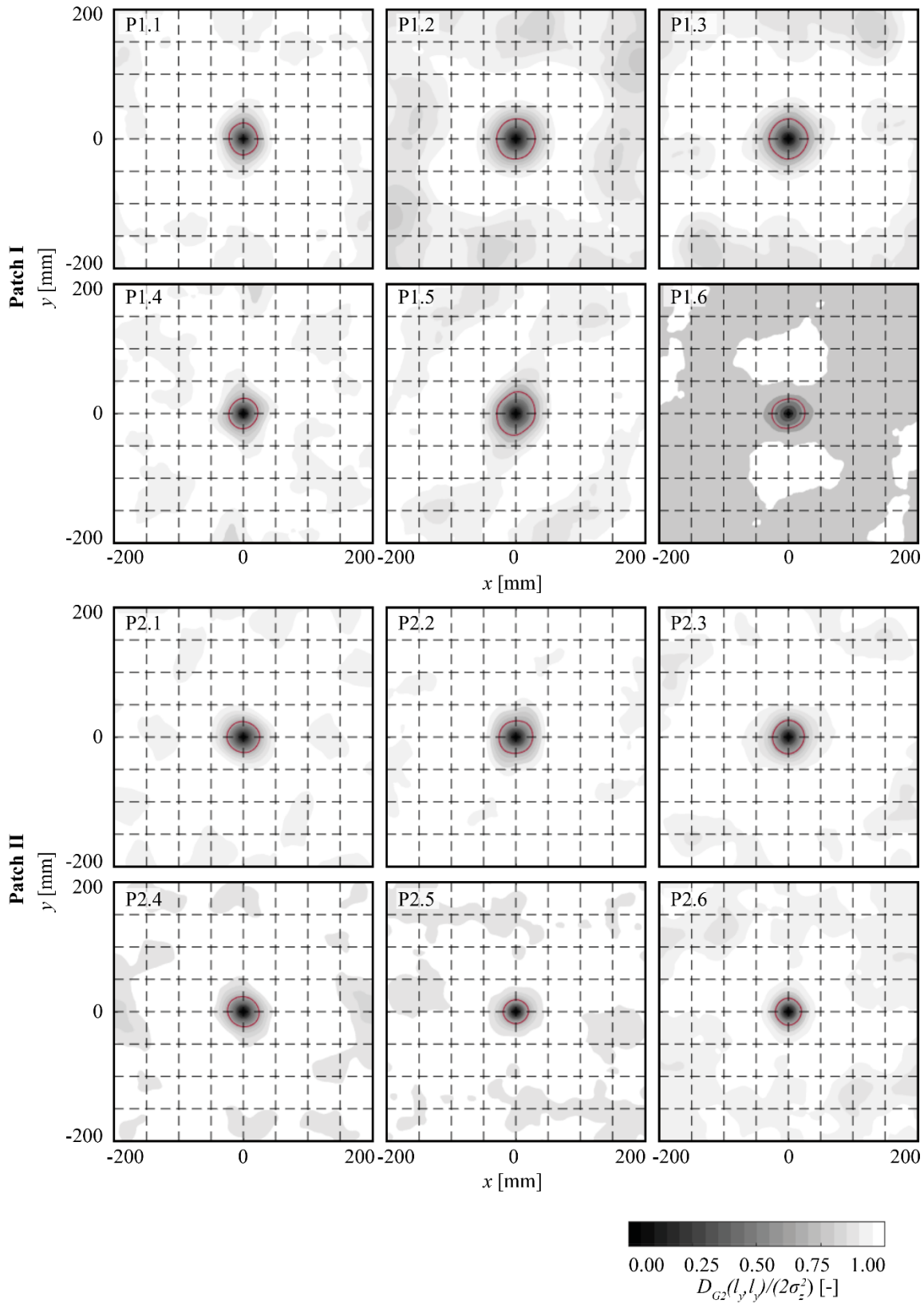


Figure S2. Visualizations of the 2D second-order structure functions (2D-SSFs) for 12 oyster samples, six Patch I and six Patch (PII), each sample surface is normalized by the respective variances $D_{G2}(l_x, l_y)/2\sigma_z^2$. The x- and y-axis show the spatial lags l_x and l_y [mm]. The gray scale reflects the normalized 2D-SSF values [-], where dark areas indicate high levels of correlation approaching $D_{G2}(l_x, l_y)/2\sigma_z^2 = 0$. Red lines illustrate the area of significant correlations A_{corr} , which is $D_{G2}(l_x, l_y)/2\sigma_z^2 \leq 0.7$

Table S1. Example of Pix4D quality report on the scale constraints error. It demonstrates the initial lengths provided by real world measurements are accurately transferred to the computed model.

? **Scale Constraints**



Scale Name	Initial Length [m]	Initial Length Accuracy [m]	Computed Length [m]	Computed Length Error [m]	GCP/MTP Label 1	GCP/MTP Label 2
Scale 1	0.7080	0.0010	0.7081	0.0001	N Arrow I(74)	N Arrow corner(74)
Scale 2	0.1830	0.0010	0.1840	0.0010	N Arrow corner(85)	N Arrow L(85)
Scale 3	0.7268	0.0010	0.7264	-0.0004	N Arrow L(74)	N Arrow I(74)
Scale 4	0.7188	0.0010	0.7188	0.0000	No N Arrow L(72)	No N Arrow I (72)
Mean [m]				0.0002		
Sigma [m]				0.0005		

Scale constraints errors.

Table S2. Example of Pix4D quality report on projection error and ground control point (GCP) error. The projection error shows the alignment of the 2D points on the photographs and how they were calculated into 3D space in the model with minimal error. The total root mean square (RMS) error for this model is 1.57 mm.

? **Ground Control Points**



GCP Name	Accuracy XY/Z [m]	Error X[m]	Error Y[m]	Error Z[m]	Projection Error [pixel]	Verified/Marked
N Arrow I (3D)	0.020/ 0.020	-0.000	0.000	0.001	4.372	74 / 79
N Arrow L (3D)	0.020/ 0.020	-0.000	-0.002	-0.000	4.275	74 / 75
No N Arrow I (3D)	0.020/ 0.020	0.001	-0.000	-0.000	4.431	83 / 89
No N Arrow L (3D)	0.020/ 0.020	0.001	0.001	0.001	5.430	72 / 73
N Arrow corner (3D)	0.020/ 0.020	-0.001	-0.001	0.000	5.156	85 / 86
Mean [m]		0.000307	-0.000210	0.000466		
Sigma [m]		0.000748	0.001027	0.000698		
RMS Error [m]		0.000809	0.001049	0.000839		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.