Technische Universität Braunschweig

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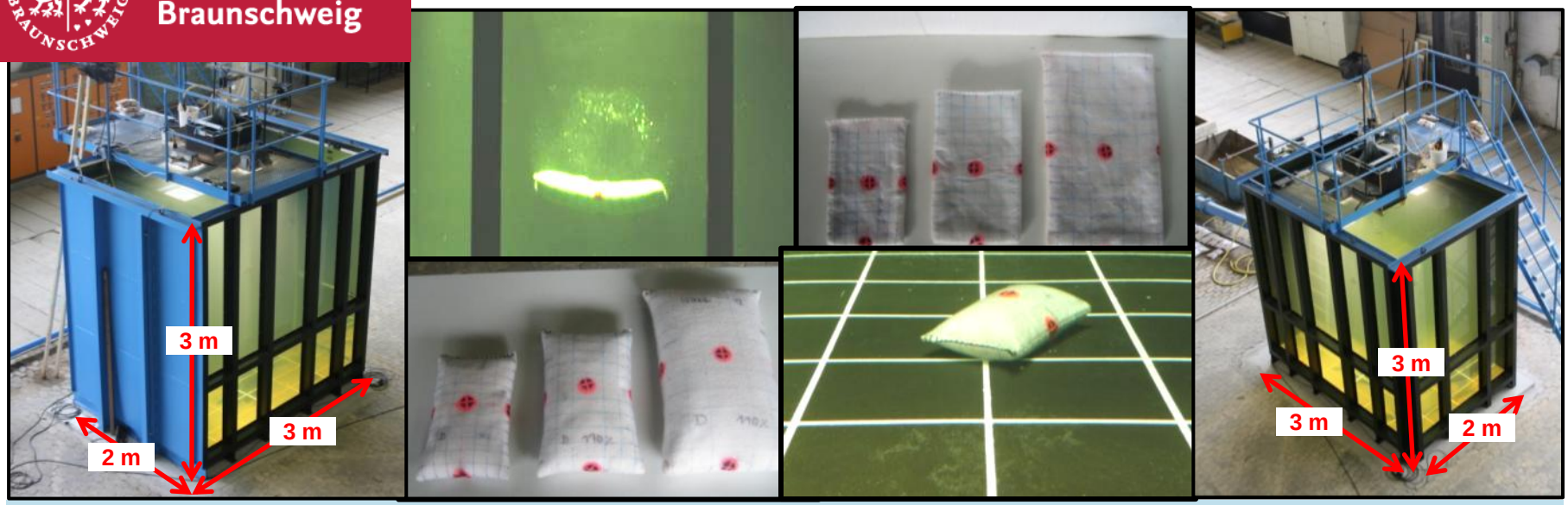
Department of Hydromechanics and Coastal Engineering



Sinking Behaviour and Deformation of Geotextile Sand Containers During Installation of Scour Protection for Marine and Offshore Structures

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10. März 2011 | FZK-Kolloquium 2011

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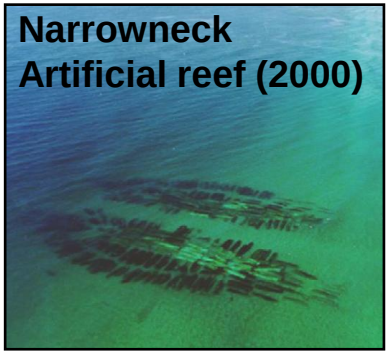


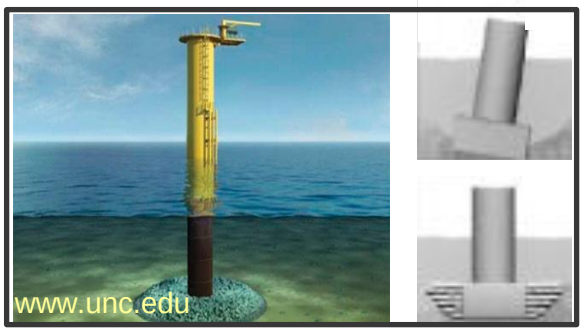
(after Saathof et al 2007)

Dumping GSCs in deeper waters

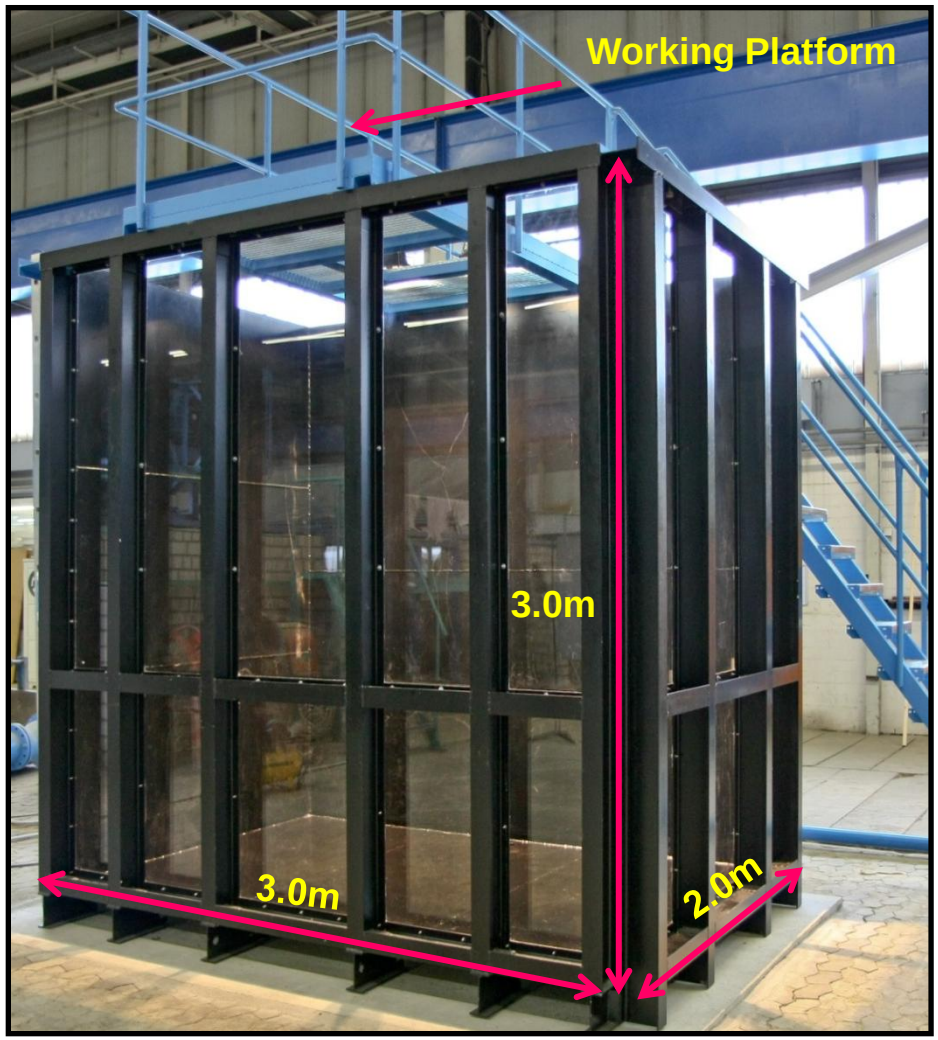
There are several methods to construct GSC-scour protection systems, but the most preferred method is to dump the GSCs from the water surface

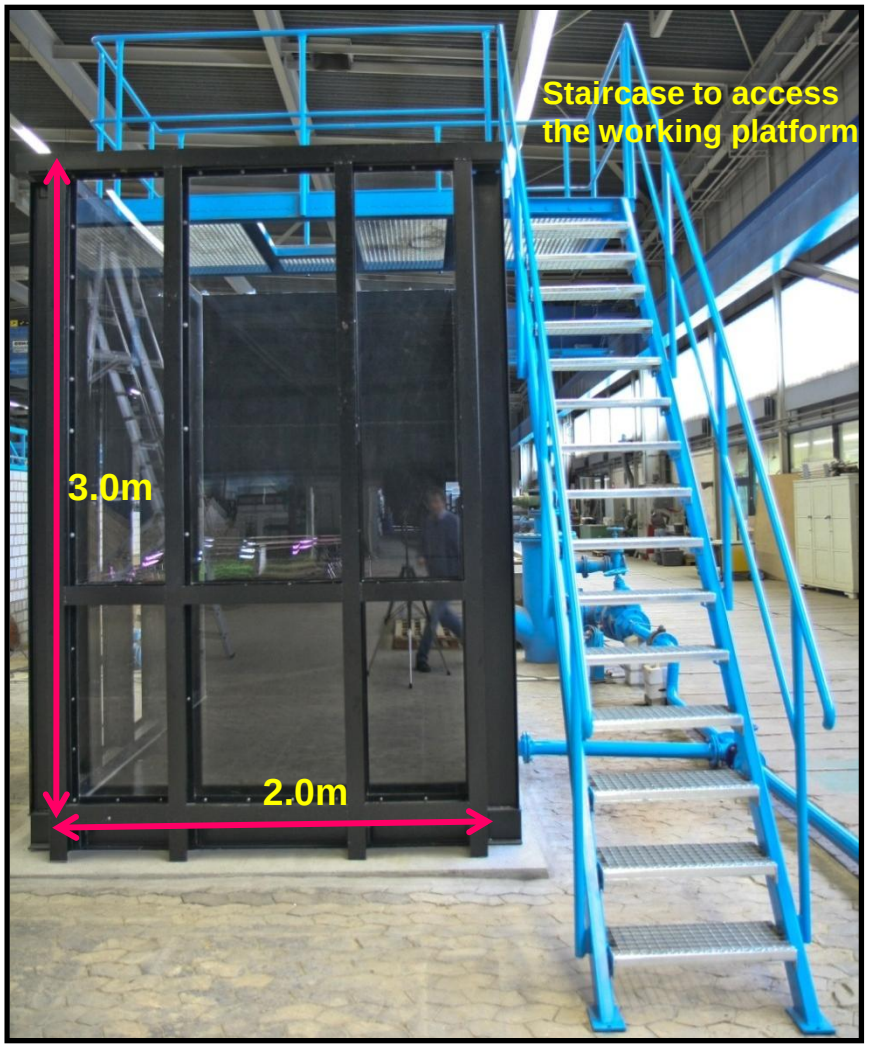
The main concerns, when designing fully submerged GSC-structures are;

- The lack of understanding of the behaviour of GSCs when sinking underwater (e.g. placing accuracy)
- The ability to survive from instantaneous loads when GSC is hitting the seabed
- Final fill ratio and deformation after hitting the seabed

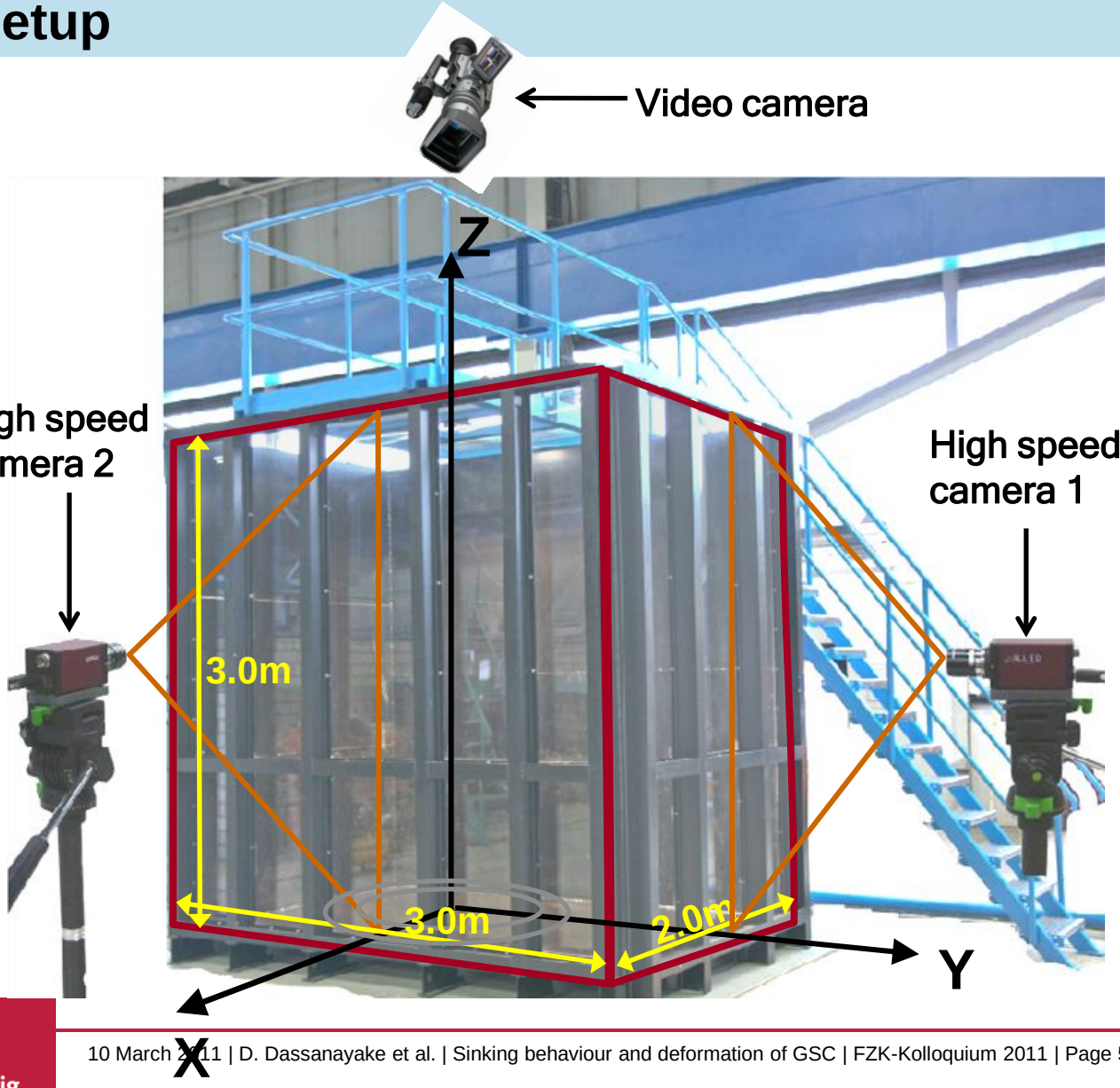


New underwater drop testing facility (UDTF) at LWI



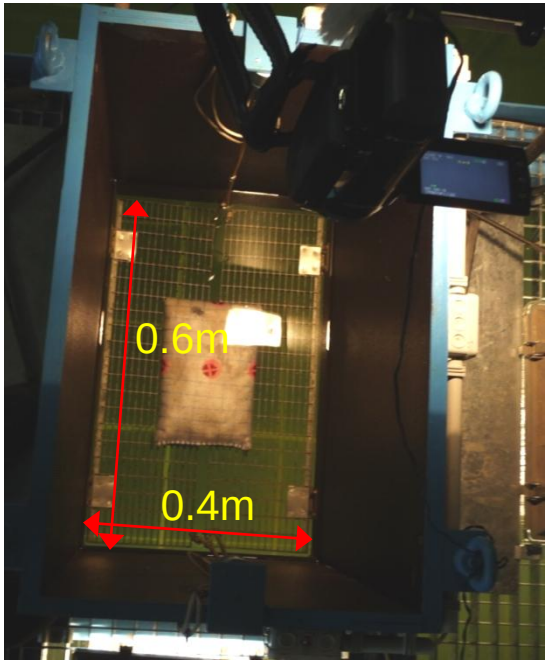


Model setup

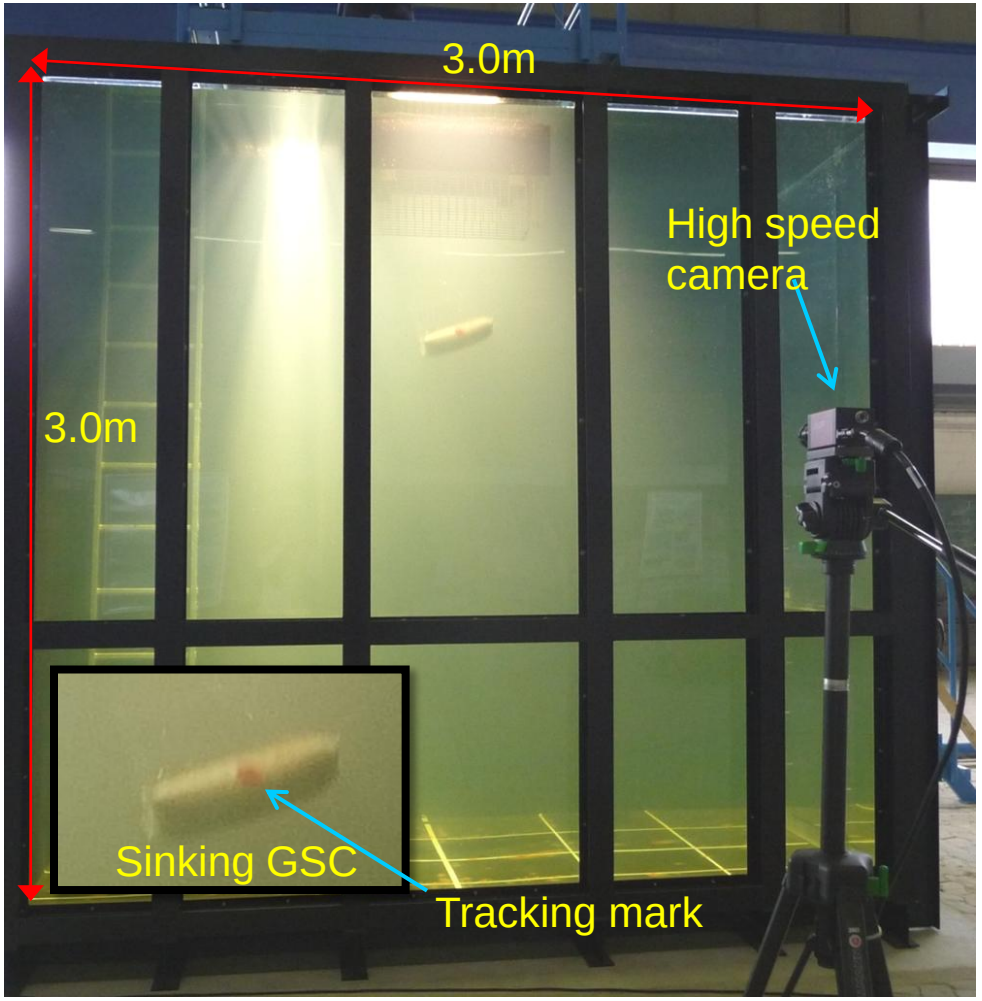

Video camera
Z
High speed camera 2
High speed camera 1
3.0m
3.0m
2.0m
Y
X

Model testing

GSC to be released from just below the water surface



Dropping mechanism - View from above

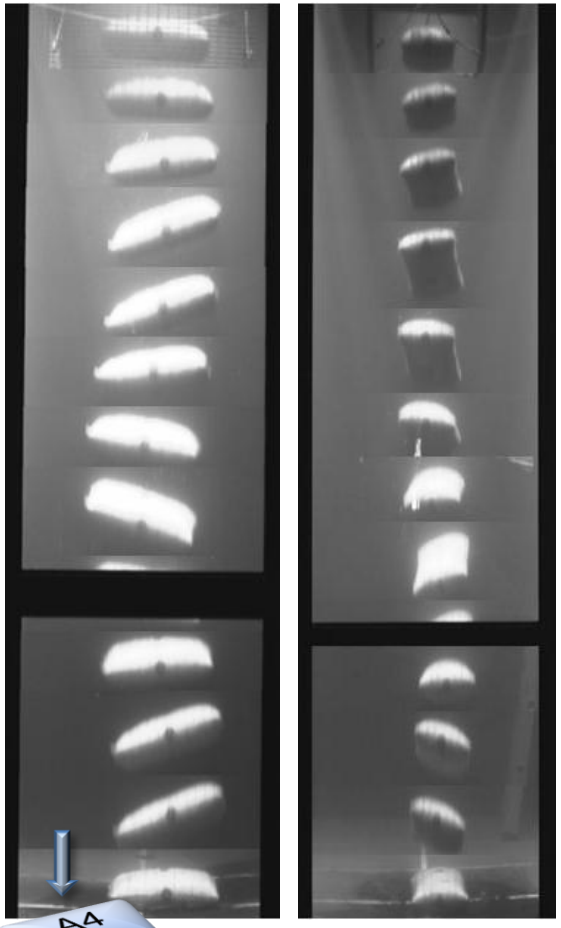


Typical drop tests results

side  front

Every 7th frame

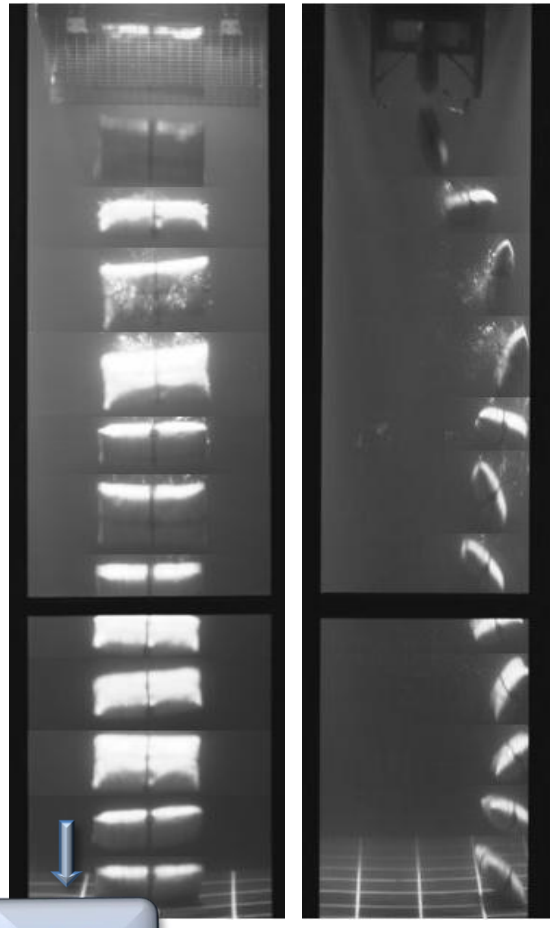
side view front view



A4

Initial orientation I

side view front view



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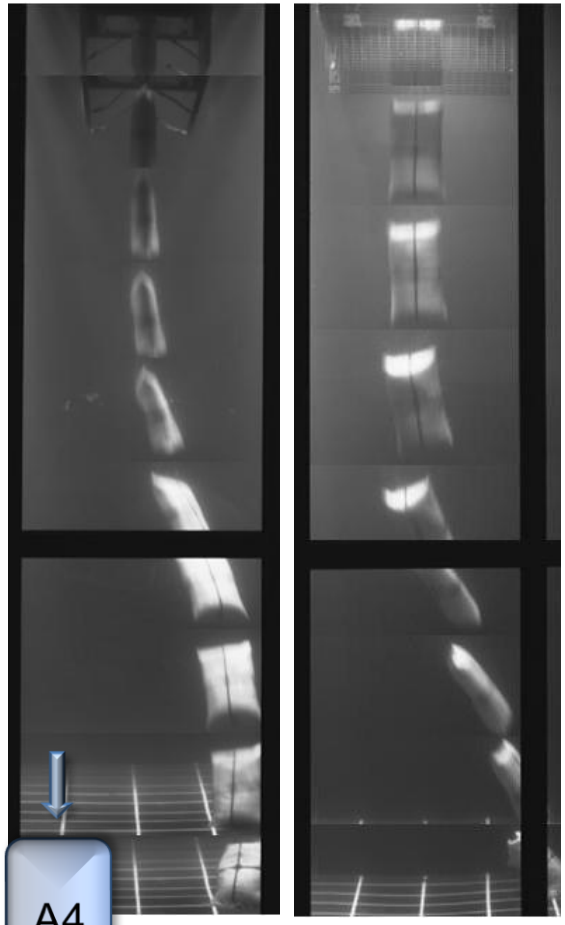
Initial orientation II

side view front view



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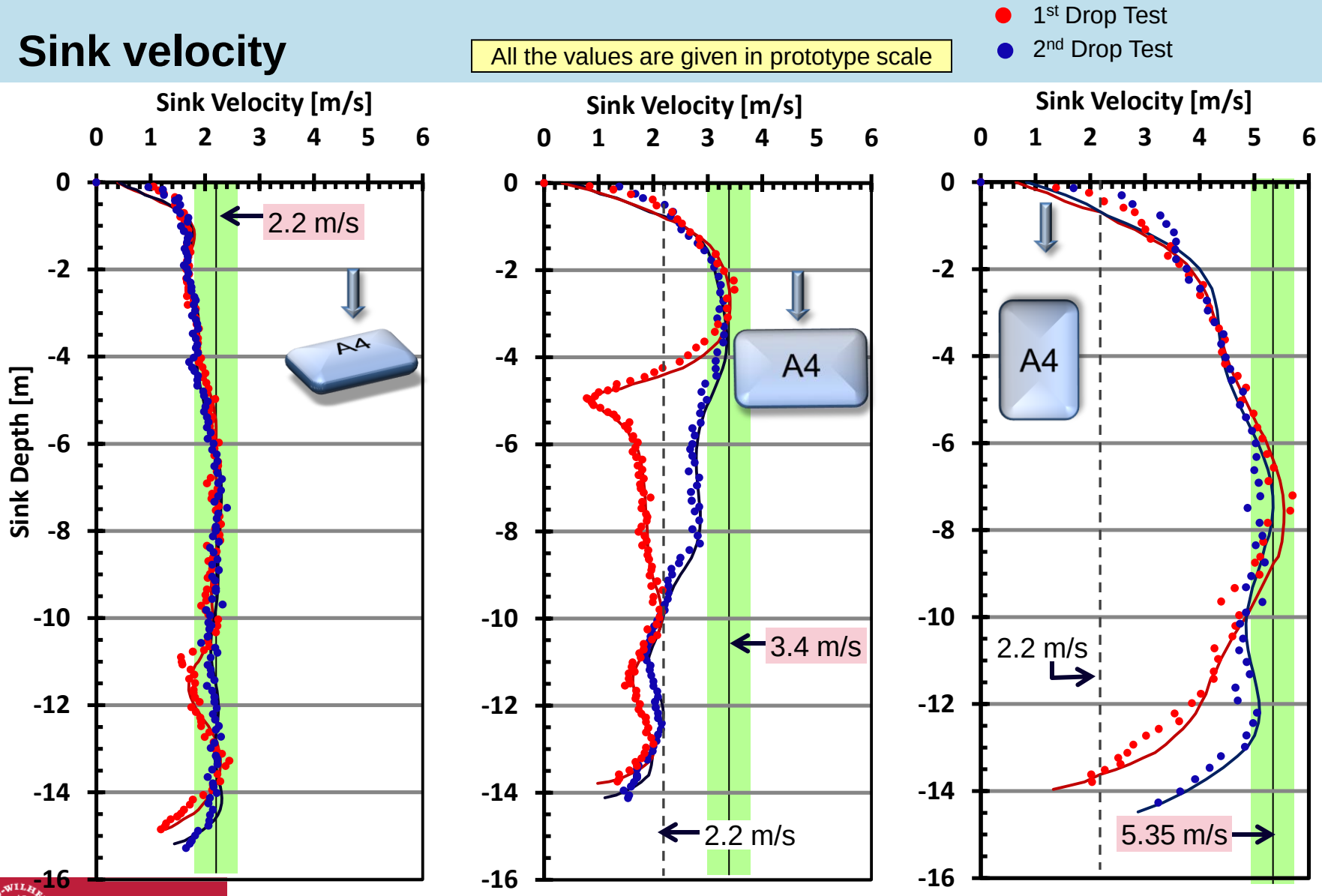
Initial orientation III

Sink velocity

All the values are given in prototype scale



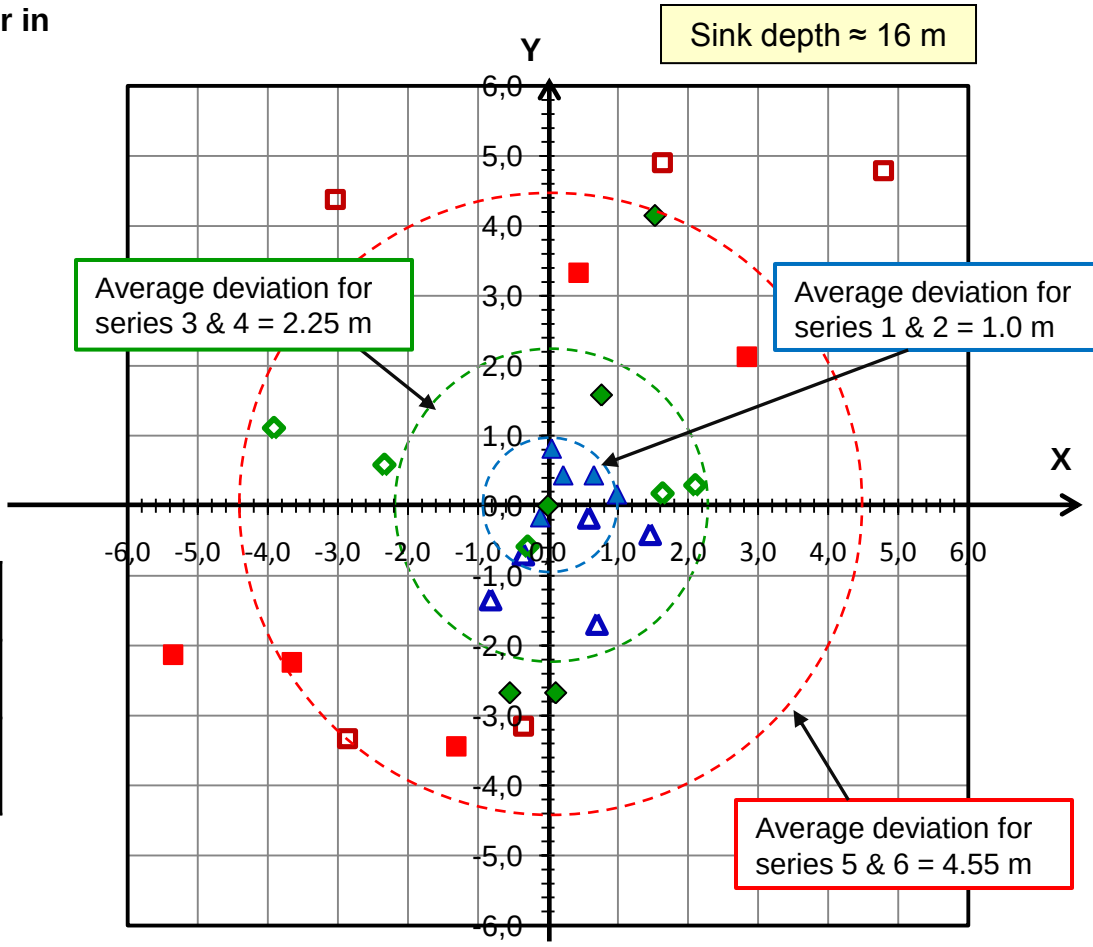
Deviation from the starting vertical axis

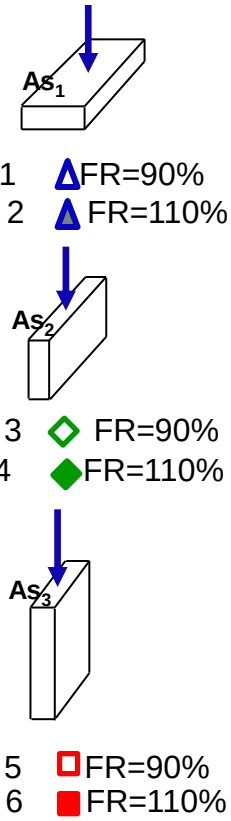
Dimensions of filled container in prototype scale [m]:

	90%	110%
Length	2.04	1.91
Width	1.08	1.00
Height	0.41	0.48

GSC mass in prototype scale [kg]

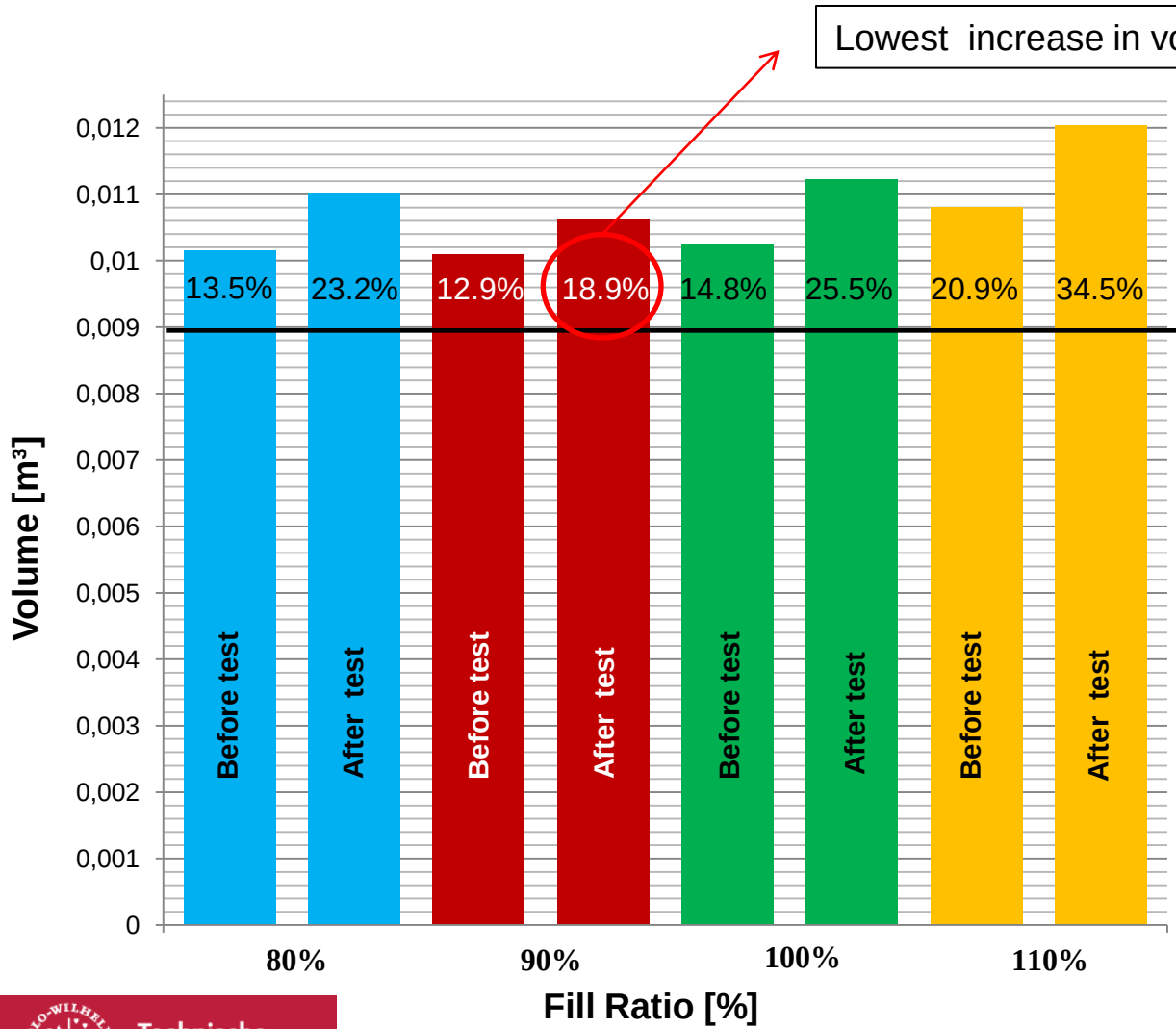
	90%	110%
In air	1000	1000
Water Content	100%	100%





All the values are given in prototype scale

Deformation



- **90% fill ratio might be the optimum fill ratio concerning deformation**

GSC Type
A_5 (a = 0.48m, b = 0.28m)

- Fill Ratio: 80% w´= 59.64N
- Fill Ratio: 90% w´= 71.42N
- Fill Ratio: 100% w´= 78.97N
- Fill Ratio: 110% w´= 87.41N

Concluding remarks

In still water, the sink trajectories and the deviations from the initial dropping axis mainly depend on the initial orientation

The results from the fully dry cases showed about 25% less sink velocities than the fully saturated cases.

A significant decrease (20~50%) in sink velocity was observed near the bottom and just before hitting the seabed

The calculated drag coefficients of GSCs are comparable to that of smooth cylinders (C_D = 0.9 ~ 1.3) for the tested Reynolds numbers (Re = 3x10^4~3x10^5 with Re; defined using the sink velocity, v and the length scale of GSC in the sinking direction, D)

New underwater drop testing facility (UDTF) is also to study:

- the sinking behaviour of group of dropped GSCs and the final geometry of the resulting structure on the seabed
- the potential to optimise the GSC placing and dropping procedures (e.g. fallpipe)

Acknowledgment

Financial support provided for the first author by German Academic Exchange Service (DAAD) is greatly acknowledged.

NAUE GmbH & Co. KG and Leichtweiß Institute, Germany and are gratefully acknowledged for their financial support to conduct laboratory investigations.