



**NSERC  
CRSNG**



# **BEACH MORPHOLOGICAL RESPONSE TO STORM WAVES USING LASER BATHYMETRIC MAPPING IN A WAVE BASIN**

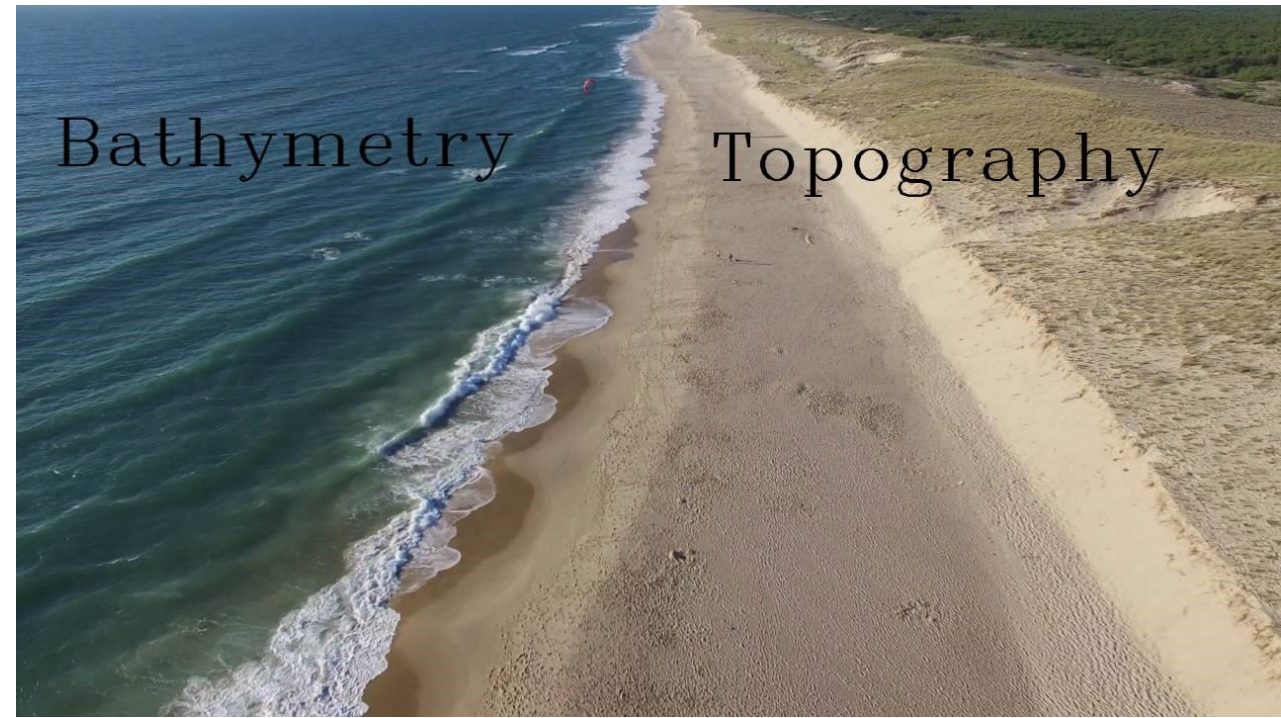
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# Introduction

- Hurricane pass along coast.
- Storm waves.
- Morphology change: topography (dune erosion) and bathymetry (sandbar accumulation).
- Surveying: GPS, Sonar.
- Remote sensing: aerial photography, video imaging, LiDAR.
- Laboratory: 2D large flume.



*Ecrite, Lumiere. "Plage du Porge – 2016." online video clip. YouTube, 9 Aug. 2016.*



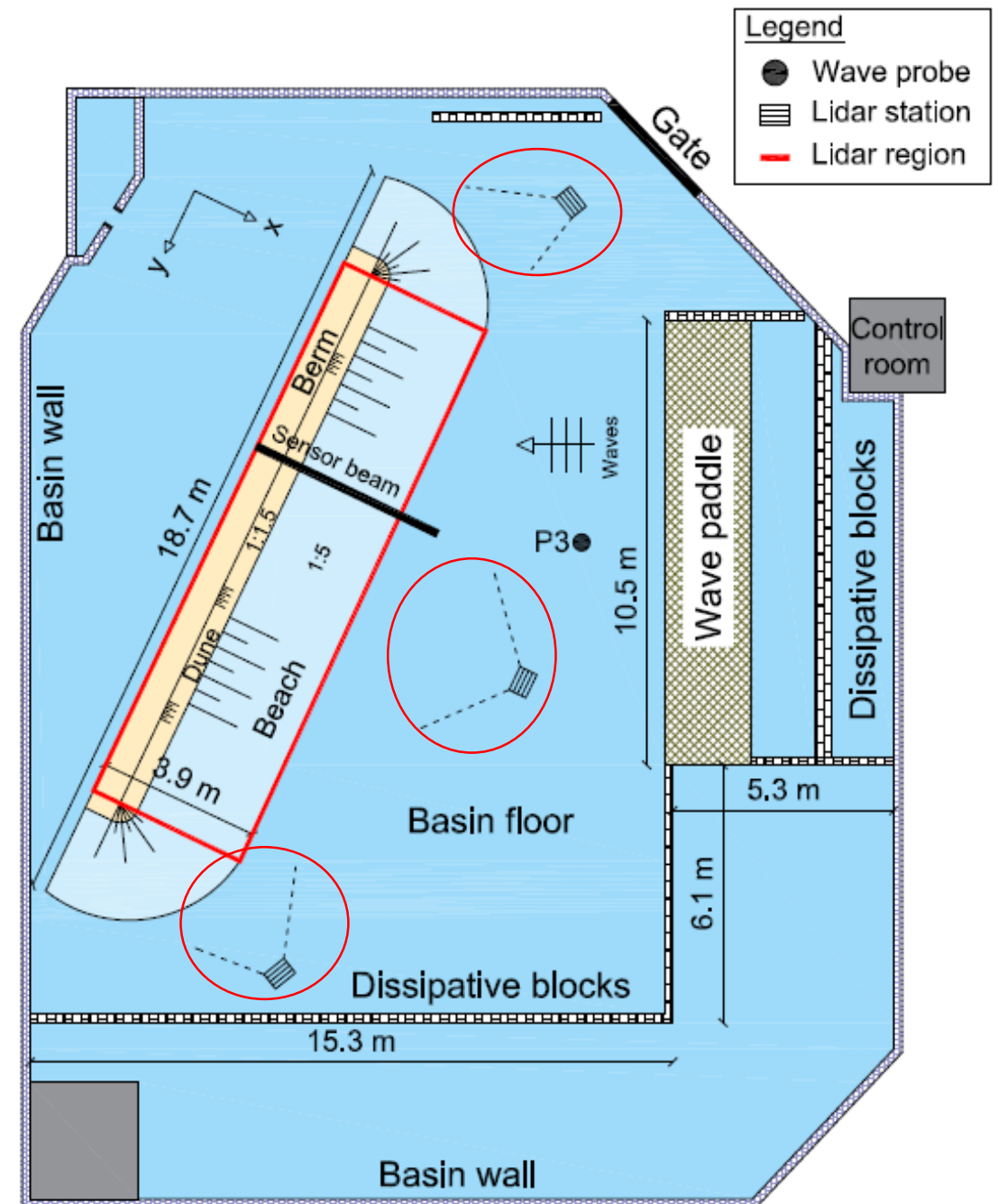
*GPS topography surveying..  
<https://www.usgs.gov>*



*GPS bathymetry surveying.  
<https://www.fondriest.com>*

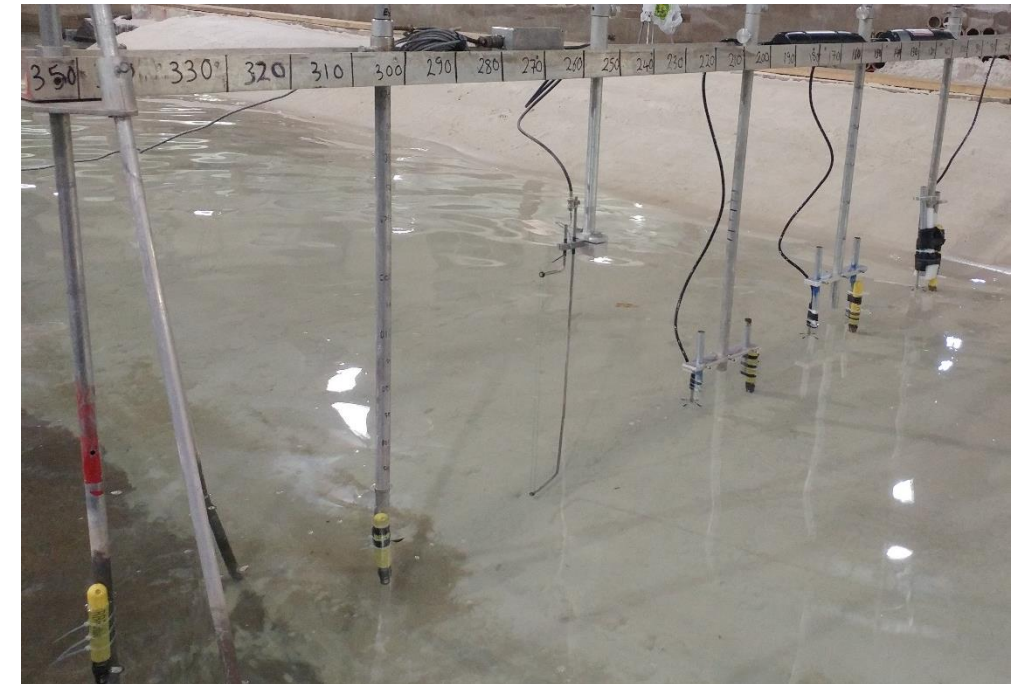
# Experiment

- Wave basin.
- Silica sand beach.
- Dune slopes 1.5:1 in Exp.1 and 5:1 in Exp. 2, connected to 5:1 beach slope.
- Unidirectional random waves.
- 25° incident wave angle.
- Cross-shore sensor beam.
- Three scans.

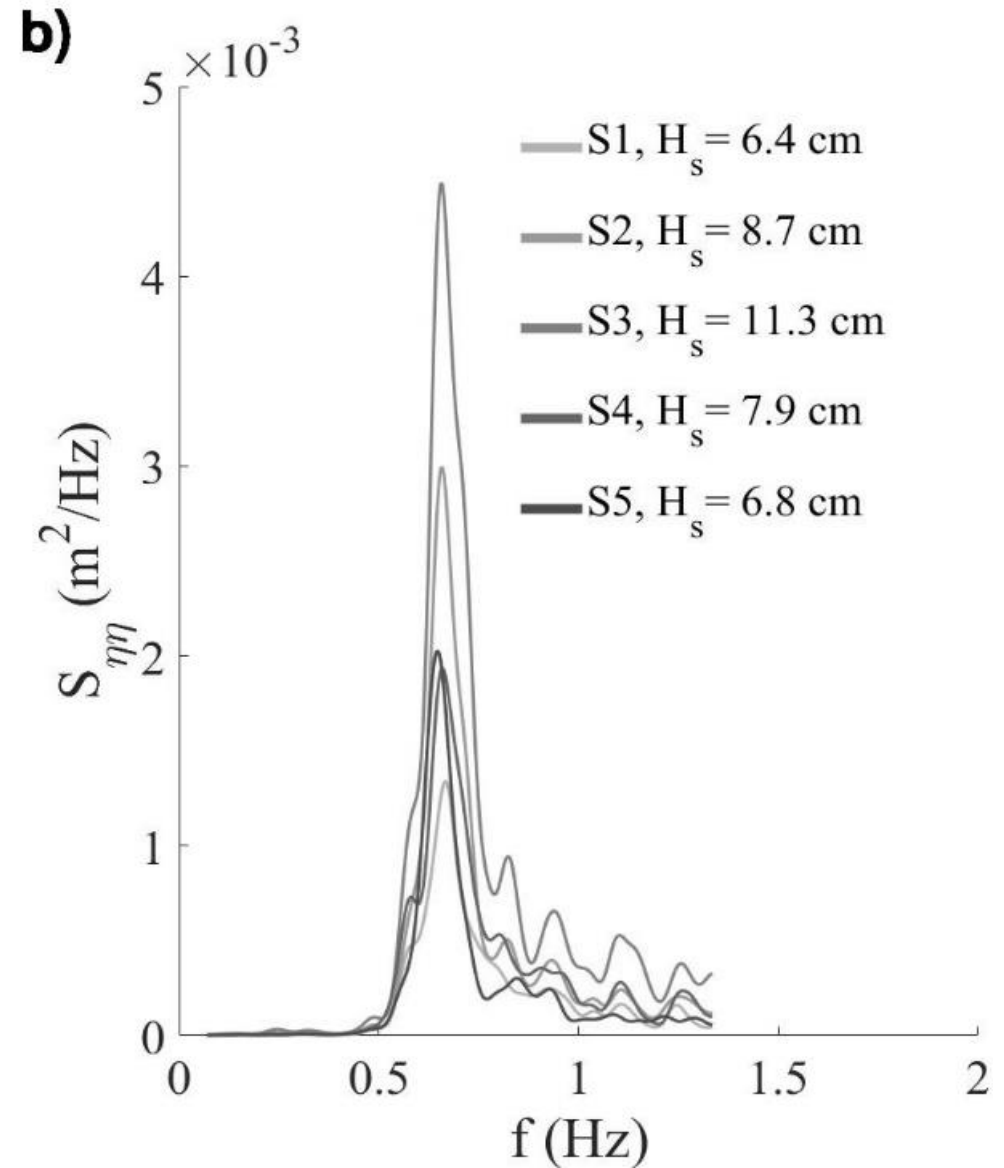
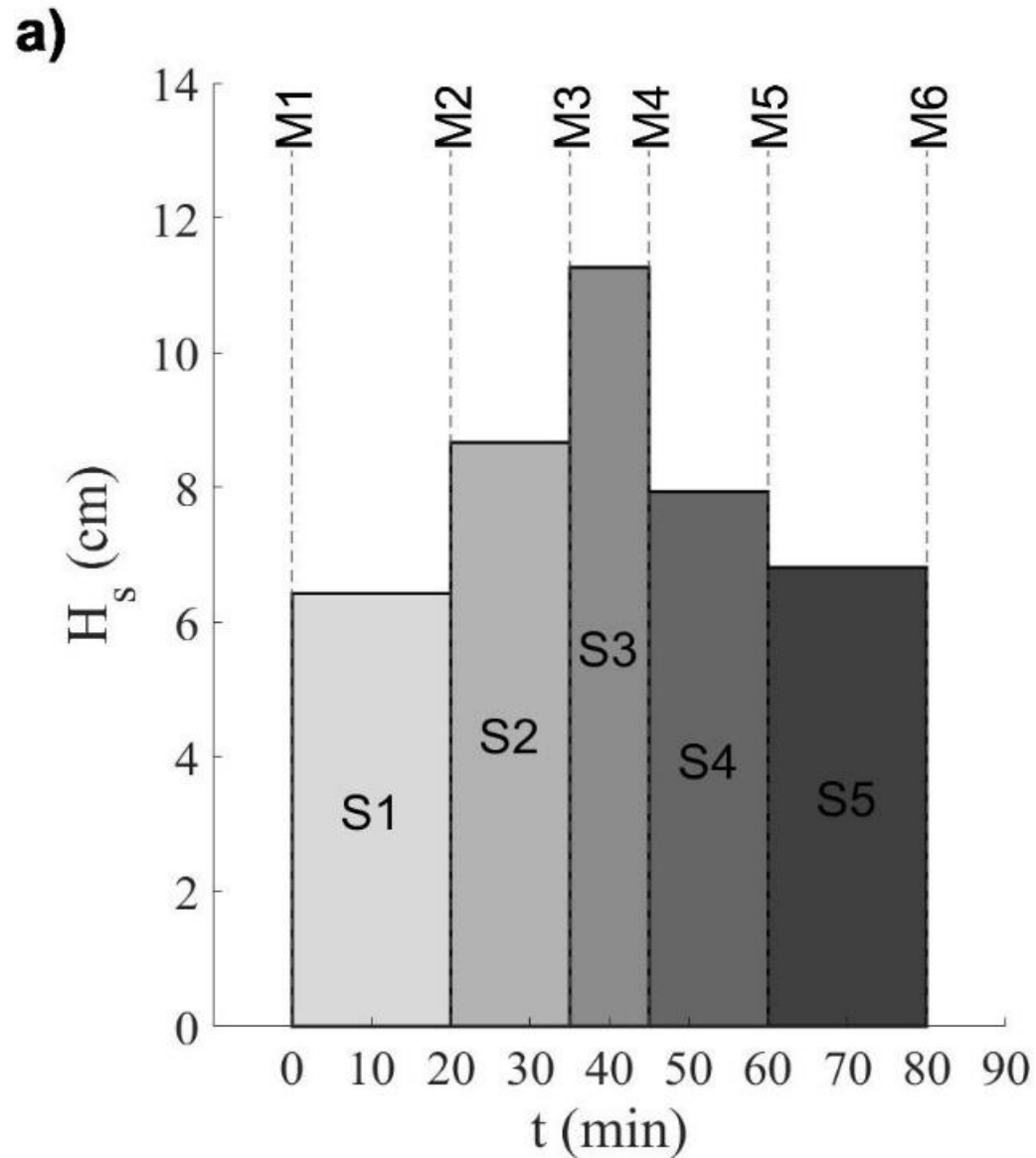


# Instruments

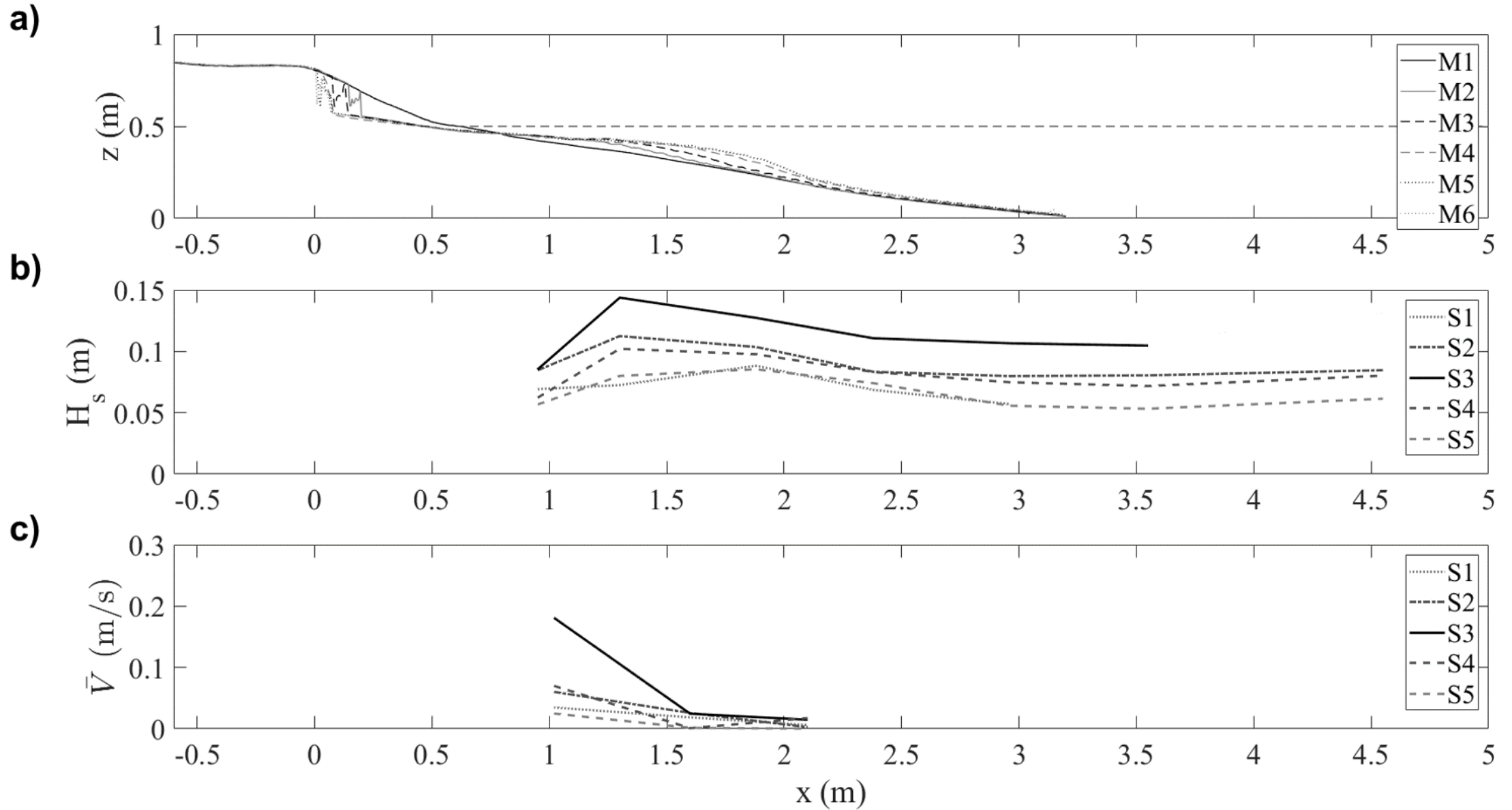
- Wave paddle.
- Laser scanner + spheres + checkerboards.
- Probes.
- Pressure sensors.
- ADVP



# Storm Waves



# Hydrodynamics

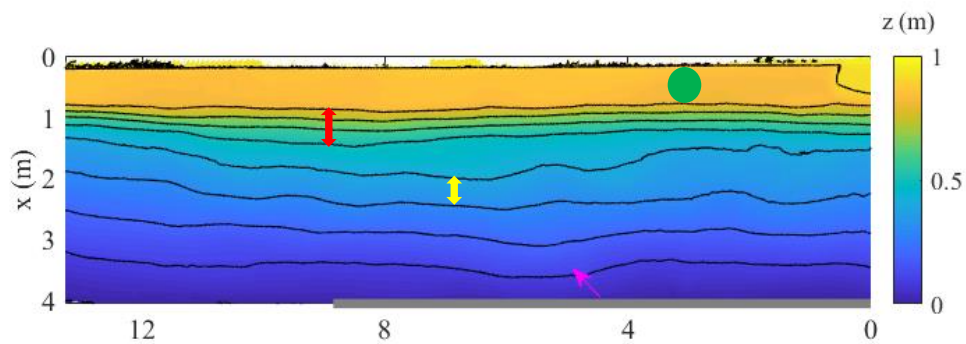


# Test Time Lapse Movie (Exp. 1, dune 1.5:1)

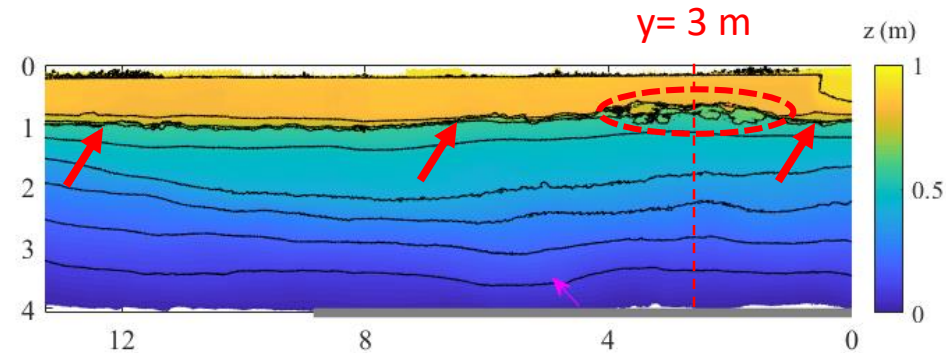


# Beach Contour Maps (Exp. 1, dune 1.5:1)

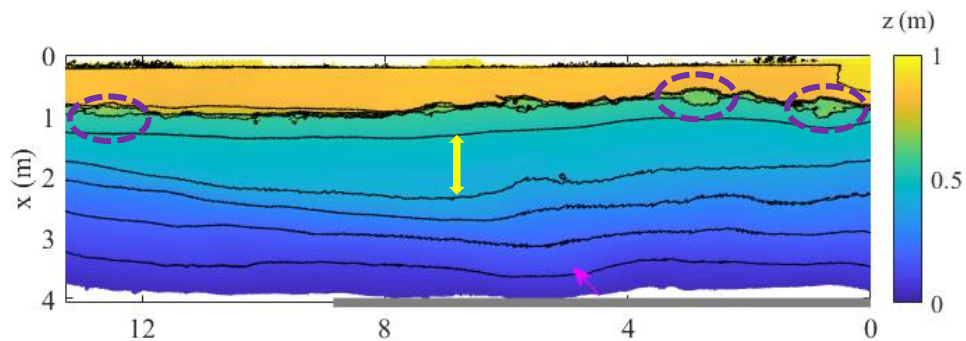
a) M1



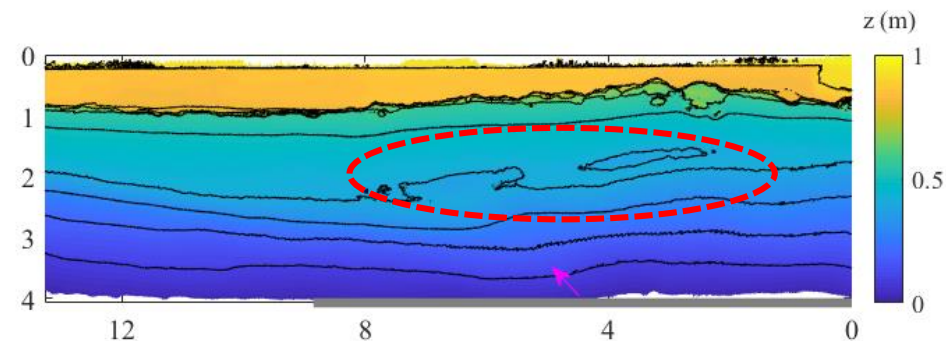
b) M2



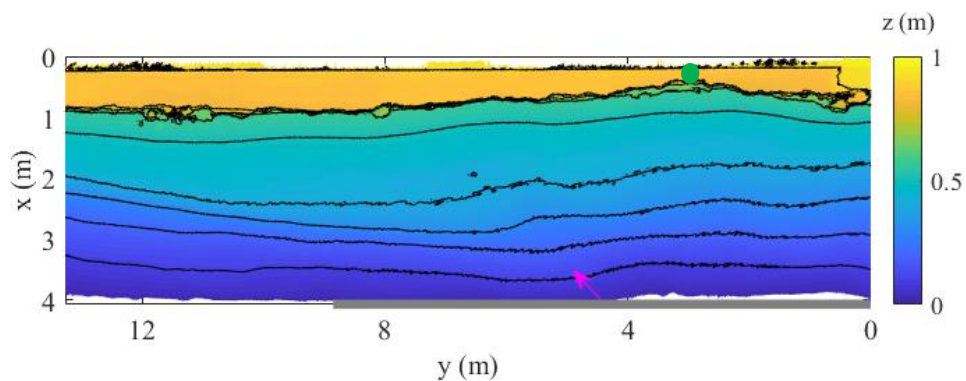
c) M3



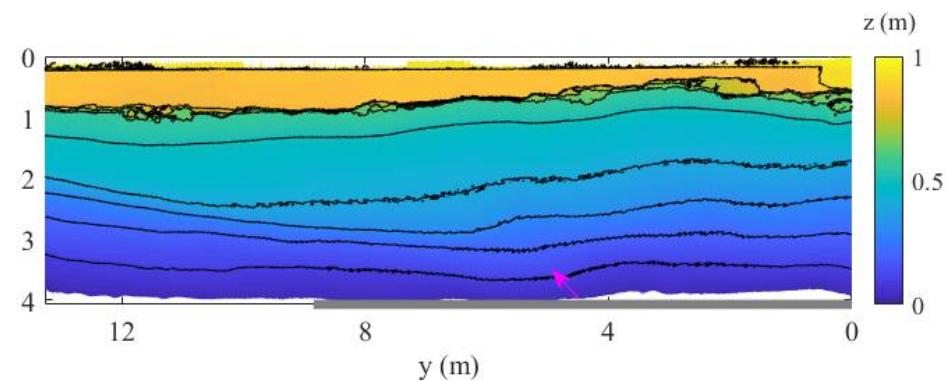
d) M4



e) M5



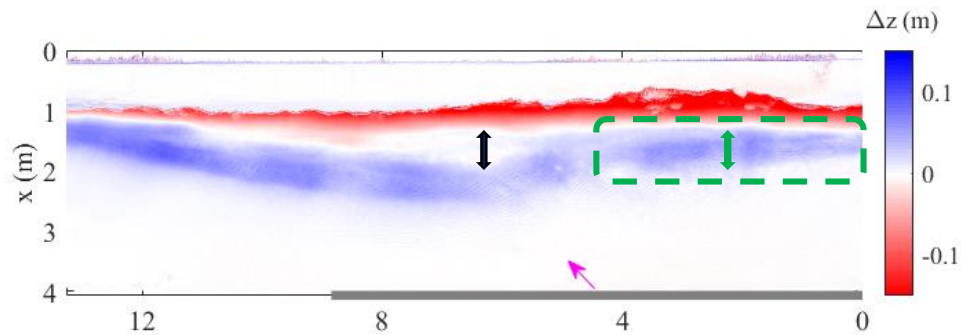
f) M6



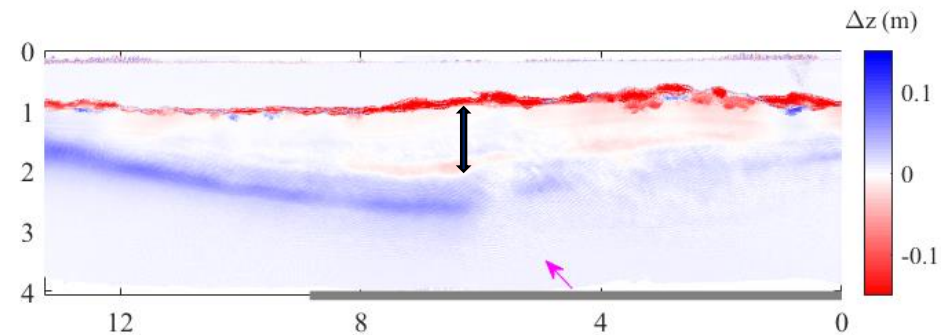


# Beach contour difference maps (Exp. 1, dune 1.5:1)

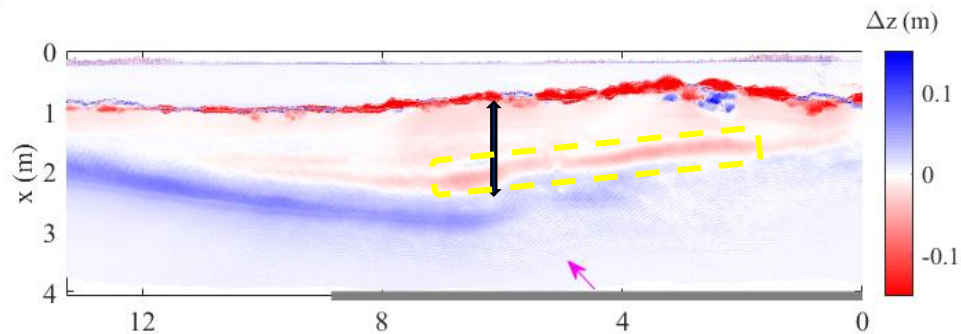
a) M2-M1



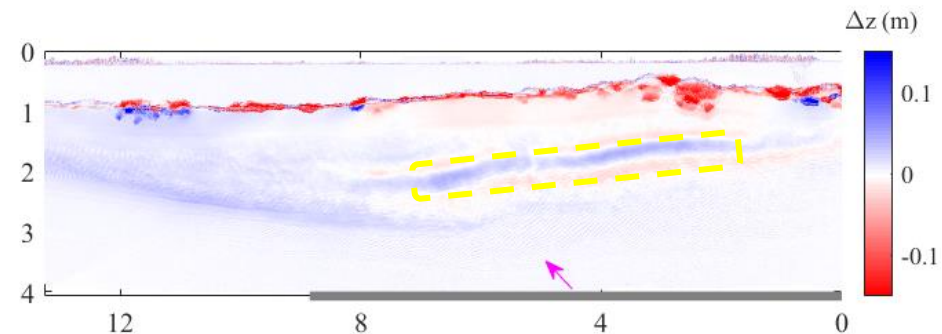
b) M3-M2



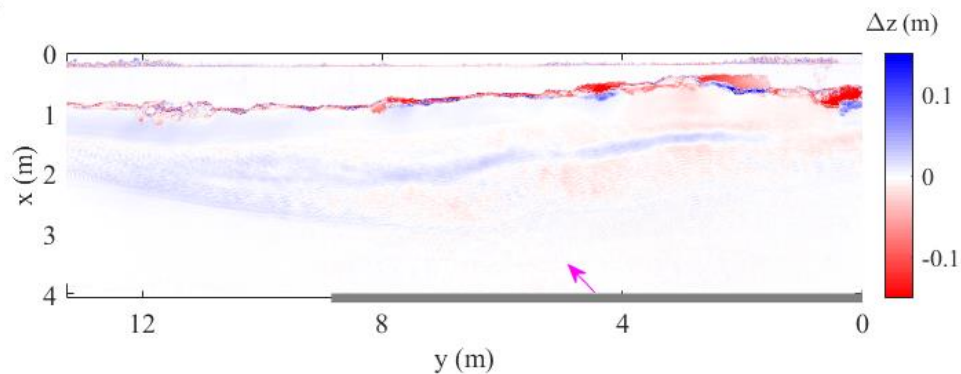
c) M4-M3



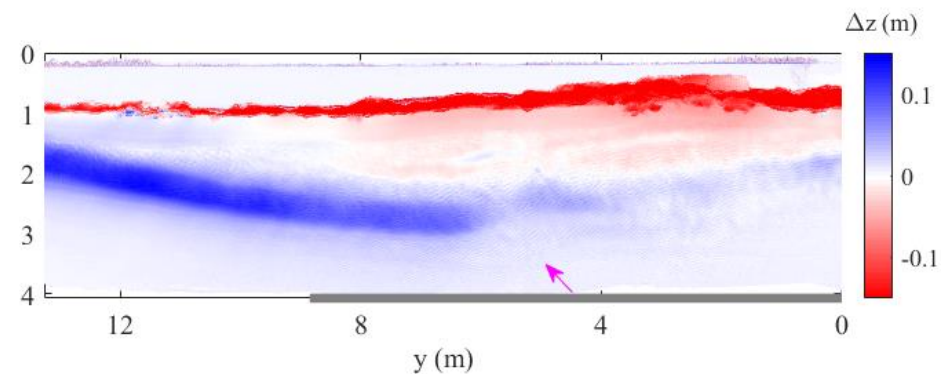
d) M5-M4



e) M6-M5



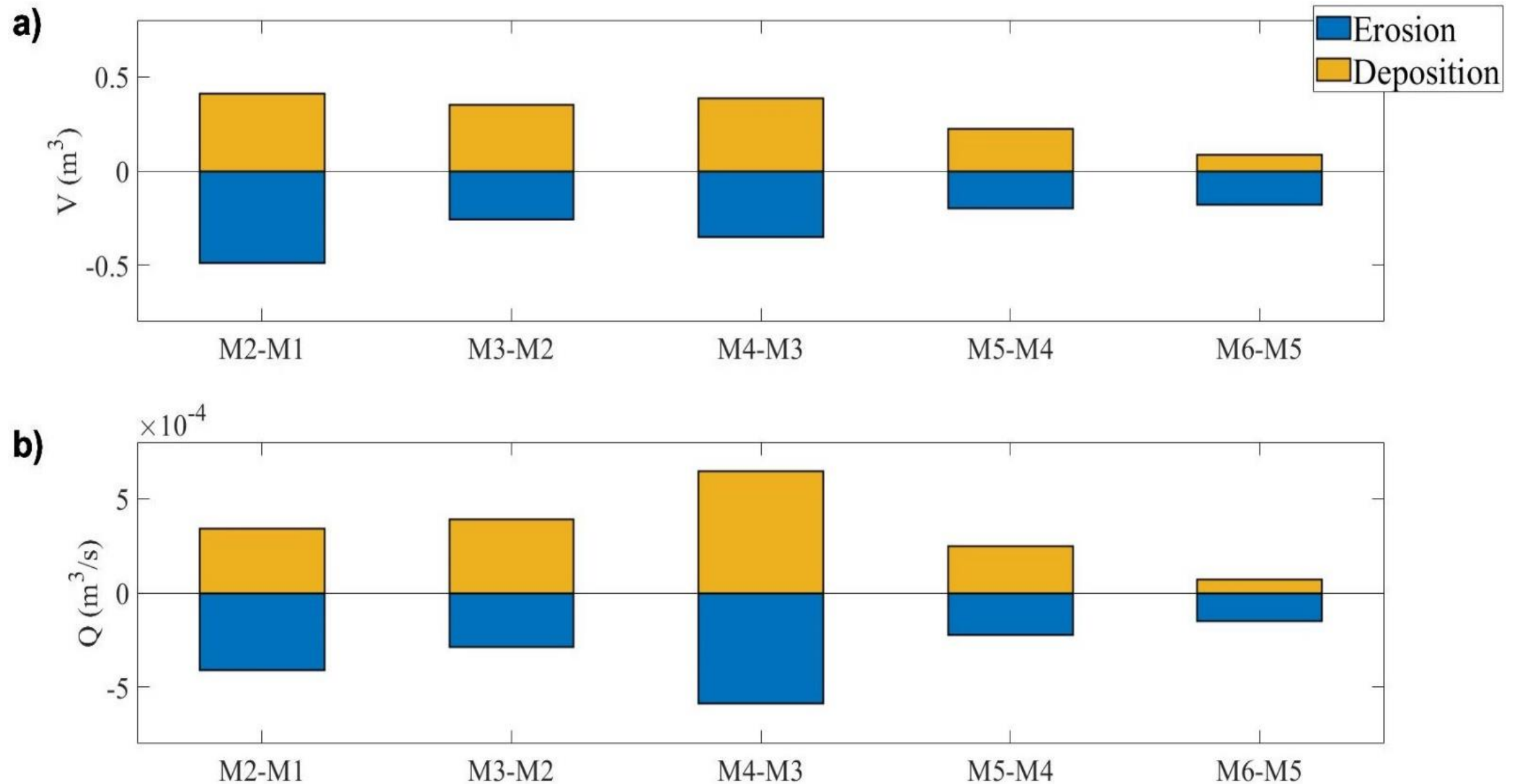
f) M6-M2



# Dune Erosion Evolution (Exp. 1, dune 1.5:1)

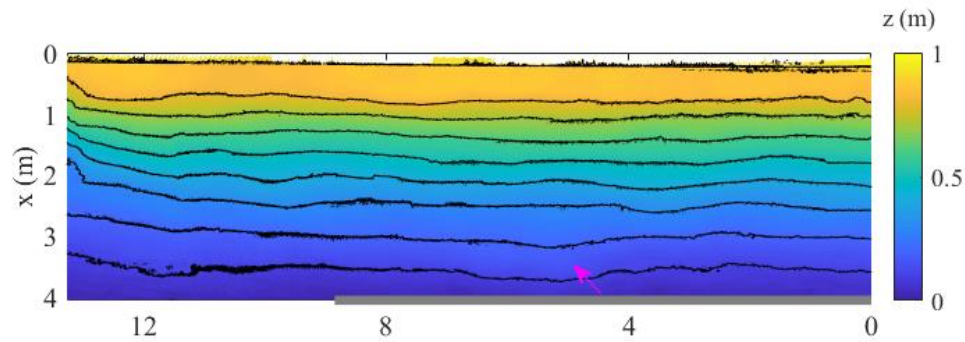


# Erosion and Accretion (Exp. 1, dune 1.5:1)

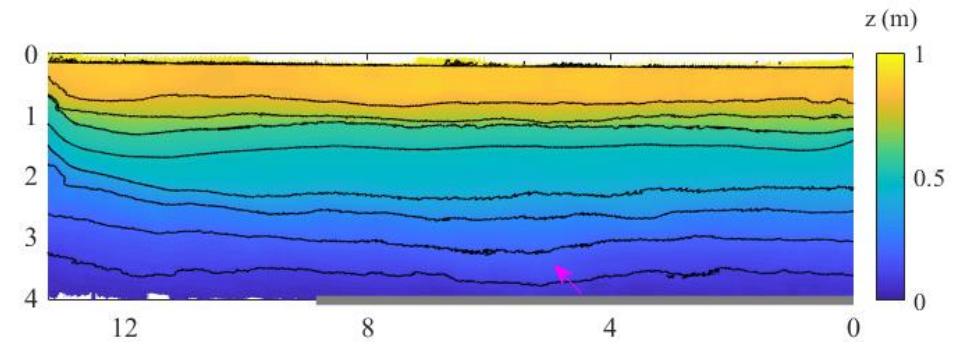


# Beach contour maps (Exp. 2, dune 5:1)

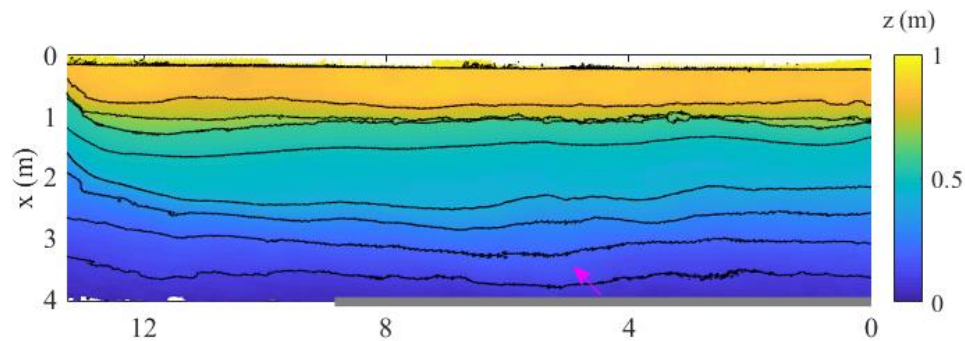
a) M1



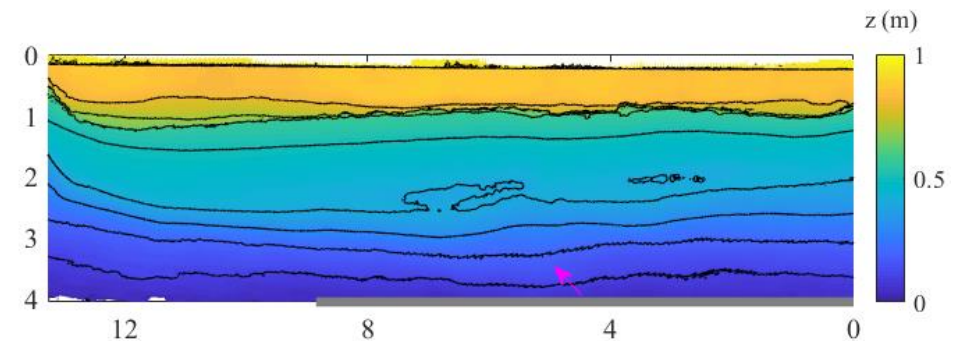
b) M2



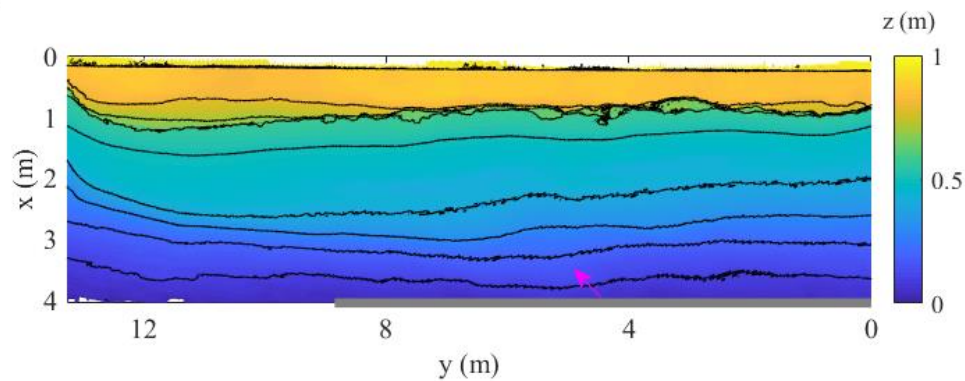
c) M3



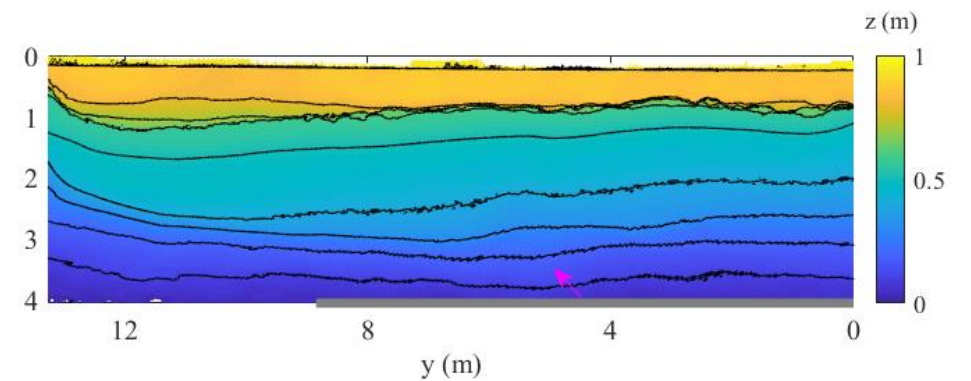
d) M4



e) M5

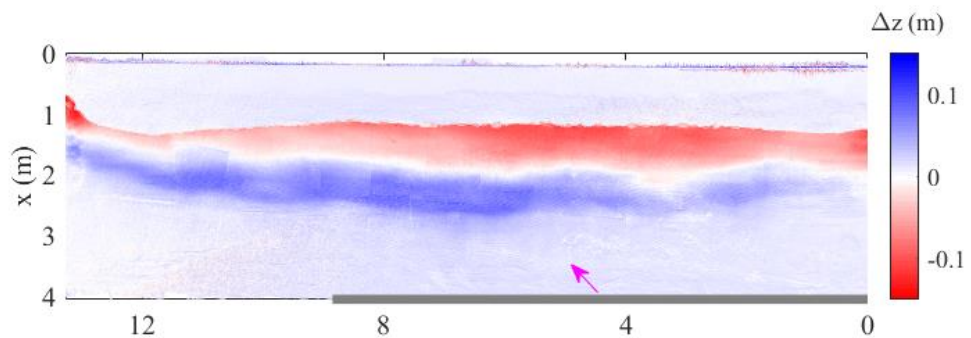


f) M6

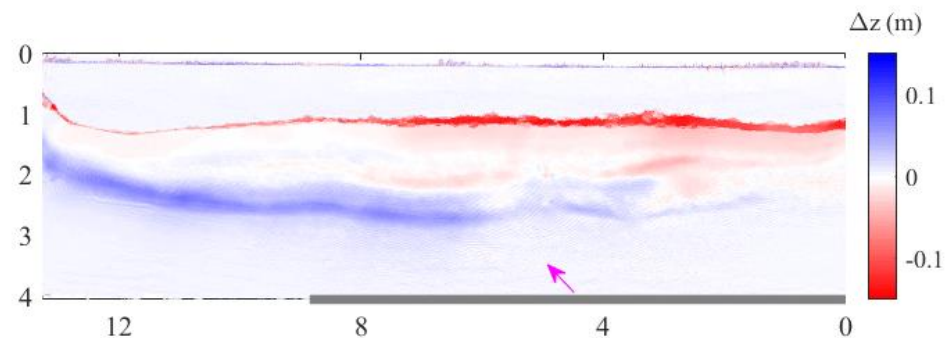


# Beach contour difference maps (Exp. 2, dune 5:1)

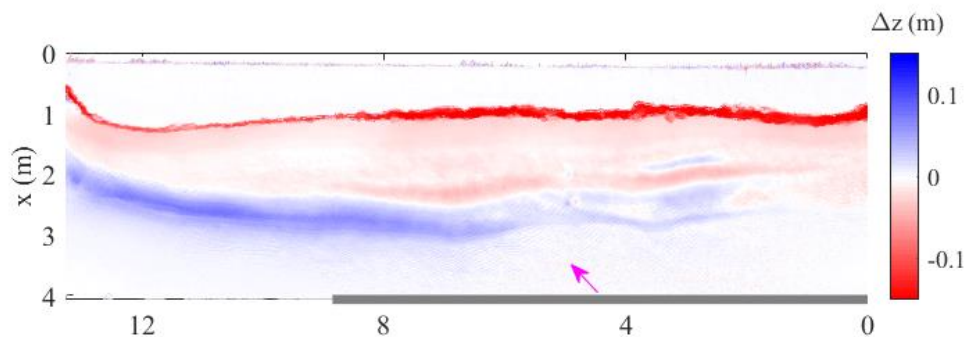
a) M2-M1



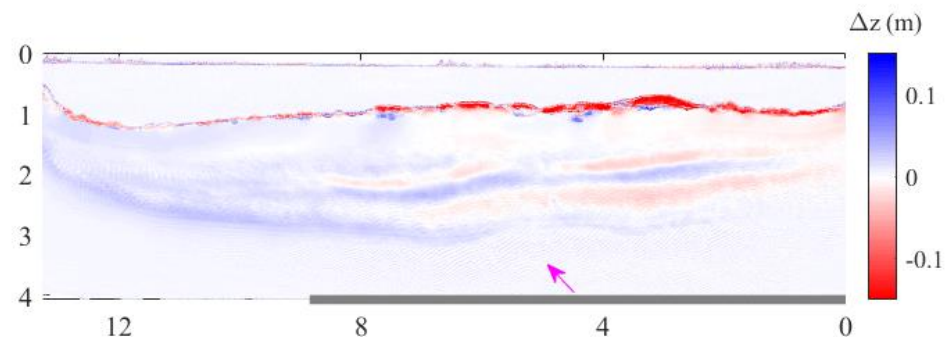
b) M3-M2



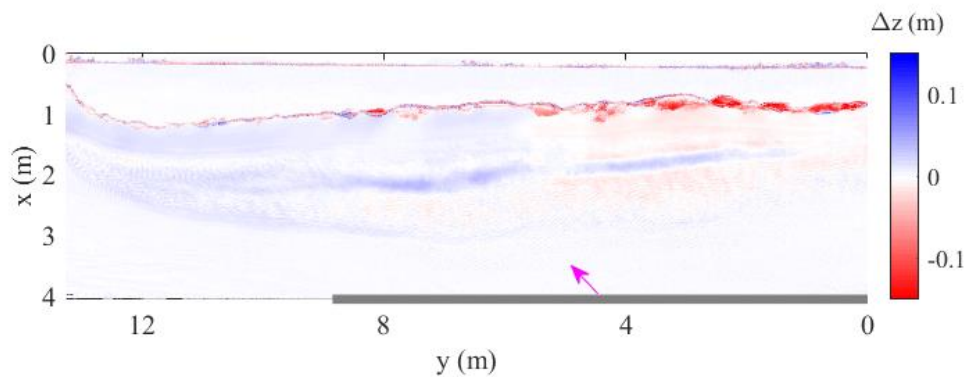
c) M4-M3



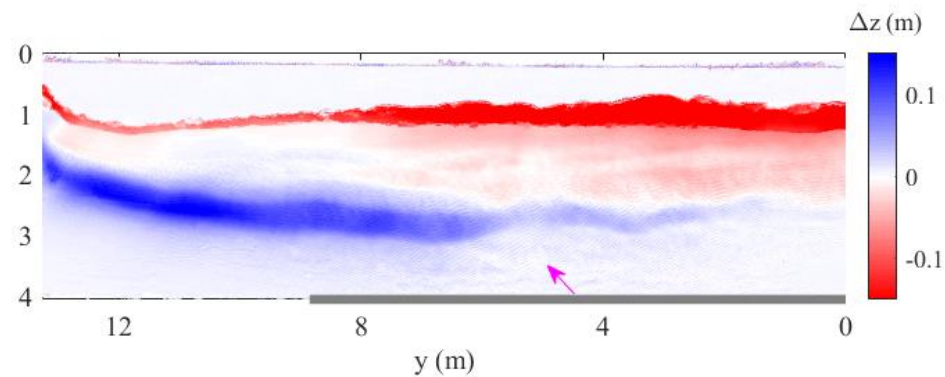
d) M5-M4



e) M6-M5



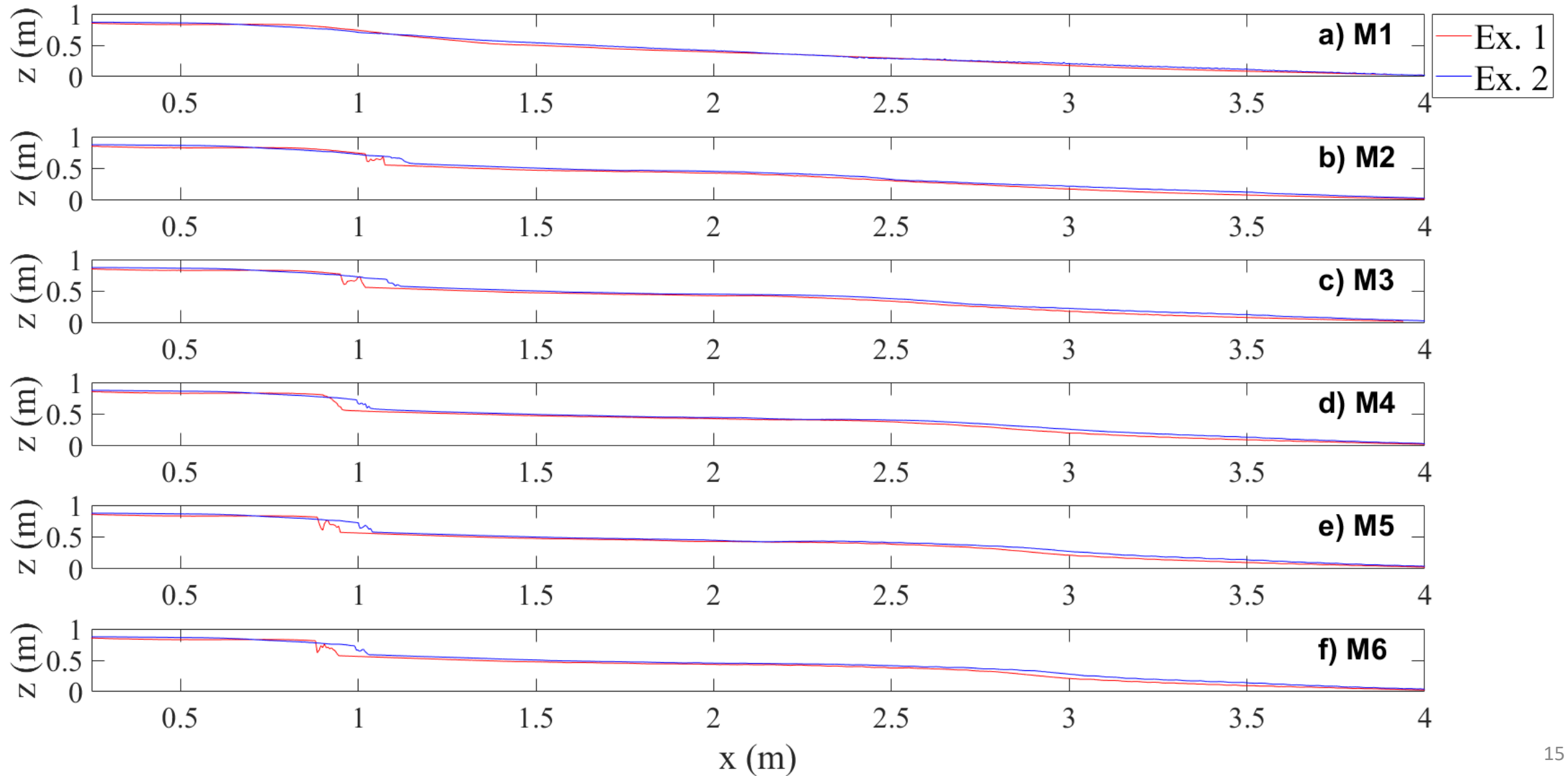
f) M6-M2



# Dune Erosion Evolution (Exp. 2, dune 5:1)



# Cross-shore Profiles at $y=4.8$ m (Exps. 1 & 2)



# Acknowledgment

- NSERC CRSNG, Dr. A. Take, M. Ibrahim, G. Boyd and H. Stephens, C. Portch, D. Benoit.



**THANK YOU!**

**SUGGESTIONS!**

**QUESTIONS?**

