High resolution seafloor classification in a sand wave environment

Delft University of Technology

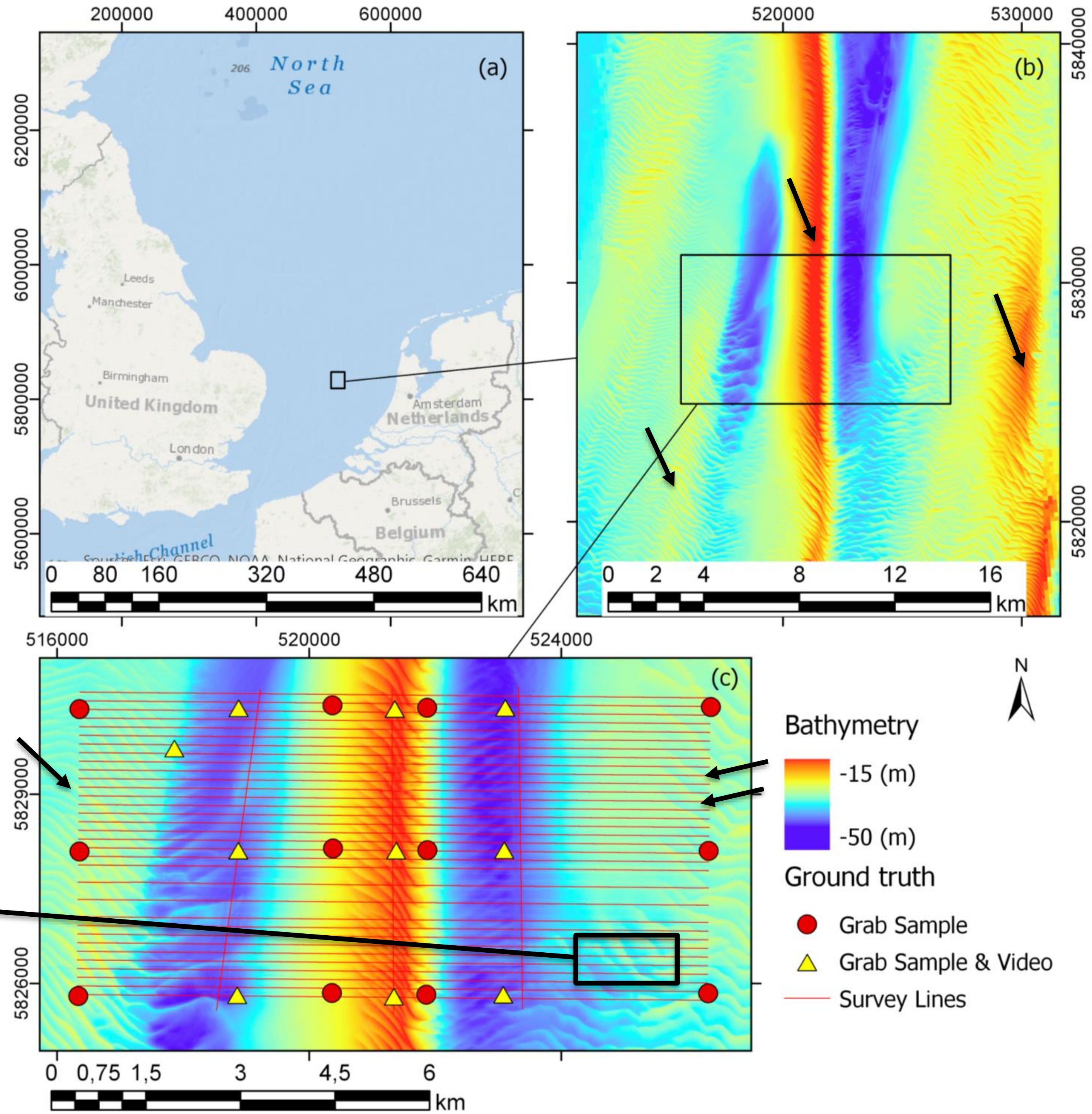
DISCLOSE Symposium

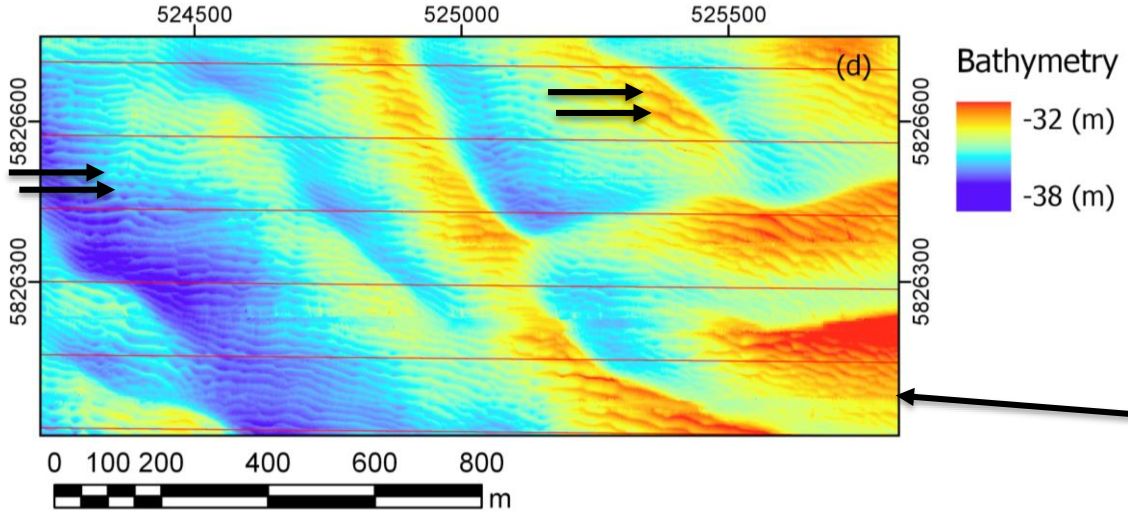
November 6, 2019

Leo Koop

The research area

- Brown bank; NIOZ Pelagia; 2017
- Sand Bank or Tidal ridge ($\lambda \approx 10\ km$)
- Sand wave ($\lambda \approx 200\ m$)
- Mega ripple ($\lambda \approx 10 - 30\ m$)





TUDelft

Motivation, challenges, and talking points

- Motivation:
  - Improved classification resolutions
  - Existence of fine scale habitats (eg: Sabellaria)
  - Better spatial overview of sand environments
- Challenges of classification in sand wave areas:
  - Steep and rapidly changing slopes over small spatial scales (mega ripples)
  - Sand wave features → sediment sorting
    - Therefore: need high spatial resolution
  - BB area consists of relatively homogeneous sediment
    - Therefore: need high geo-acoustic resolution
- Today:
  - Research area
  - (Mean grain size vs. the full grainsize distribution)
  - Classification method
  - Geo-acoustic vs. spatial resolution
  - Classifying sediments over mega ripples
  - Offer closing comments and thoughts

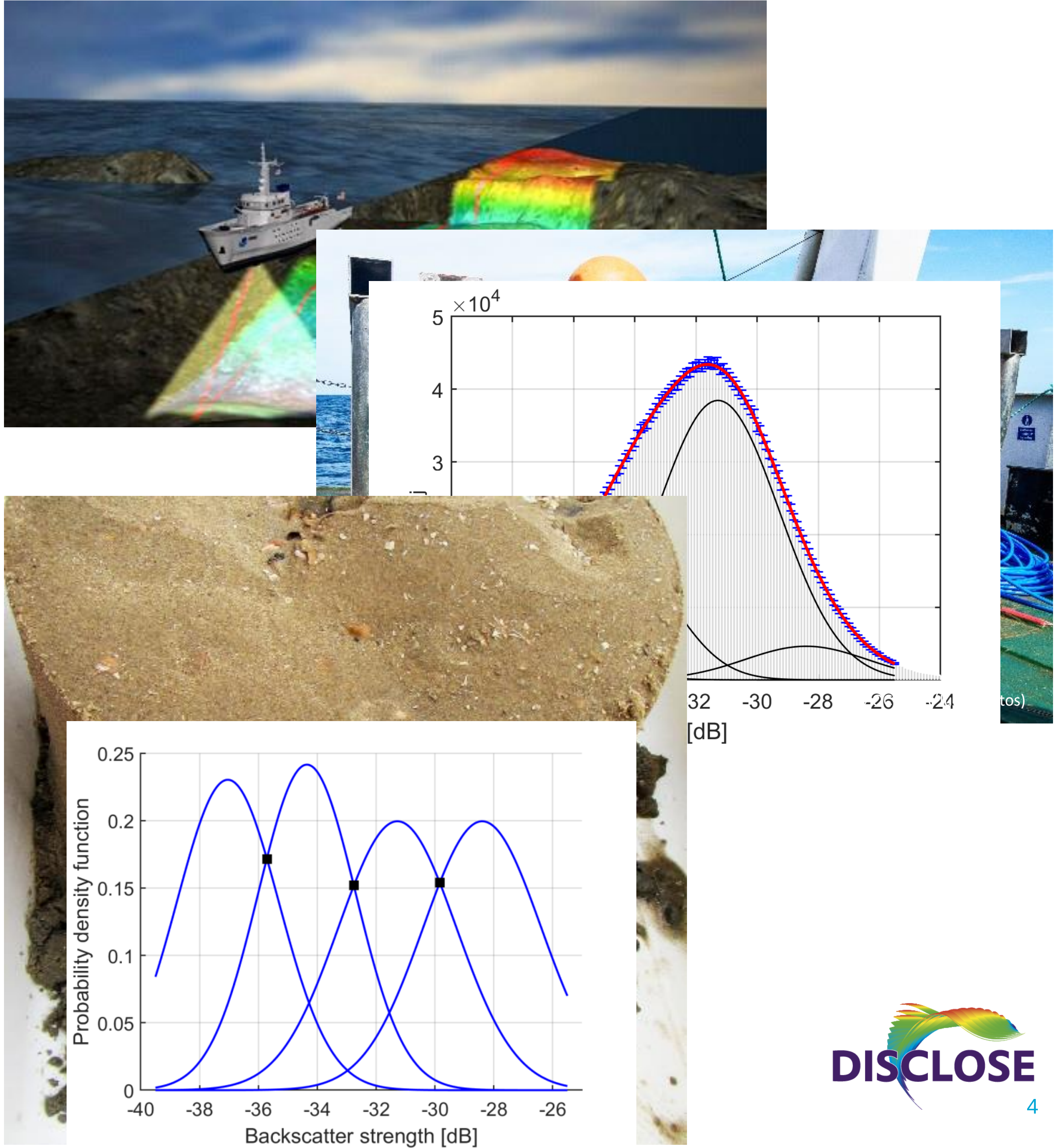
TU Delft

DISCLOSE

Classification method

- Multibeam echosounder data
- Video data
- Grab sample data

- We have backscatter as a function of beam angle
- Bin backscatter points for a specific angle into a histogram
- Fit a linear combination of Gaussian distributions to the histogram
- The intersecting points of the unscaled Gaussians are acoustic class boundaries

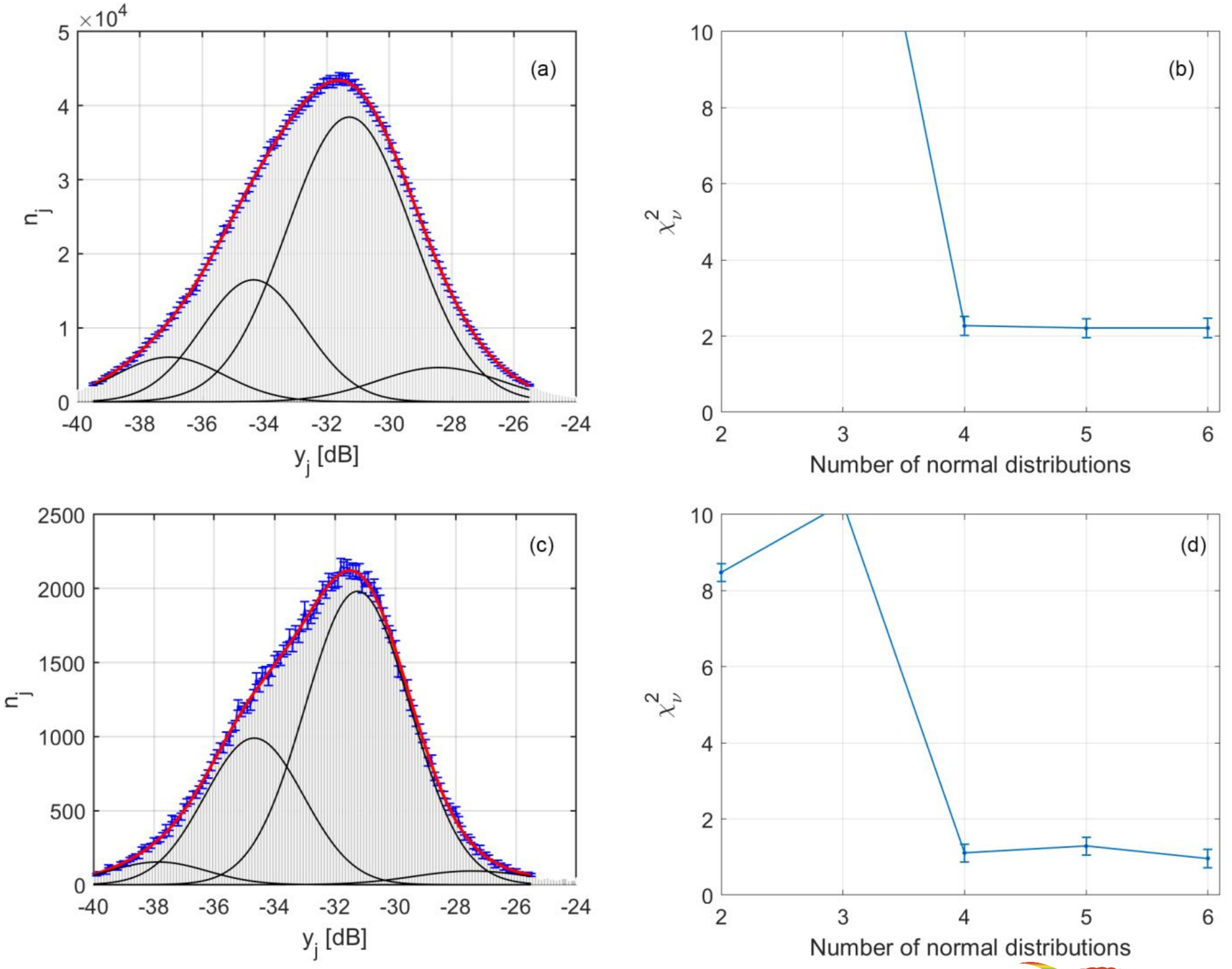


TU Delft

DISCLOSE

Spatial vs. geo-acoustic resolution

- There is ping to ping variability in backscatter data
  - Solution: averaging of data
  - Effect: increase in geo-acoustic resolution
  - Side affect: decrease in spatial resolution
- The resolution trade off
  - (a) minimum needed averaging
  - (c) typical amount of averaging

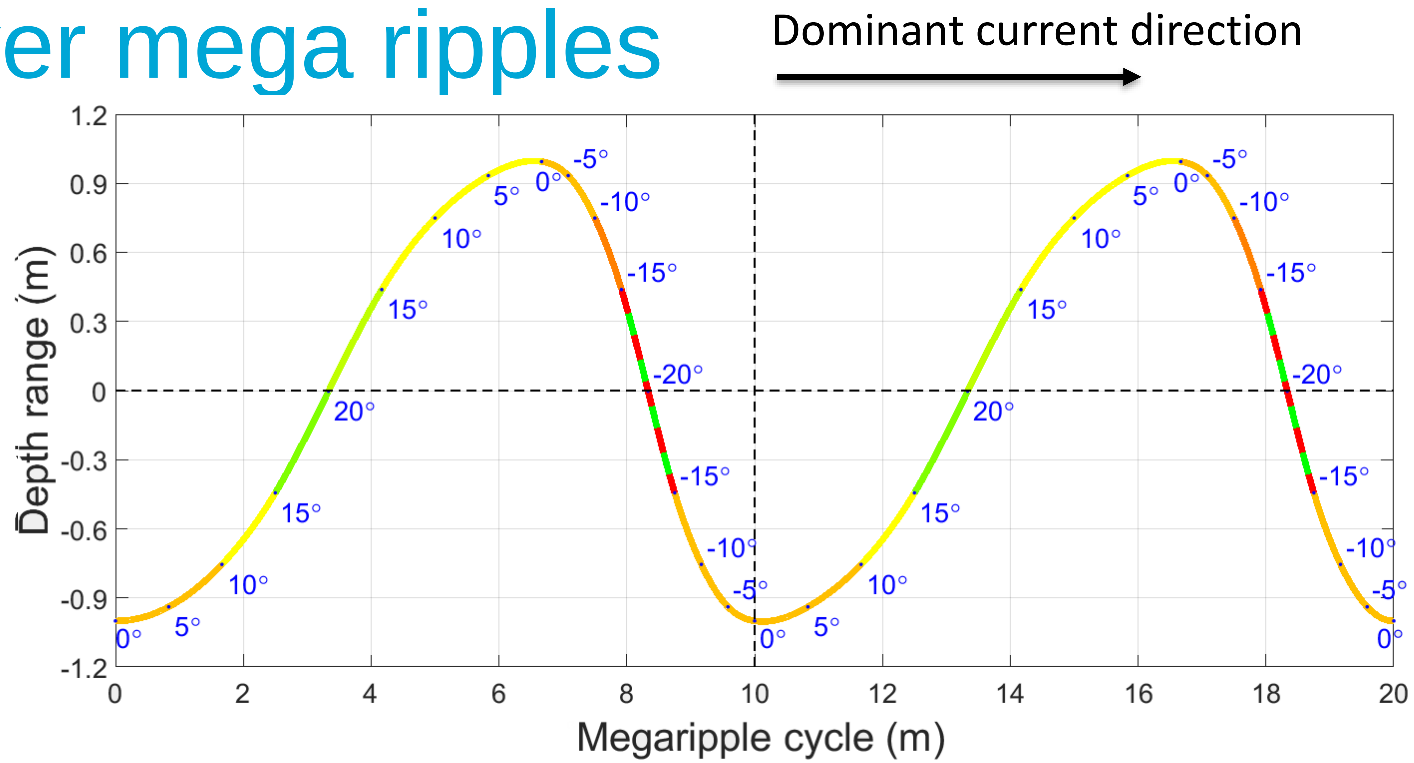


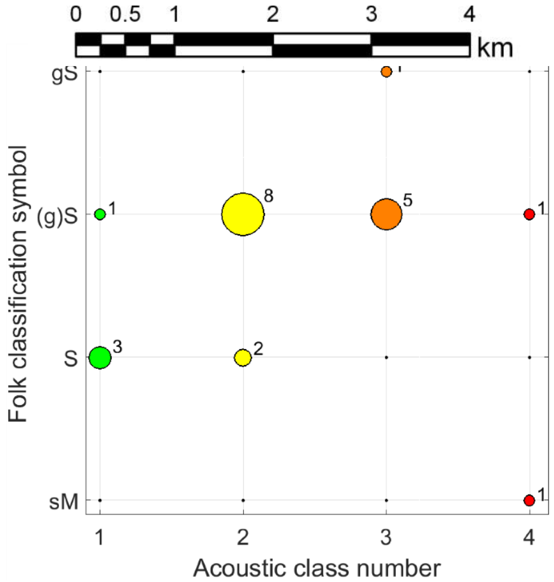
TUDelft

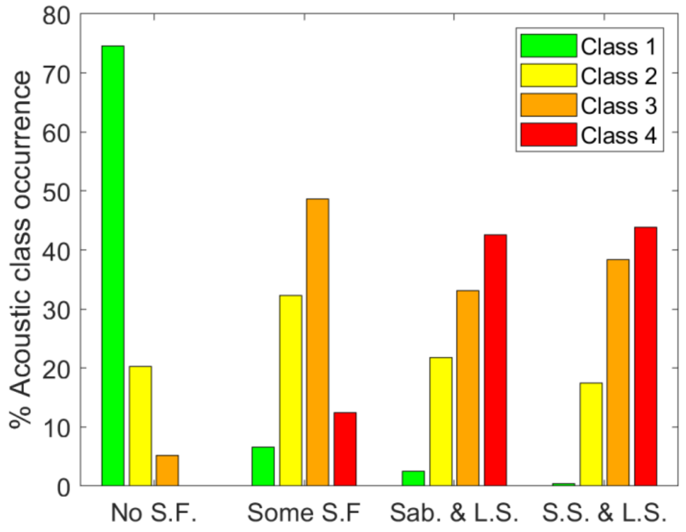
DISCLOSE

Seafloor classification over mega ripples

- Classification results for the entire survey area
- Performed detailed investigation of multiple small areas with megaripples
- Acoustics coupled with video and grab data gives the final/full picture







TU Delft

Conclusions and implications

- Classification in sand wave areas performed
- Both spatial and geo-acoustic resolution was sufficient
- Proof of MBES BS-based classification over mega ripples
  - Reveals the spatial distribution of sediments on mega ripples
  - For detailed habitat mapping, mega ripple (not sand wave) spatial scales should be considered
  - <10 m accuracy in geo-referencing for future data gathering (grab sampling and video) highly recommended in any sand wave areas
- Results showcase the value of the DISCLOSE approach for seafloor mapping

Thank you

For more results and methods see:
Koop, Leo, et al. "*Seafloor Classification in a Sand Wave Environment on the Dutch Continental Shelf Using Multibeam Echosounder Backscatter Data.*" *Geosciences* 9.3 (2019): 142.