Challenges to Topobathy Lidar Processing in Alaska Coastal Mapping

Evan Joyce
Graduate Research Assistant
University of Alaska Fairbanks (UAF)
edjoyce2@alaska.edu

akcoastalmapping

Topobathy Technical CoE

US Army Corps of Engineers

US Army Corps of Engineers ®

Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX)

Partners

WOOLPERT

INE

UAF UNIVERSITY OF ALASKA FAIRBANKS

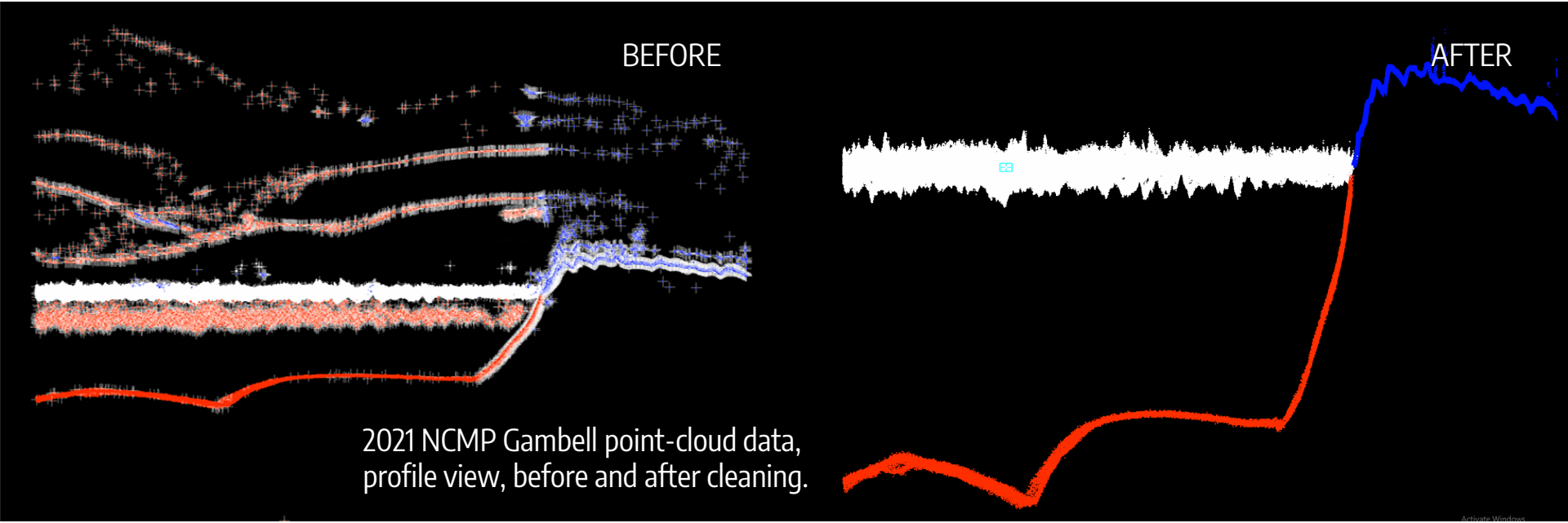
Step 1: Data Collection

- Collect data in coastal areas, where water is too shallow for SONAR
- Airborne LiDAR
  - Green laser (~532 nm)
- Additional imagery includes RGB/NIR, hyperspectral

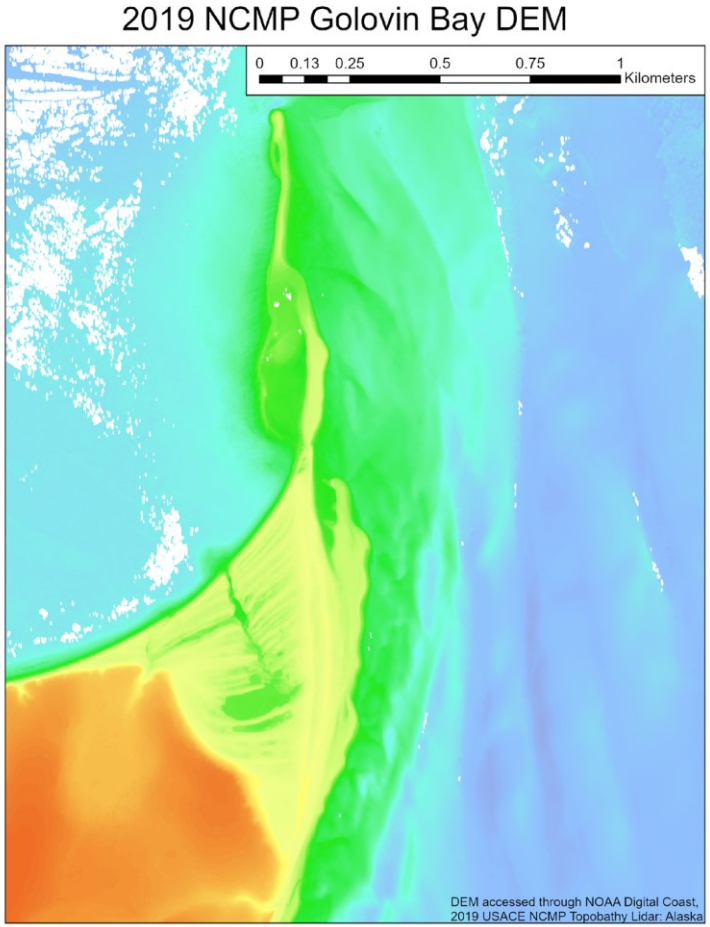
Woolpert (2022), https://woolpert.com/wp-content/uploads/2022/04/bulldog_vector_slider.jpg

Step 2 and 3: Processing

Pre-processing filters → Clean point-cloud data → Reclassify points



2021 NCMP Gambell point-cloud data, profile view, before and after cleaning.



Step 4: Post-Processing and Final Products

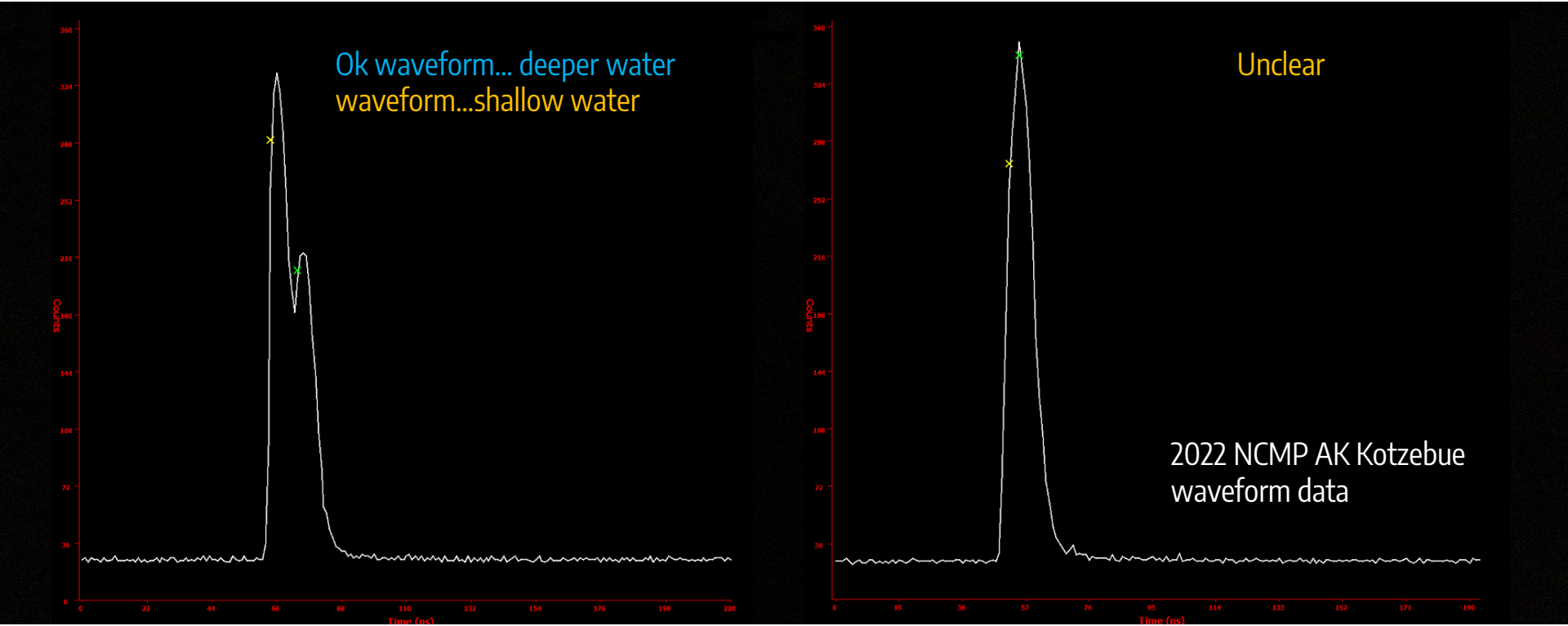
- Woolpert + USACE QC
- Products:
  - Grid-based DEM + DSM
  - Point-cloud data (LAS)
  - RGB mosaic
  - HSI mosaic
- Published on NOAA Digital Coast

Bad Conditions → Errors!!

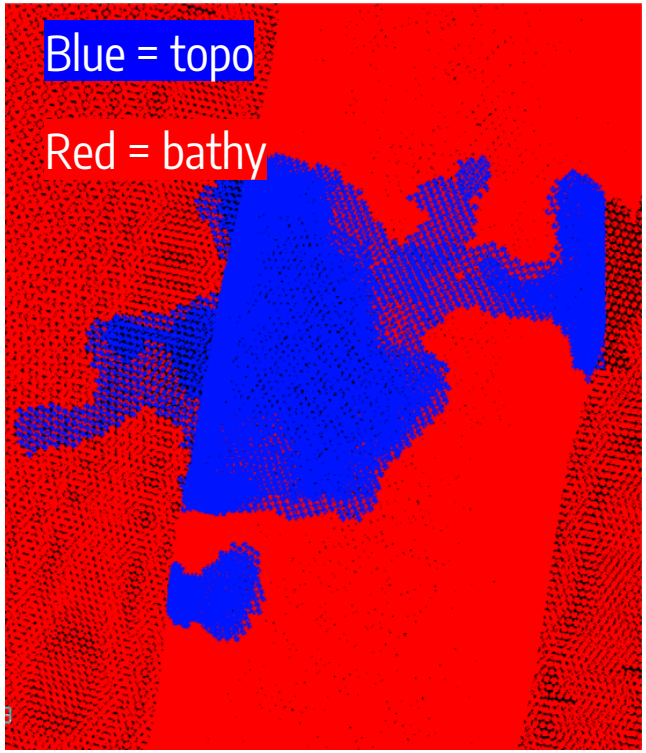
- Whitewater
- High turbidity
- Dark bathymetry
- Shallow water

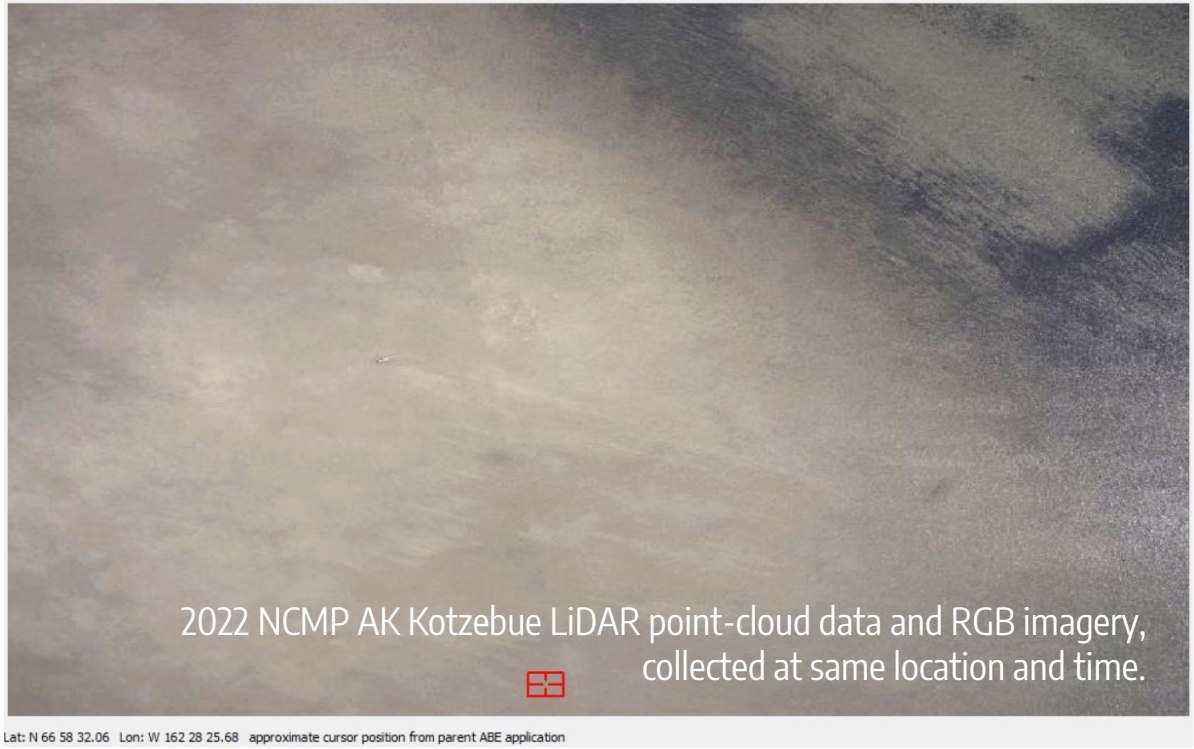
2022 NCMP AK Kotzebue RGB imagery, high turbidity and shallow water.

Topobathy Errors



Topobathy Errors

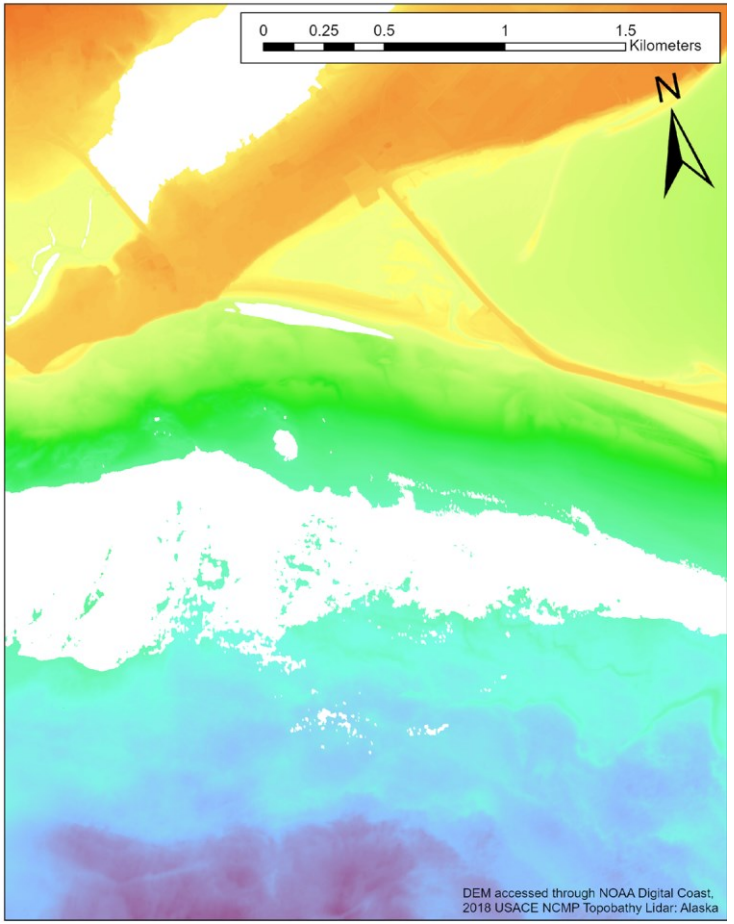




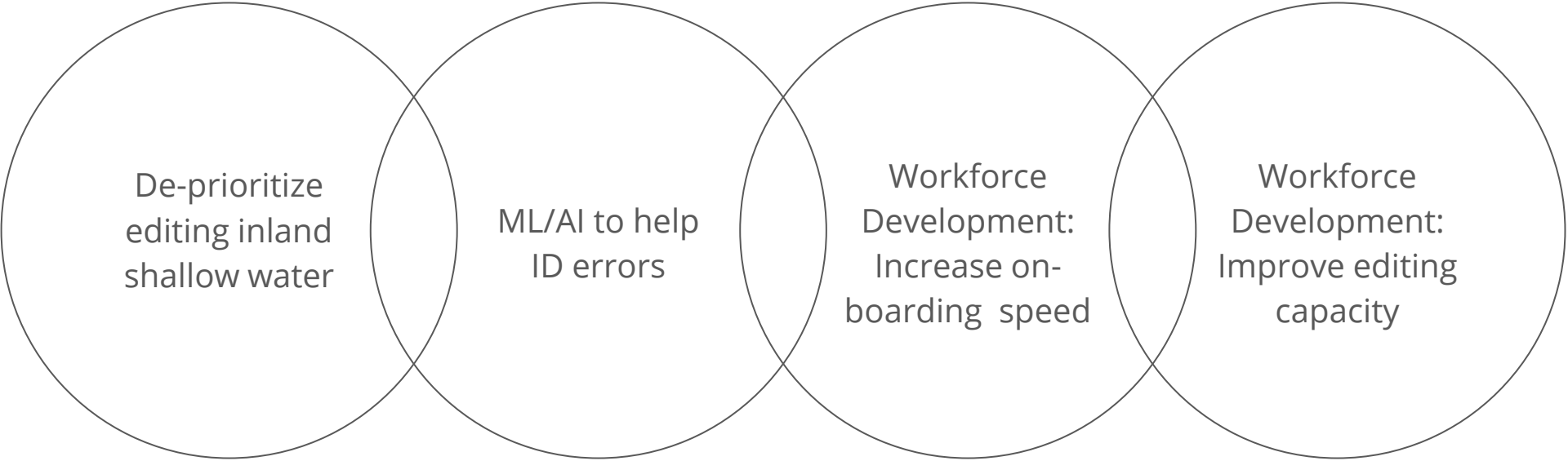
Ongoing Issues

- Poor conditions ⟶ Limits data and increases processing time
  - E.g. no data in:
    - Intertidal zone (too shallow and turbid)
    - Lagoons (too dark)

2018 NCMP Homer DEM

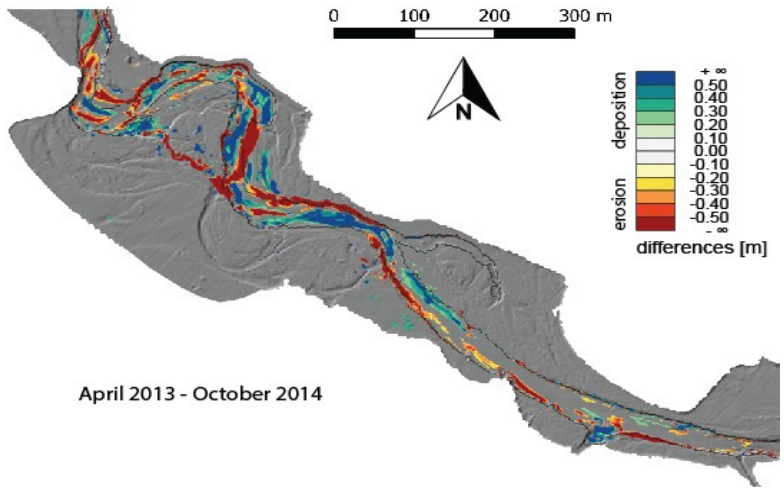


Potential Solutions

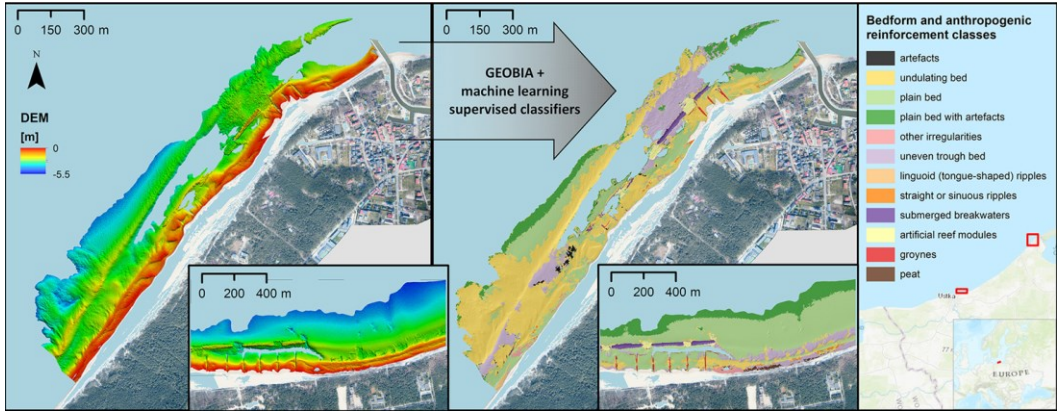


Future products

- Change detection
  - Repeat surveys
- Disaster Management
  - Flood maps
- Bathy classification



(Mandlburger et al. 2015)



Janowski et al., 2022

Thank-you

Janowski, L., R. Wroblewski, M. Rucinska, A. Kubowicz-Grajewska, and P. Tysiac. 2022. “Automatic classification and mapping of the seabed using airborne LiDAR bathymetry.” *Engineering Geology*, 301: 106615. https://doi.org/10.1016/j.enggeo.2022.106615.

Mandlburger, G., C. Hauer, M. Wieser, and N. Pfeifer. 2015. “Topo-Bathymetric LiDAR for Monitoring River Morphodynamics and Instream Habitats—A Case Study at the Pielach River.” *Remote Sensing*, 7 (5): 6160–6195. https://doi.org/10.3390/rs70506160.

akcoastalmapping

Topobathy Technical CoE

UAF University of Alaska Fairbanks

US Army Corps of Engineers

UAF Chukchi Campus in Kotzebue, Alaska