

### living planet symposium BONN 23-27 May 2022

TAKING THE PULSE OF OUR PLANET FROM SPACE

## The Submerged Parts of the Coastal Picture



## Indicators for describing the « submerged »

esa



- Foreshore morphology is influencing the dynamics of the coastlines
- Submerged indicators for assessing the overall **sedimentary budget**
- Assess the impact and effectiveness of coastal protection measures such as beach nourishment or sandbags barrier.
- Valuable information for submerged ecosystem changes

- Key indicators for the submerged systems have been developed
   Vertical erosion of the foreshore
   Strong dynamics of the nearshore sandbars
   Information
   Detection of
   Adaptation
  - Precursors for coastal erosion
    Information on sediment depletion
    Detection of human impact
    Adaptation of the system to climate
  - Adaptation of the system to climate change



## Intertidal widths and flooding index

- Automated selection of cloudfree images of all water levels for user defined regions
- Distribution of dry-fallen water covered areas by spectral indices and thresholding
- Relation between dry-fallen and water covered cases
- Manual quality check during the process possible







## Intertidal Creeks – a moving environment



- Low tide acquisitions
- Development over time: index of water covered to dry—fallen cases or vice versa
- Identification of stable and changing areas

## Bathymetry - derived from optical satellite imagery .eesa





## **Bathymetry - derived products**







Meso-tidal context

#### Deltaic deposits





#### Seasonal sedimentary fluctuations

## Submerged Sandbars – extraction from optical data esa



#### Approach based on

- the spectral response of sandbars locations
- multispectral satellite data.

**Each submerged sandbar** position extracted using perpendicular profiles along the shoreline.

 For each profile, reflectance values are extracted, thus taking advantage of all information in the visible part of the electromagnetic spectrum.



# High diversity of sandbar morphologies and dynamics







→ THE EUROPEAN SPACE AGENCY

1.5 km

## **Validation Data**

SPACE FOO

-ield measurements

- Available data sets
  - Field measurements (intertidal FEW!)
  - Airborne orthophotos
  - Airborne Laserscan data
- Validation in the foreshore is challenging due to difficult data collection.
- Intertidal areas can only be visited during low tide
- measurements depend on water level (e.g. position of creeks)
- Fast changing environment



· eesa

Submerged Sandbars Heiligenhafen (Baltic Sea)



## **Conclusion - perspectives**



- The submerged part and intertidal areas have been addressed with several indicators
- Users have now data and tools on hand that provide information they did not see before

*"It is increadible what is possible meanwhile"* 

"Those are tools we were awaiting for a long time"

Turning indicators into qualitative and holistic information: Sediment budget

**Vulnerability Indicator**