Saltmarsh Dynamics Derived from Long-Term Satellite Data

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Coastal saltmarshes

Photo: Jim van Belzen
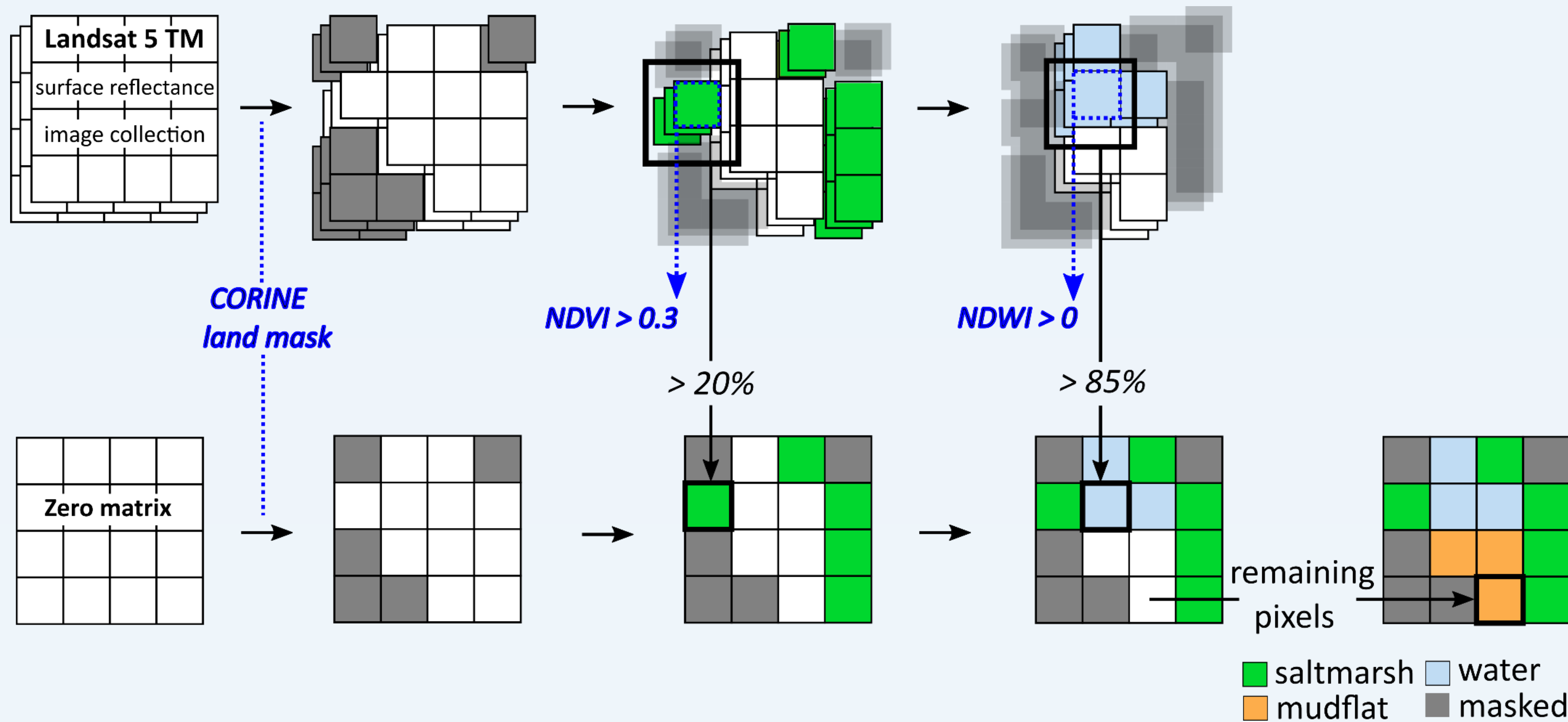
- Saltmarshes are highly productive ecosystems and provide crucial functions for flora, fauna and humankind

- Nevertheless, their dynamics and response to environmental changes are not fully understood and their investigation is often limited in space and time

- Satellite data enable large-scale, long-term analysis

Saltmarsh Classification Principle

Storm events
HAT
Periodic Sea level Change
Water Level
LAT
Time
saltmarsh   mudflat   water
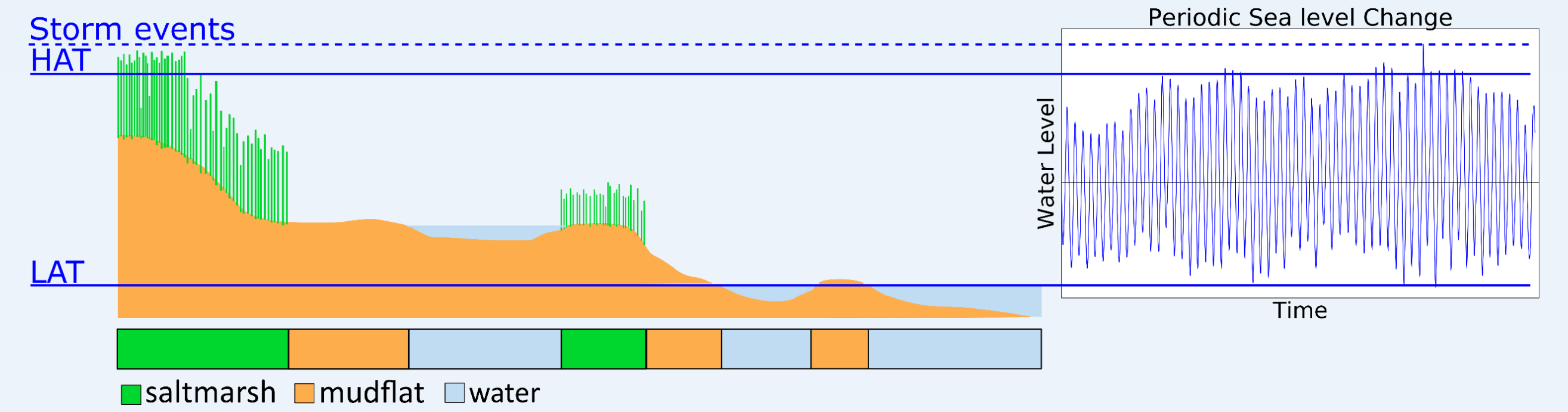
- Saltmarshes are not always visible from space as they are regularly flooded due to astronomical tides

- Unsupervised classification on several images at different tidal situations avoids the need for tidal information

- We classify vegetated saltmarsh, unvegetated mudflat, open water

Saltmarsh classification procedure

Landsat 5 TM
surface reflectance
image collection

CORINE
land mask

NDVI > 0.3
> 20%

NDWI > 0
> 85%

Zero matrix

remaining pixels

saltmarsh   water
mudflat   masked

- Unsupervised decision tree classification procedure performed in Google Earth Engine

- Each classification result represents a time step generated from an image collection over 3 years

- Kappa coefficient > 0.85 indicates very good classification performance

- Simple, flexible approach allows for integrating environmental data and can be applied on different scales

Application on different scales

Local →→→→→→→→→→→→ Global

1986
2004
2007
2010

Western Scheldt 2010
Saltmarsh
Mudflat
Water
0   2.5   5 km

Saltmarshes Europe
Yearly Habitat Change [%]
● -4--2
● -2--0.5
● -0.5 - 0
● 0 - 0.5
● 0.5 - 2
● 2 - 15
✳ significant change

North Sea
Baltic Sea
North Atlantic
Mediterranean Sea

Western Scheldt

Area [%]
104
102
100
98
96
1986 1989 1992 1995 1998 2001 2004 2007 2010
Time

More information: Laengner, M.L.; Siteur, K.; van der Wal, D. (2019). Trends in the Seaward Extent of Saltmarshes across Europe from Long-term Satellite Data. *Remote Sensing* 11(14): 1653. https://dx.doi.org/10.3390/rs11141653