ESA Baltic SEAL: Setting course to advance satellite-derived sea-level products for jagged coastlines.

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Sea level Rise and Ireland

➢ Ireland's complex coastline shelters coastal communities, with population centres in Cork Harbour, and Galway Bay.

➢ Key infrastructure such as roads and ports/docks are built along shorelines in many places.

➢ Existing defences and currently safe areas are at risk of storm surge and storm waves with increased sea level.

➢ Understanding regional dynamics of sea-level change is essential to inform adaptation planning and action.

⬅ Coastal communities such as Westport rely on complex coastline and other natural and man-made barriers to protect them from Winter Storms.

⬇ Rising sea levels enable storm tides, and the storm-driven waves on top, to reach higher, potentially overwhelming coastal defences.
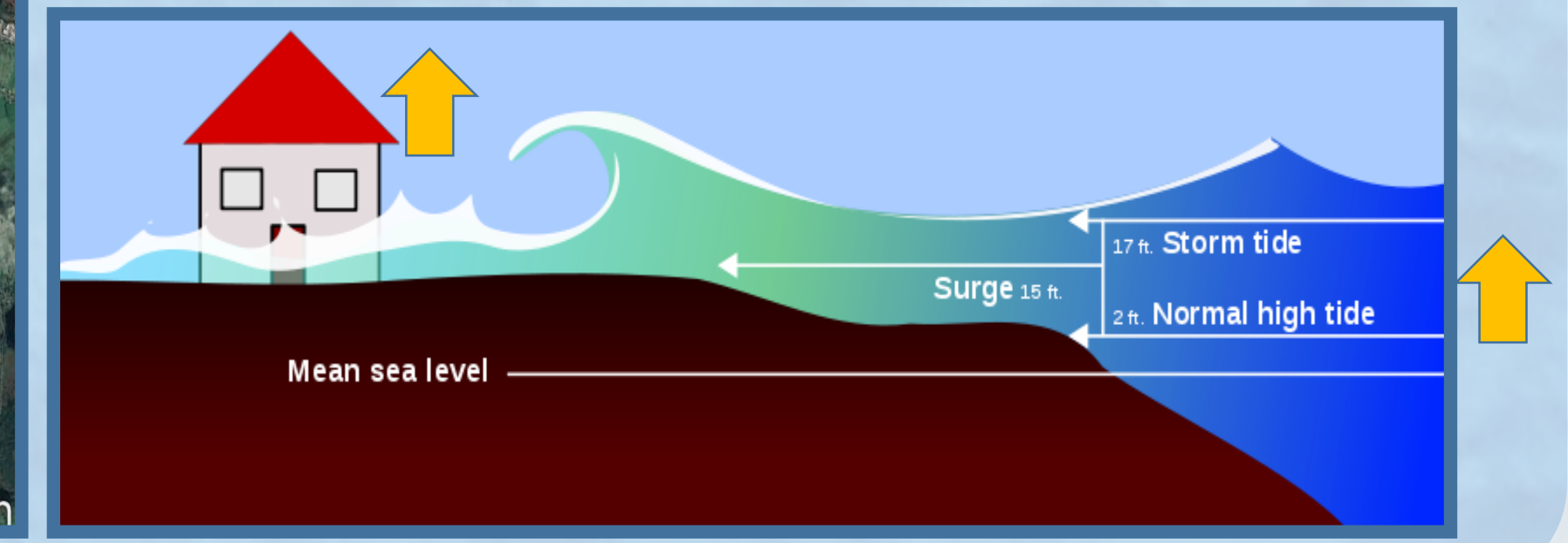
Irish stakeholders can now position themselves to harness new coastal sea level products

Global Sea Level Products: ESA-CCI

➢ Global mean sea level products are available.

➢ Initiatives are currently examining products to assess changes closer to coasts – e.g. Marti et al. (2019).

➢ Altimetry measurements need to be re-processed to maximise the information yield closer to the coast.

➢ Coastal Altimetry studies are constantly improving the possible information yield.
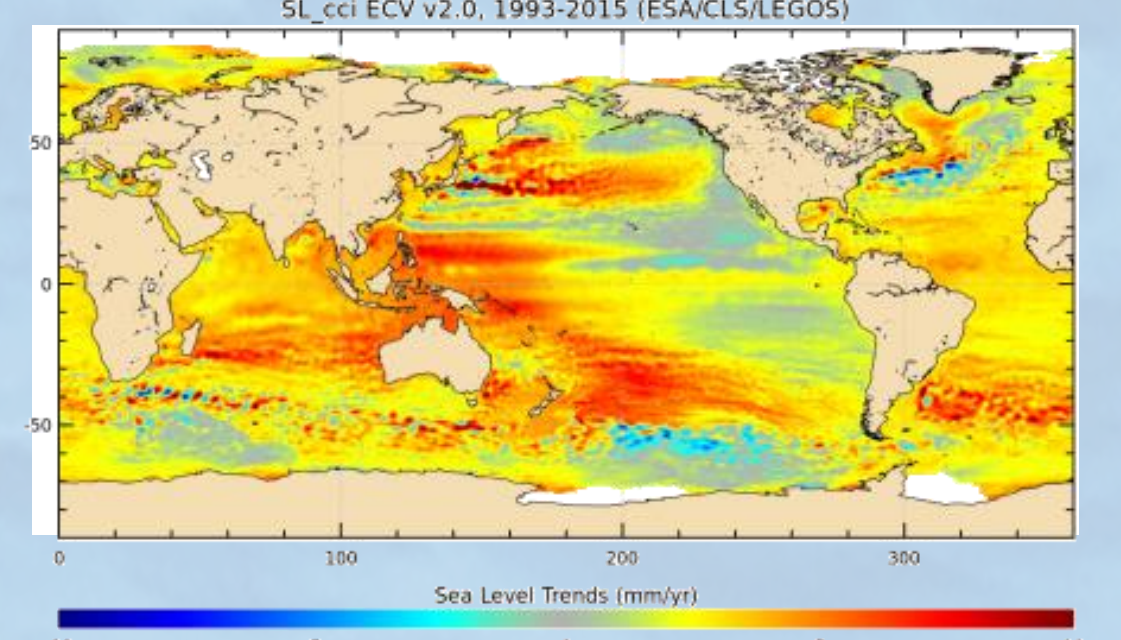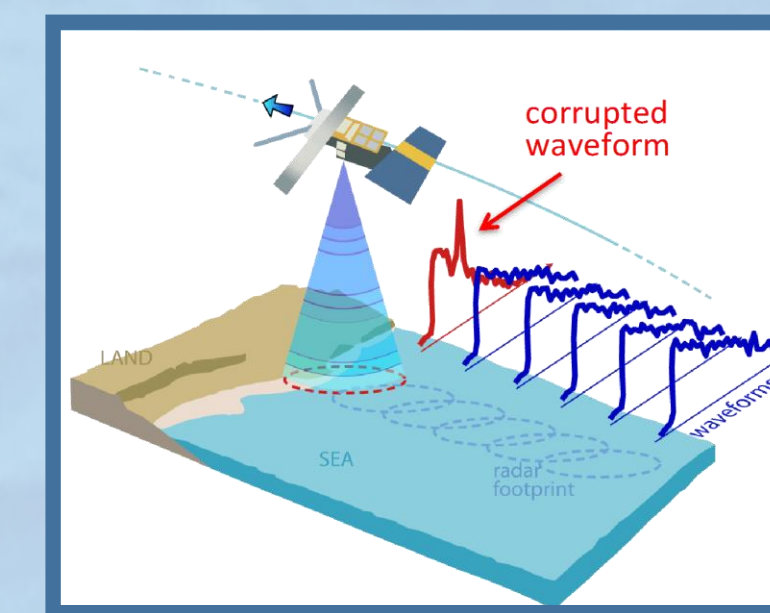
⬆ Example of the global ESA CCI product.
See www.esa-sealevel-cci.org for more information

⬅ Altimetry measurements are of limited use close to the coast, as hard surfaces corrupt the return signal

Baltic SEAL Project

Using the Baltic Sea (with low tide signal) as a testbed to:

➢ Exploit high-frequency multi-mission altimetry observations (LRM & SAR);

➢ Advance data retrieval very close to coasts (~ 3km);

➢ Improve and update our understanding of mean sea level in the entire Baltic Sea, in the vicinity of jagged coastlines and sea-ice;

➢ Provide various timeframe datasets, extending as far as 25 years, with monthly triangulated meshes, high-temporal resolution grids, and validated with tide gauge data.

⬇ Lessons will be learned from extracting coastal sea level measurements for coastal areas along the (low-tide) Baltic Sea. These can be examined in the context of complex coastlines with a greater tidal influence, such as along Ireland's west coast.
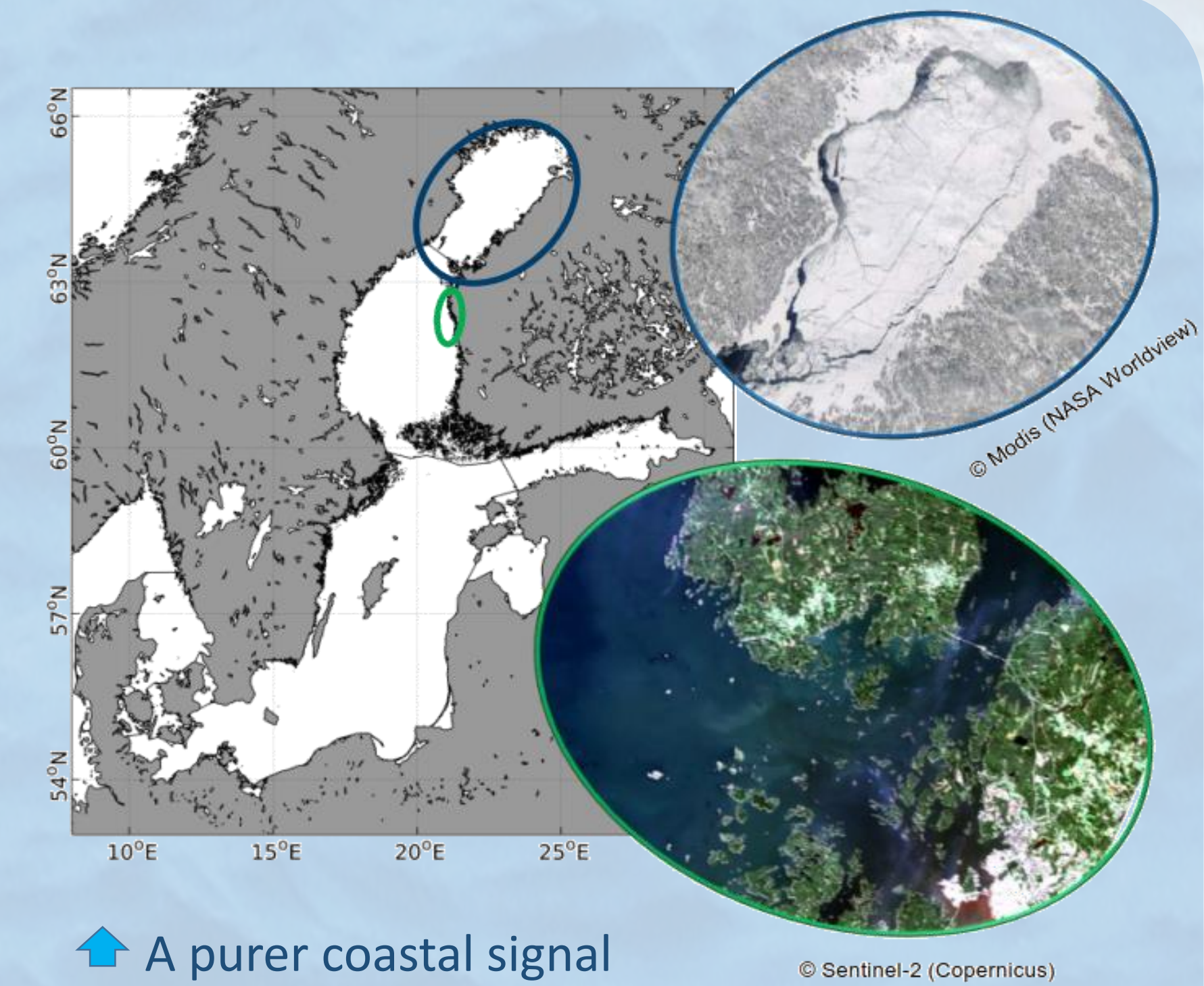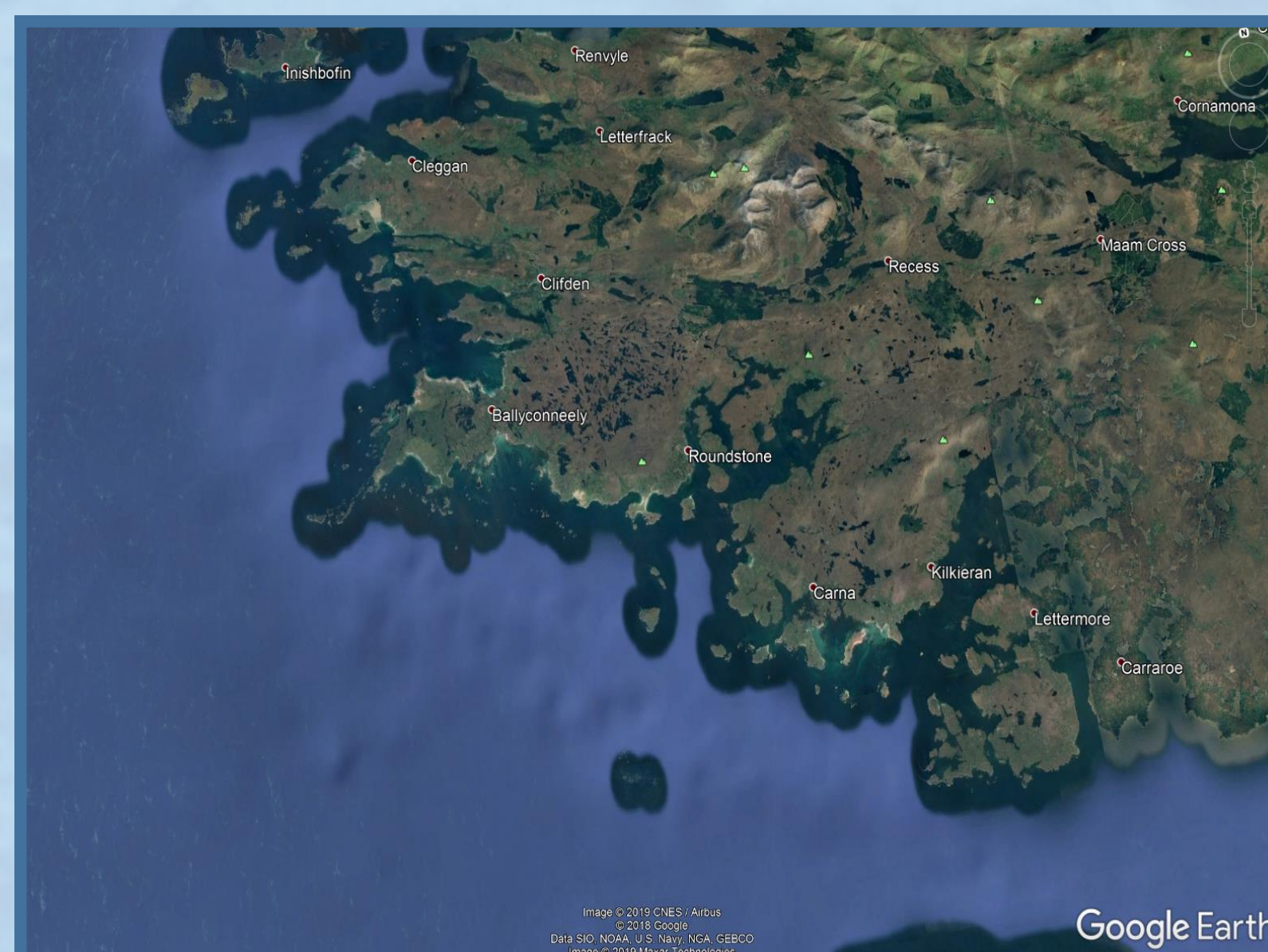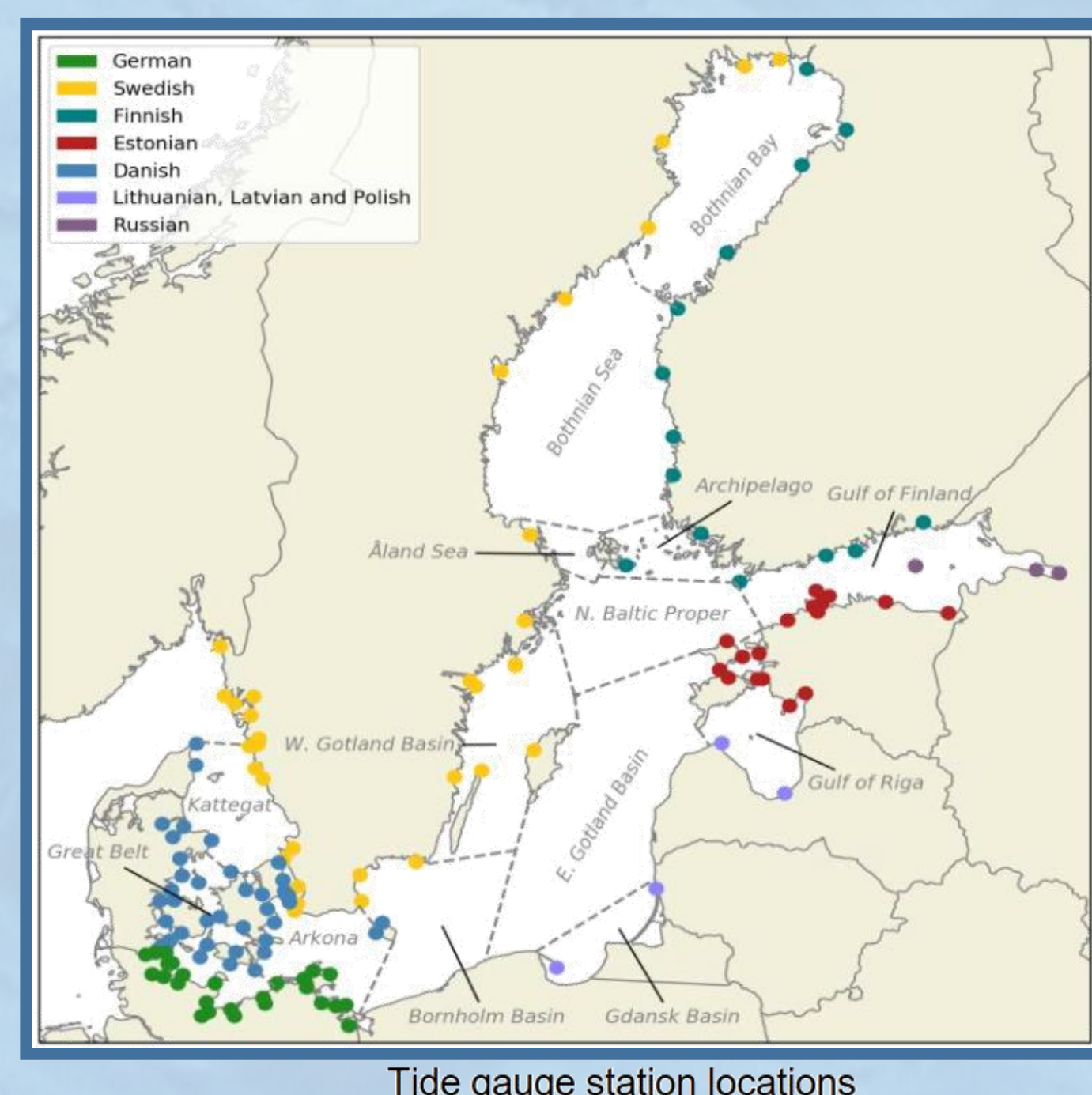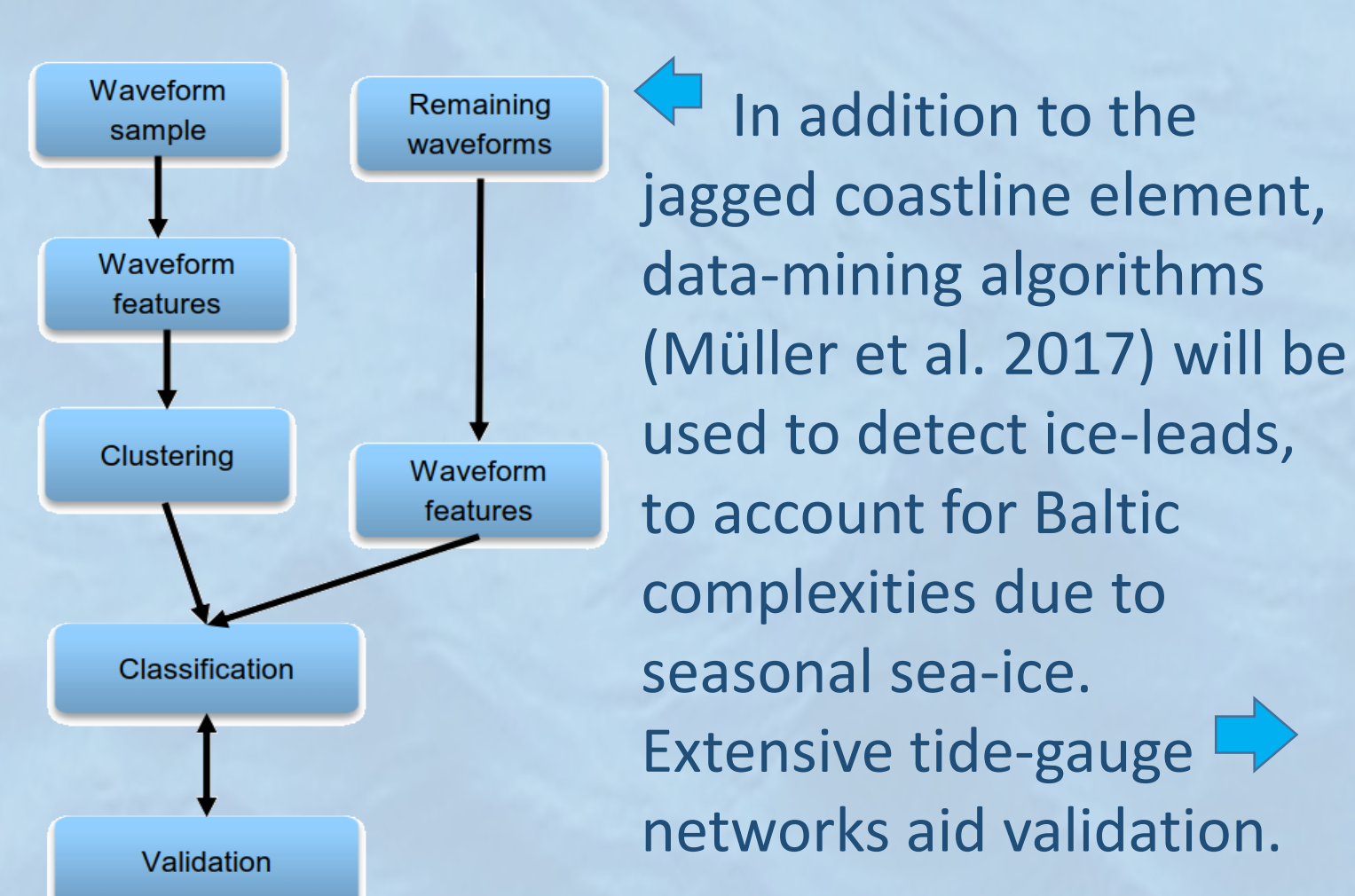
⬆ A purer coastal signal from the low-tide Baltic can be used to improve re-tracking and estimation of sea level sea levels in areas with complex coastlines.

Research Approach

Workflow
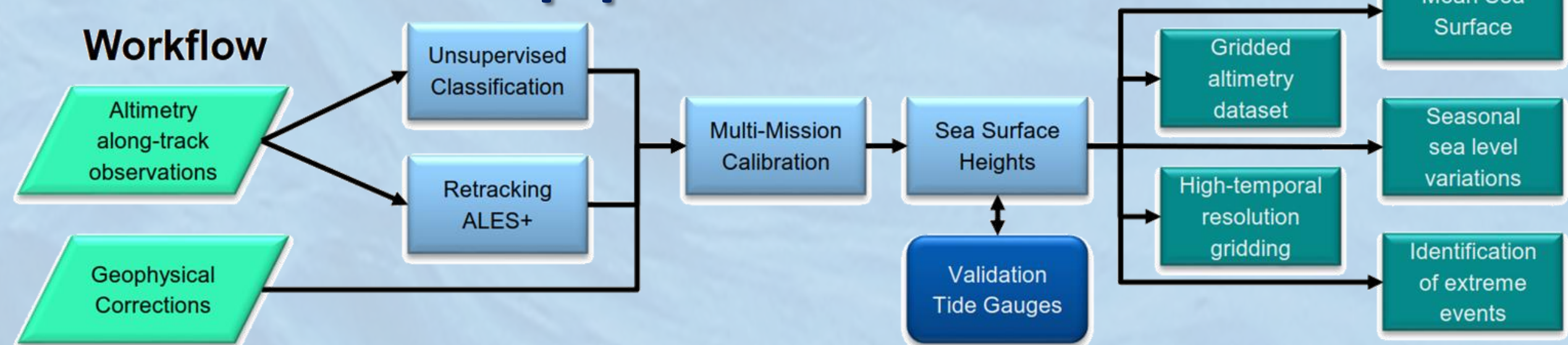
Re-tracking and validating will produce a series of inter-related sea-level products, and knowledge about (i) multi-mission calibration, (ii) classification approaches, (iii) regionally-tailored geophysical corrections, and (iv) harmonising trans-national gauge datasets.

➡ In addition to the jagged coastline element, data-mining algorithms (Müller et al. 2017) will be used to detect ice-leads, to account for Baltic complexities due to seasonal sea-ice. Extensive tide-gauge networks aid validation.

Coastal Altimetry approaches:
See Cipolini et al., 2014, & Passaro et al., 2017

Tide gauge station locations

Charting a course beyond Baltic SEAL

➢ It is essential to ensure the lessons learned and best practice approaches (i) integrate with global initiatives, and (ii) can be tailored to other regions.

➢ ESA Baltic SEAL is road-mapping the way forward for its research discoveries.

Framing the achievements of the Baltic+ SEAL initiative, and **charting** the way forward

External & internal **Stakeholder Perspectives & Advisory**

Context & **Best Practice Literature**

Developer Advances

Scientific **Roadmap Development**

Baltic+ SEAL Scientific Roadmap

Foreground Mapping

Join the conversation

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