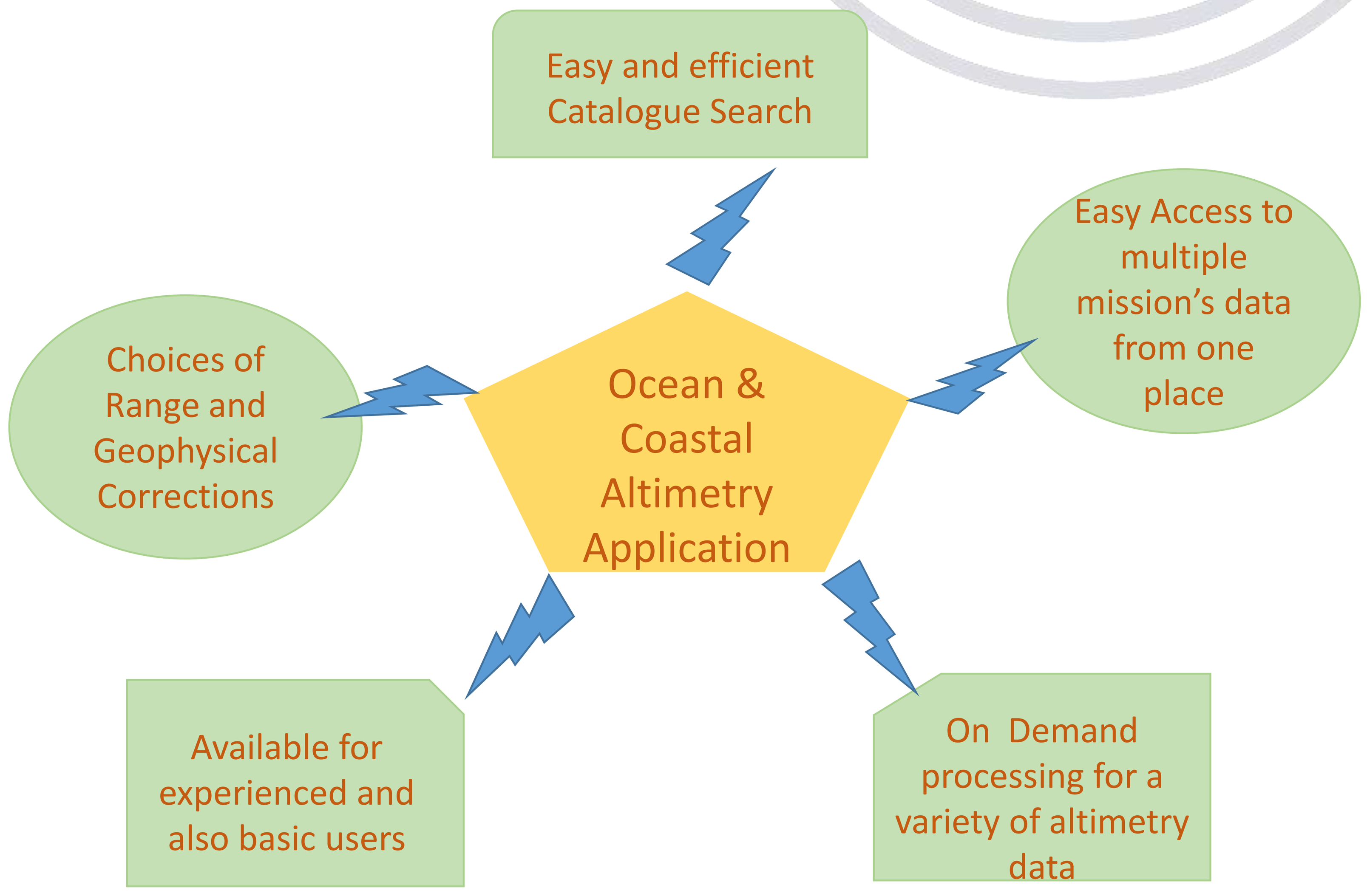
Research Application: Ocean &Coastal Altimetry

Background & Objectives

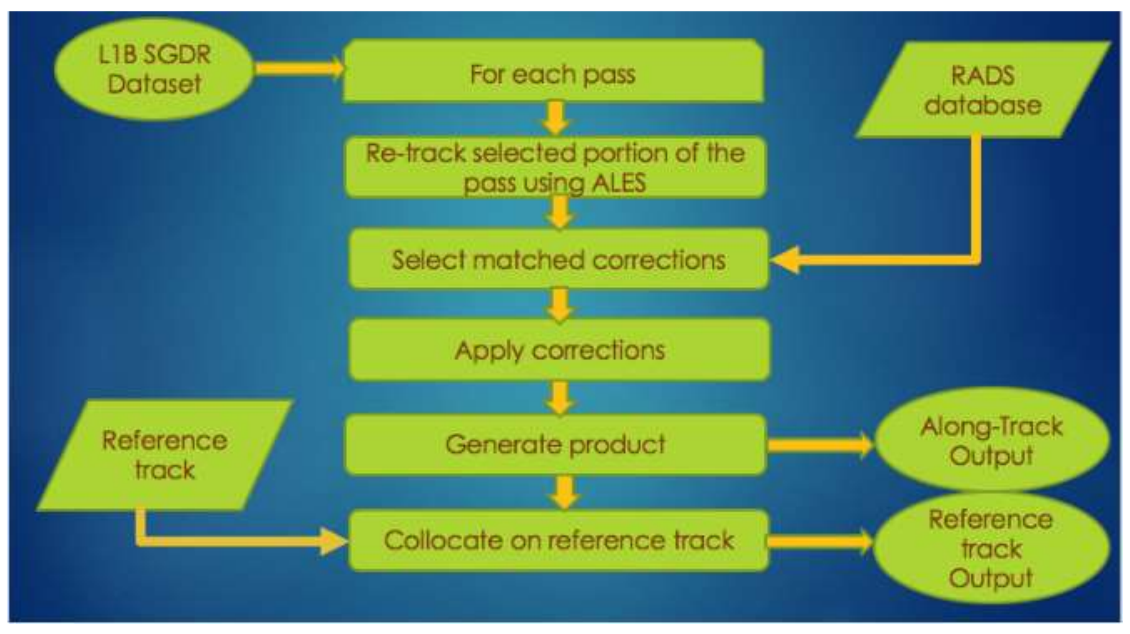
Satellite radar altimetry is capable of taking an accurate measurement of the height of the sea surface along the ground track of the satellite, in addition to an estimate of the significant wave height (SWH) and surface wind. However, altimetry data in the coastal zone are normally flagged as unreliable in standard ocean products, due to contamination of the altimeter footprint by land and calm waters.

Over the past few years, the National Oceanography Centre (NOC), UK, has developed the Adaptive Leading-Edge Subwaveform (ALES) retracker (Passaro *et al.*, 2014) that is potentially better able to retrieve geophysical information from pulse-limited altimeter waveforms in the coastal zone. Since then, ALES has been used at NOC to retrieve improved coastal data from most altimetry missions for use in internal projects. Integration of the NOC's Coastal Altimetry Processor on the CoReSyF platform will provide the wider coastal communities not only with access to the coastal altimetry data but also the ability to process them for bespoke purposes.

Key Attributes

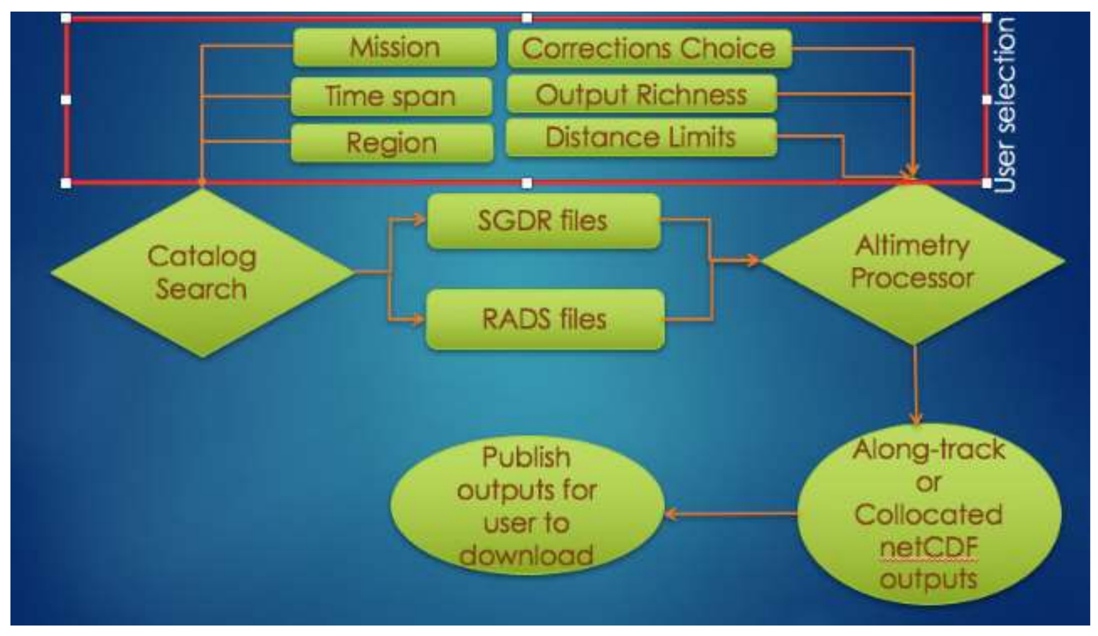


Methodology



NOC's Coastal Altimetry Processor Flowchart

The CoReSyF Coastal Altimetry Processor uses the ALES retracker to manipulate data from the Level1 Sensor Geophysical Data Record (SGDR) altimetry products for a chosen section of track (see left). This yields the altimeter range (SWH) and backscattering coefficient, sigma0, which is used to obtain wind speed.



Ocean & Coastal Altimetry Application Flowchart

The next stage of the process is to match the improved Range and Geophysical Corrections available from the Radar Altimeter Data System (RADS) provided by the Technical University of Delft, to produce Sea Surface Height Anomaly (SSHA) values.

SSHA = Orbit – (Range + ionosphere + dry_troposphere + wet_troposphere + sea state bias + solid_earth_tide + loading_tide + ocean_tide + pole_tide + Dynamic_atmospheric + Mean Sea Surface)

The system generates two netCDF products: along-track and on a reference track

User interaction is controlled through Integration of the Altimetry Processor in the Geoportal (see above right).

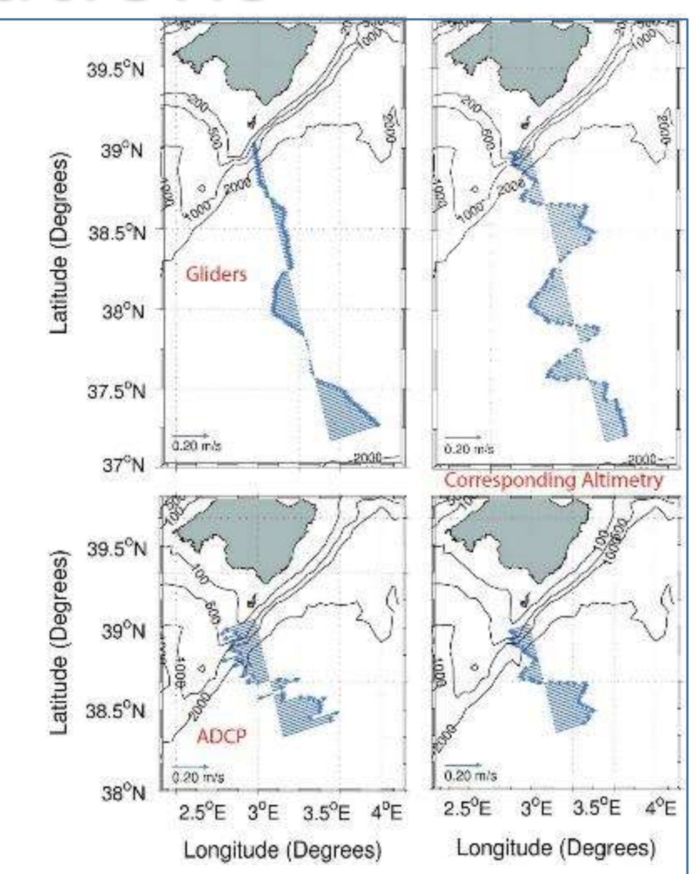
Key Results

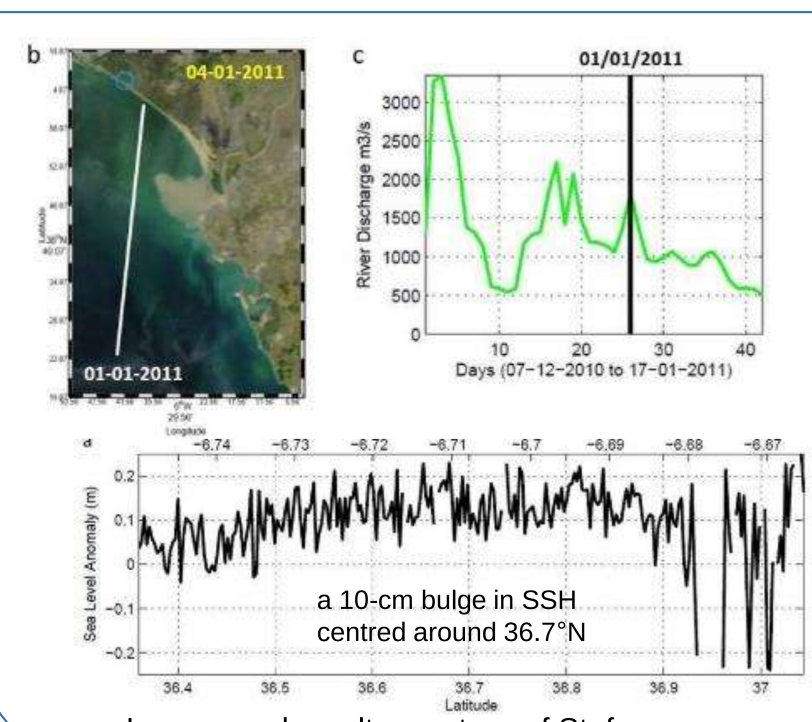
The application outputs include a range of parameters at 20 or 40 Hz (determined by the mission frequency) and the used range and geophysical corrections at 1Hz from RADS.

Product	Source	Along -Track	Ref- Track
Time, lat, lon	SGDR	Yes	Yes
Orbit	SGDR	Yes	No
Range	SGDR & ALES	Yes	No
SWH	SGDR & ALES	Yes	Yes
Wind speed	SGDR	Yes	Yes
Sigma0	ALES	Yes	Yes
SSHA	SGDR (improved) & ALES	Yes	Yes
TWLE	SGDR (improved) & ALES	Yes	Yes
Corrections	RADS	Yes	No

Example Applications

Surface absolute geostrophic velocities from coastal altimetry outputs can be used to monitor coastal current systems. The example (right) from Heslop *et al*, 2017 (doi:10.1002/2017GL076244) shows how altimetric data compare to *in situ* data from gliders and shipborne ADCP system.





Images and results courtesy of Stefano Vignudelli, CNR, Italy

River Plumes. Heavy discharge from the Guadalquivir River on Jan 1, 2011 creates mixing, seen in the Modis image (above left) and is seen in the CryoSat-2 overpass three days later (below)

This project has received funding from the EU's H2020 research and innovation programme under grant agreement No 687289