C-RISe – Coastal Risk Information Service
Satellite Products Data Update

D Cotton SatOC Ltd., 12/03/21

1 Introduction

The C-RISe project team has acquired additional funding to support an update to the satellite products already distributed. This short note describes the upgrade to the data sets

2 Near Real Time Data Web Page

The Near Real Time Data demonstration Web Page will continue to be maintained until the end of December 2021 at https://www.satoc.eu/projects/c-rise/demo.html. This page presents the latest available wind, wave and surface current data, as follows:

- Satellite altimeter significant wave height and surface wind speed
  - Along-track at 7km intervals.
- Satellite scatterometer surface wind speed and direction
  - 25km gridded data; 2 x 500km swath
- Satellite measured surface current data
  - Total surface current estimated from satellite data. 0.25° resolution. Daily mean
- NOAA Wavewatch III forecast model output: Significant wave height, mean wave period, mean wave direction, surface wind speed and direction.
  - 0.5° grid, 3 hourly updates

Please note that the satellite data are produced by a Fast Delivery Processing chain, which may contain data gaps due to anomalies in data transmission or processing.
SatOC can set up a daily automatic ftp transfer if users would like to receive data directly onto their systems.

Figure 1 gives an example of these data for the 15th September 2020.

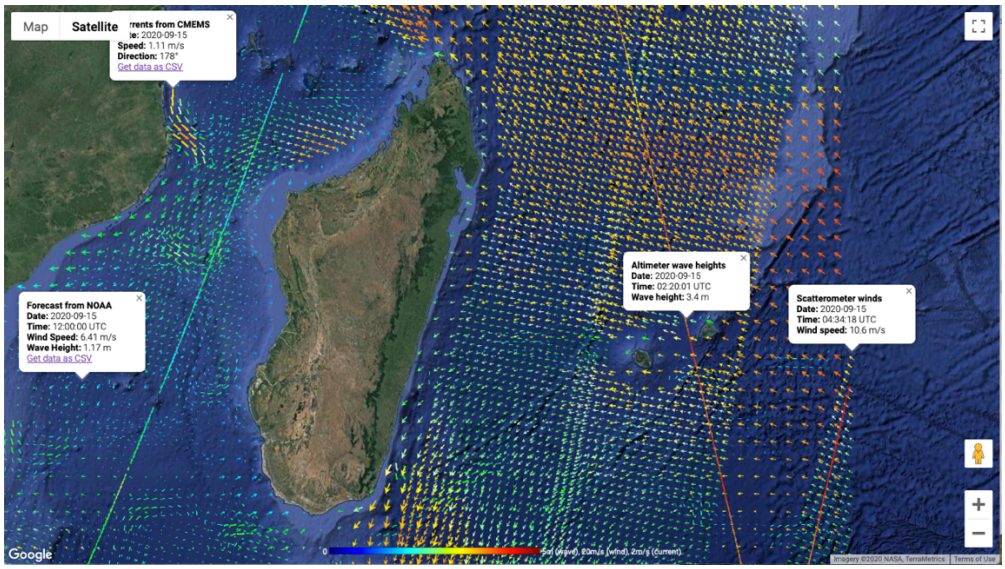

Figure 1 Screenshot from C-RISe Near Real Time data demonstration page 15th September 2020

3 Extension of Wind and Wave Climatology data

An extension to the satellite wind, and wave climatology data, and sea level data, will be provided, as specified in Table 1. This extended data set will be distributed early on 2021, on USB / hard drive and online. Unfortunately we have not been able to provide an update to the surface current data at this time, due to a change in the format of the source data. We hope to be able to provide an update later

Parameter	Location	Description	Time Coverage	Satellites
Sea Level	/Data/C-RISE/AltimetrybyPass	Along track data from the NOC coastal processor, 10 day repeat.	2002-2020	Jason-1, Jason-2, Jason-3
			2002-2010, 2013-2016	Envisat, AltiKa
Significant Wave Height and Wind Speed	/Data/WindWave/waves	Monthly, 1° x 1° gridded climatologies, from ESA CCI+ sea state	1992-2018	ERS-1, ERS-2, Envisat, Topex, Jason-1, 2,3
Wind speed and direction	/Data/WindWave/winds	Monthly, 0.25° x 0.25°, gridded climatologies from ASCAT	2007-2019	METOP-A, METOP-B
Total surface current (geostrophic + Ekmann)	/Data/Currents/currents_L4	0.25° x 0.25°, gridded climatologies, from Globcurrent	2002-2016	Envisat, Jason-1, 2,3

Table 1. Satellite Climatology and sea level data to be provided by C-RISe

4 Extended Sea Level Data Set

In addition to the one year extension to the existing sea level data set from the Jason-3 satellite (red tracks in Figure 2), an improved spatial resolution in the sea level data will be achieved by processing altimeter data Envisat and AltiKa (yellow tracks in Figure 2).

Because of the different repeat orbits, the data from the Jason satellites provide a measurement once every 10 days, and the data from Envisat and AltiKa provide a measurement once every 35 days (but at a higher spatial resolution).

Figure 3 shows examples of long term trends from the two data sets.

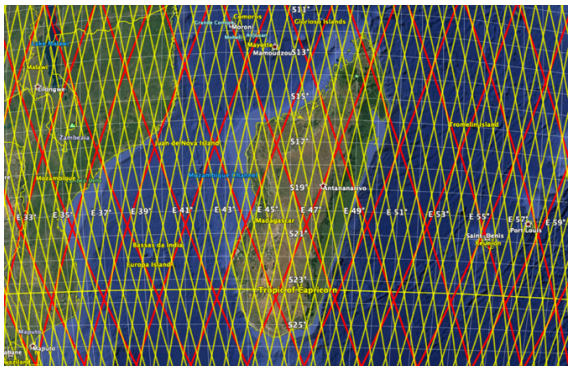

Figure 2 Coverage of the extended sea level data set. A time series of one measurement every 10 days (2002 – 2019) will be provided on the Jason satellite tracks (red), and a time series of one measurement every 35 days (2002-2010, 2013-2016) will be provided on the Envisat / AltiKa satellite tracks (yellow)

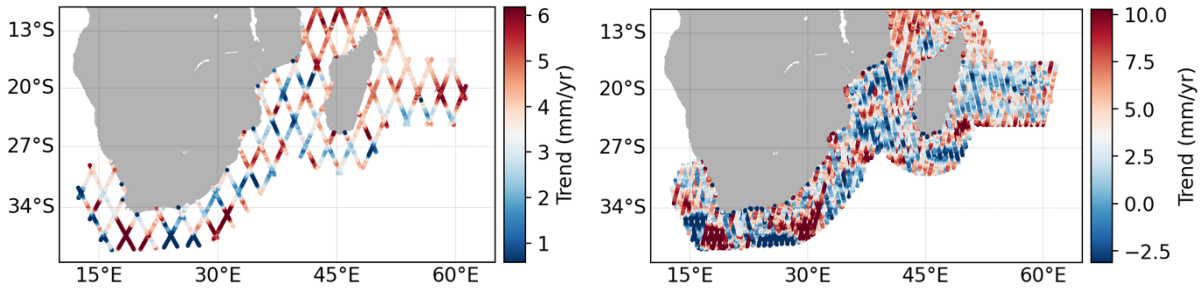

Figure 3 Annual Trends in Sea Level from Reprocessed Altimeter Data. Left for 2002-2020, from Jason-1, Jason-2 and Jason-3 data. Right for 2002-2010, 2013-2016 from Envisat and AltiKa data.

5 Shoreline Change Data

Shoreline Change Data Sets are provided for Mozambique and Madagascar.

For each region the following data sets are provided (as shape and gdb files)

- Shorelines for each year in the period 2000 to 2020
- 10 year trends and 10 year trend uncertainty
- 20 year trends and 20 year trend uncertainty
- Shoreline change rates

These data were generated by NOC.

Shorelines between 2000-2020 were created by annual median composites of LandSat 7 and 8 imagery which delineates the approximate mean high water mark. Methods are inspired by Coastsat, a Google Earth Engine-enabled open-source software toolkit that delineates shorelines at any sandy coastline worldwide from publicly available satellite imagery (https://github.com/kvos/CoastSat).

Shoreline change rates were calculated using the Digital Shoreline Analysis System (DSAS) version 5.0 (https://www.usgs.gov/centers/whcmsc/science/digital-shoreline-analysis-system-dsas). This toolkit was also used to forecast shoreline change by a 10- and 20-year period.

Shorelines are not provided in complex areas of shorelines, low-lying shorelines and mangrove coastlines where uncertainty would be too great.
No manual checks have been completed, in general the accuracy is assumed to be within 10m.
Positional uncertainty is larger for non-sandy coastlines as the algorithm uses sandy/water boundary to find shoreline. Transects on these shorelines have been included in the dataset

The Mozambique data set was generated for and funded by the ESA EO4SD project. The Madagascar data set was generated for and funded by C-RISe.

An additional document provides a short guide on loading and viewing these data sets on GIS *("Guidance note for Shoreline Files")*

References: Vos, K., Splinter, K.D., Harley, M.D., Simmons, J.A. and Turner, I.L., 2019. CoastSat: A Google Earth Engine-enabled Python toolkit to extract shorelines from publicly available satellite imagery. Environmental Modelling & Software, 122, p.104528
Himmelstoss, E.A., Farris, A.S., Henderson, R.E., Kratzmann, M.G., Ergul, Ayhan, Zhang, Ouya, Zichichi, J.L., and Thieler, E.R., 2018, Digital Shoreline Analysis System (version =5.0):
U.S. Geological Survey software release, https://code.usgs.gov/cch/dsas.-0.523263 1.199775 6.114434 5.364795

6 Software

Python Software routines are provided as a basis for visualising and analysing these data sets.
Other applications (e.g. Panoply https://www.giss.nasa.gov/tools/panoply/) can also be used to visualise netcdf format data.
Guidance notes for setting up and running the python routines are provided in a separate document ("*C-RISe_Python Code Guidelines.pdf*")

Annex A – USB Drive Contents and Structure

The data are provided on the USB Drive in the following directory structure. We recommend that you copy the directory structure across under a top level /Shared/Data Directory. Remember to edit the python code so that it matches your directory structure.

Data Sets

/Data/C-RISE/AltimetrybyPass

Co-located Satellite Altimeter Along Track Time Series:		12.23 GB
Jason-1, Jason-2, Jason 2002-2020	j1j2j3_stats_ales_p<passnumber>.nc	
Envisat, AltiKa, 2002-2010, 2013-2016	n1sa_stats_ales_p<passnumber>.nc	

/Data/WindWave/Waves

Wave Climatology (CCI Sea State): 08/1991 – 12/2018 694 MB

/Data/WindWave/Winds

Wind Climatology (ASCAT) 05/2007 – 12/2019 4.65 GB

/Data/Currents/currents_L4

Surface Current Climatology (GlobCurrent) 01/2002- 12/2016 2.29 GB

/Data/Shoreline Change

Shoreline Change Data Set

Mozambique	351 MB
Madagascar	733 MB

Tide Gauge Data 550 MB

Software

/Currents
/SeaLevel
/WindWave

Documentation

C-RISE Data updateV2 (this document)
C-RISe_Python Code Guidelines
Guidance note for Shoreline Files
C-RISe New Data Trend and Annual Cycle
Madagascar_Shoreline_showcase
madagascar_map_series