Monitoring Water Quality in Coastal Systems with Drones

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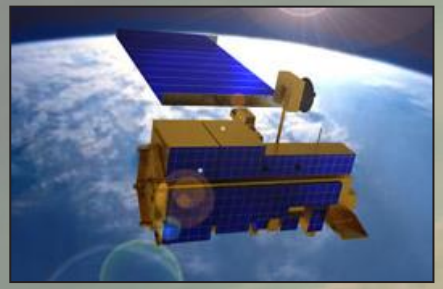
BEODAY

DECEMBER 8TH 2016

MODIS




Landsat-8

Sentinel-2

Drone

USER CASE

» **Dredging activities** are subject to growing **environmental regulations**

  » Sediment plumes behind ships can not exceed specific threshold

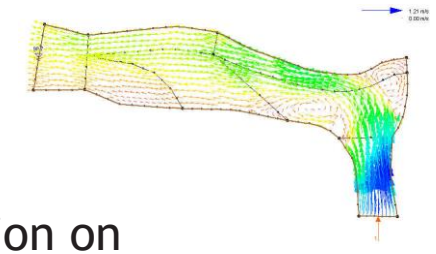
» **IMDC** : consultancy for dredging industry, harbour authorities, oil and gas industry and governmental organisations:

» **Current practice & technology:**

  » Lab measurements: expensive, local, time consuming

  » In situ stationary (buoys) and mobile (vessel-based) measurements : fixed locations, local

  » Hydrodynamic, wave and sediment transport model



Need for up-to-date and high resolution information on sediment concentration, integrated into a decision support tool

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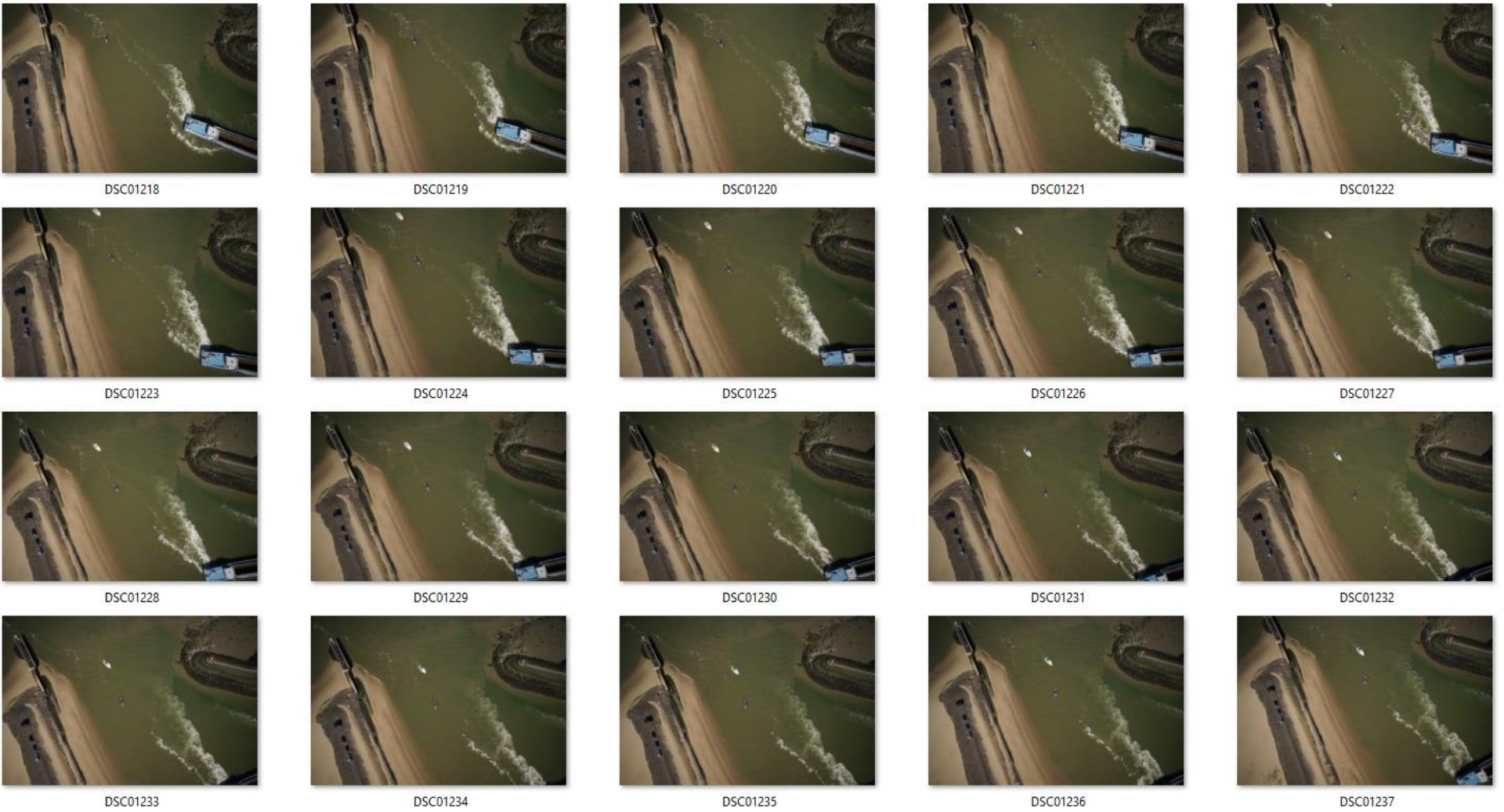
Port of Zeebrugge, Belgium 17/09/2014

Scheldt river, Belgium 25/09/2015

Breskens, The Netherlands 15/07/2016

DRONESED – CHALLENGE 1 - GEOREFERENCING

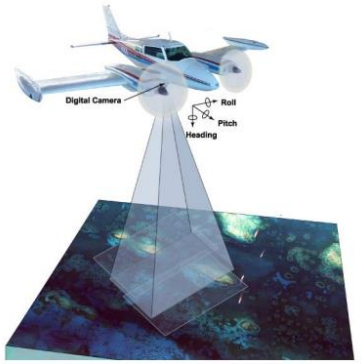
Dynamic environment and sunglint effect does not allow “normal” SfM processing of drone imagery over water



DRONESED – CHALLENGE 1 - GEOREFERENCING

Dynamic environment and sunglint effect does not allow “normal” SfM processing of drone imagery over water

Direct georeferencing



Dedicated hardware

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DRONESED – CHALLENGE 2 – RADIOMETRIC CALIBRATION

Camera - Radiometry

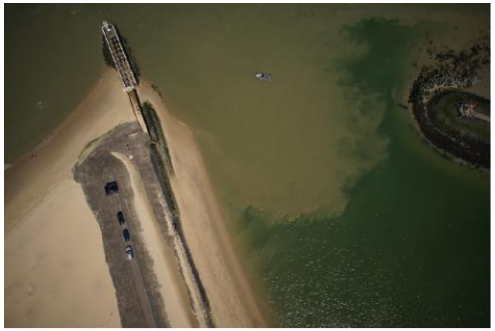
VS

Illumination conditions

VS

Waves

Raw RGB image

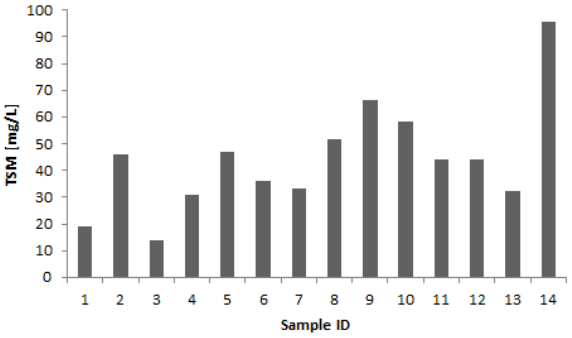


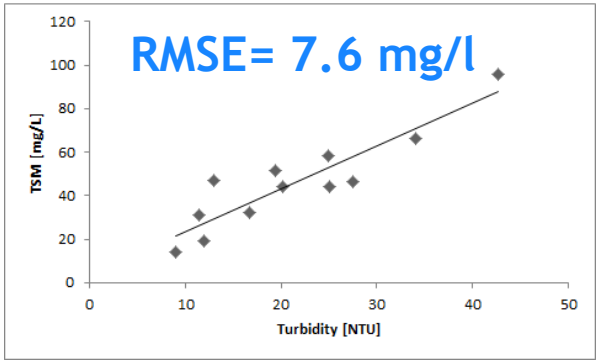
Vignetting

Reflectance (Rapp & Rw)

DRONESED – CHALLENGE 3 – SEDIMENT MODEL

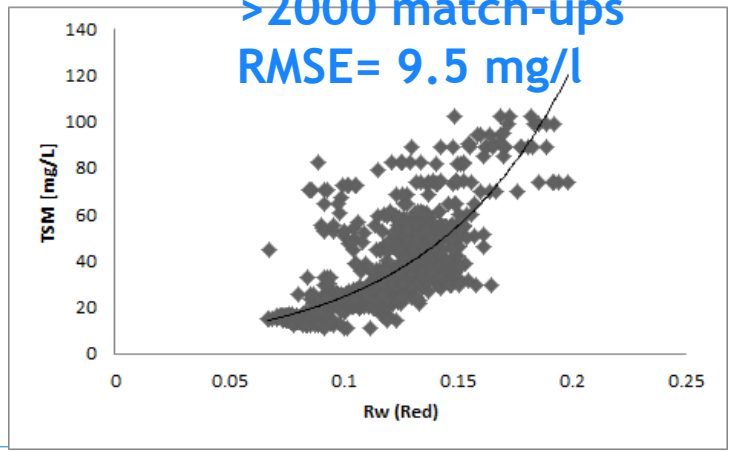
1. Field measurements (TSM from water samples and OBS Turbitidy logger)





2. Extraction of Rw values for each point of the turbidity logger

3. Correlation between Rw and TSM



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DRONESED – CHALLENGE 3 SEDIMENT MODELLING

Result: Georeferenced RGB and TSM map

DRONESED – CHALLENGE 4 COMBINATION WITH MODELLING

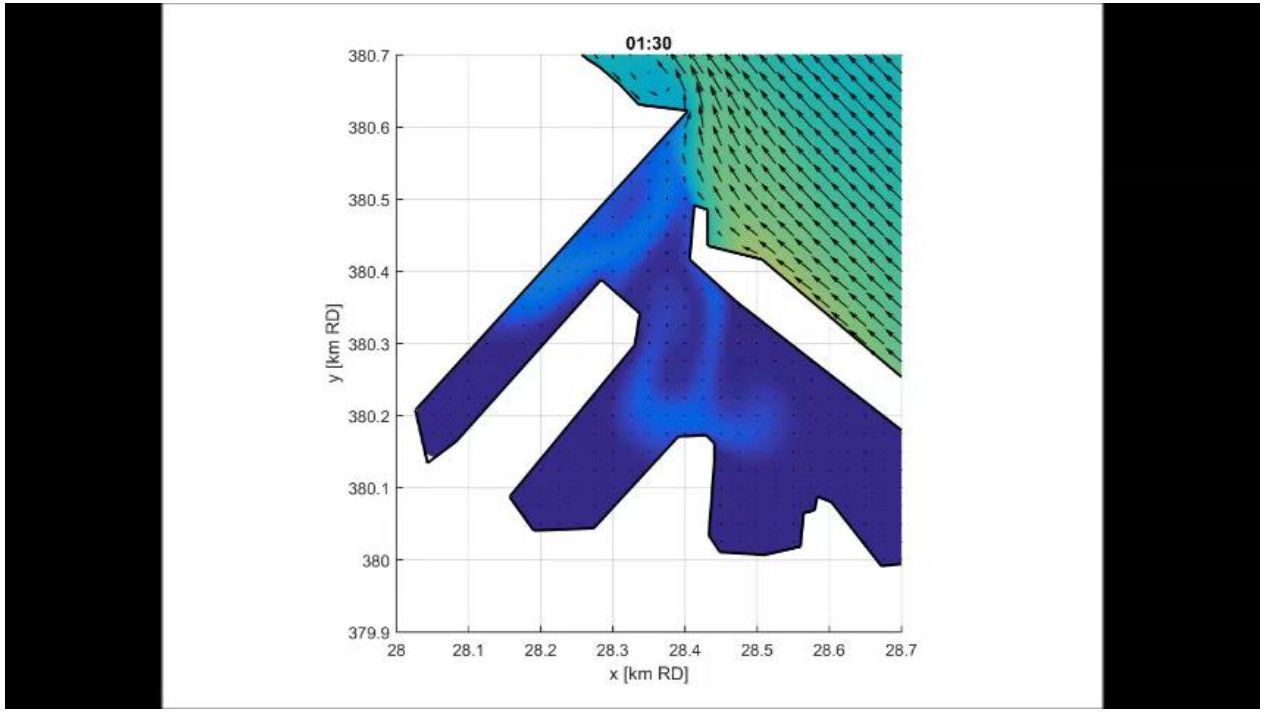
General sediment transport model for the Scheldt

↓

Detailed level model for Breskens

↓

Model developped and validated with use of Drone data



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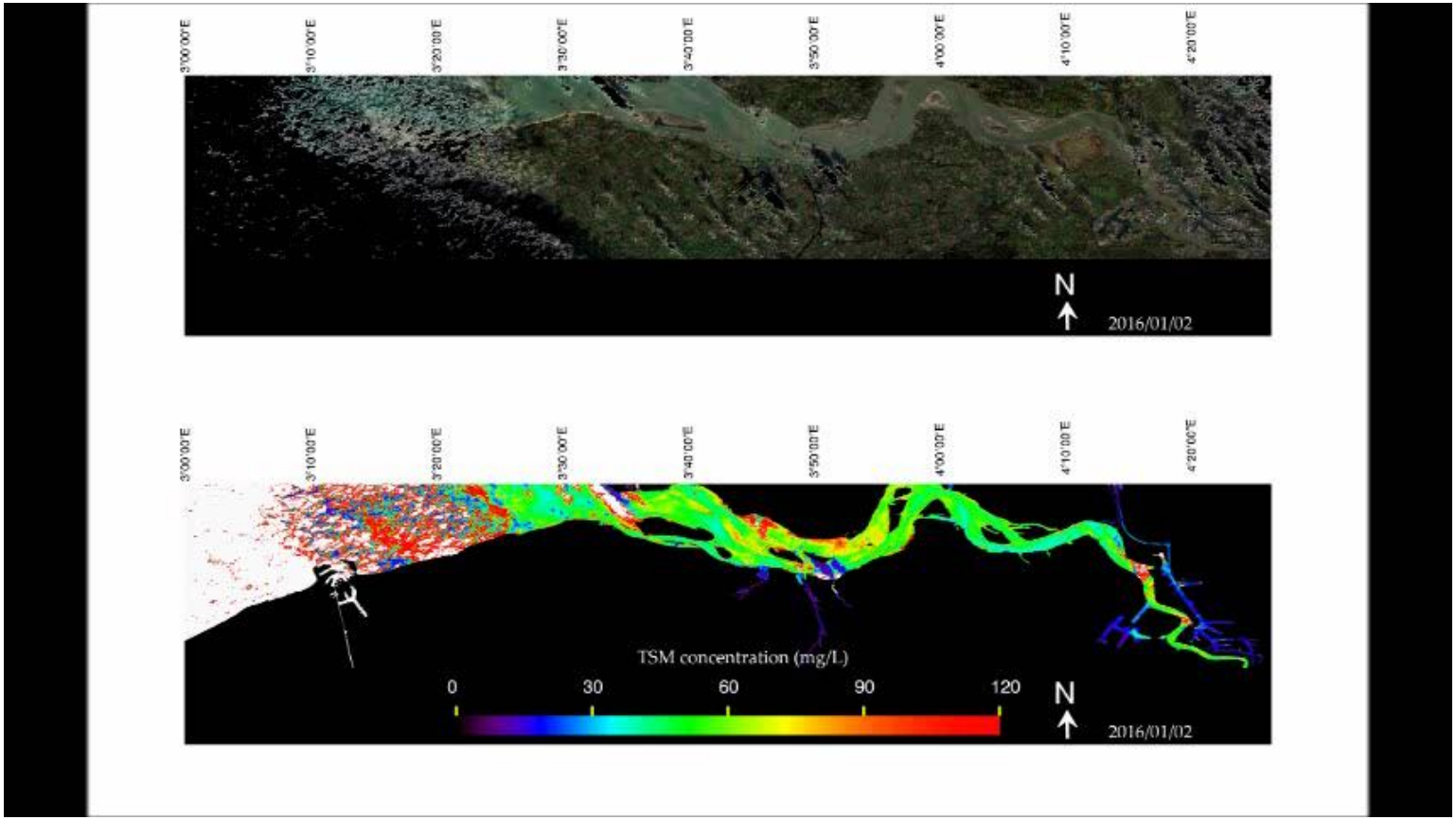
DRONESED – CHALLENGE 5 – COMBINE WITH SATELLITE DATA

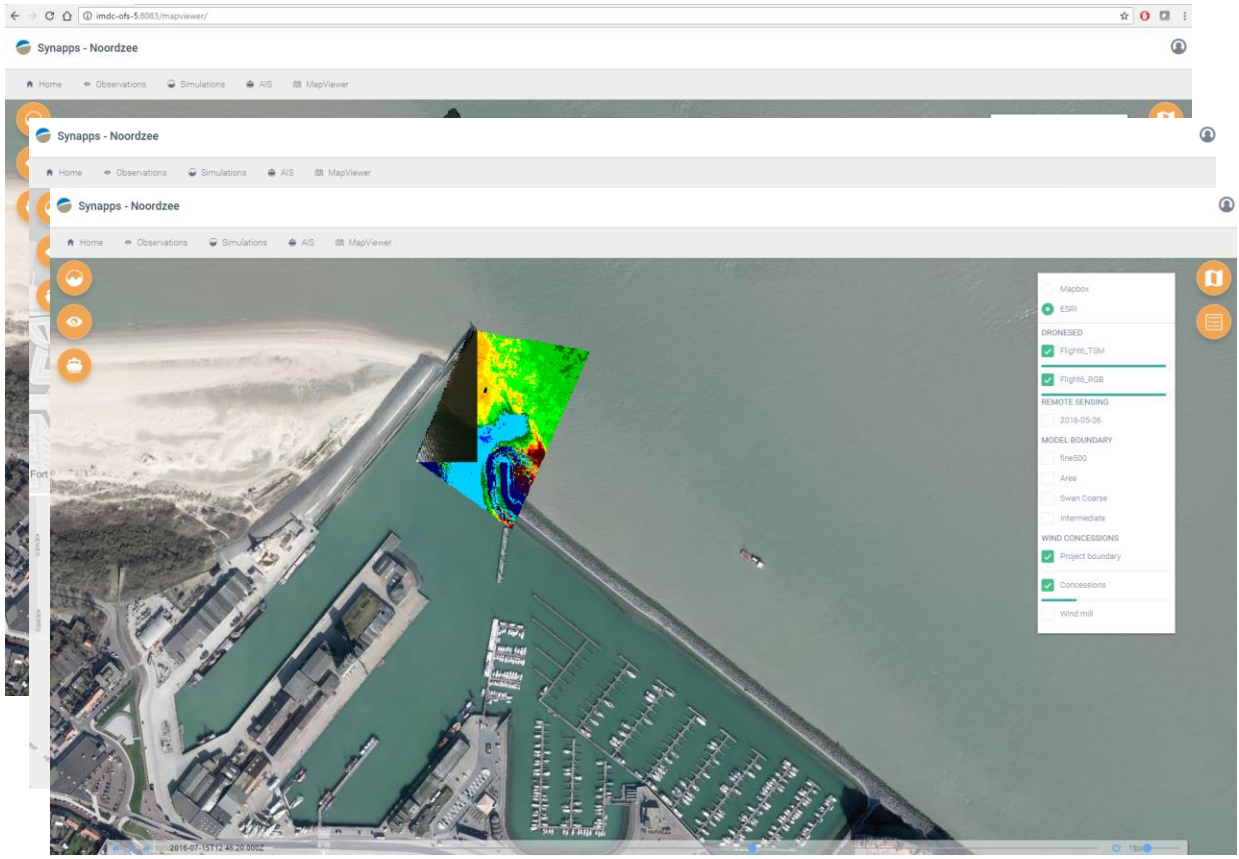
- Satellite data can be used to define historic background concentration
- Selection of available Sentinel2 for 2016 processed with MORPHO



DRONESED – CHALLENGE 6 - GET THE DATA TO THE END-USER

IMDC's operational support system 'SYNAPPS':

- Web-based
- Modular
- RS layers
- Real-time hydro measurement data
- Numerical model results
- Project-specific outline, e.g. wind turbine positions, dredging zones, …
- Visual data analysis



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Future operational setup…

Data sources

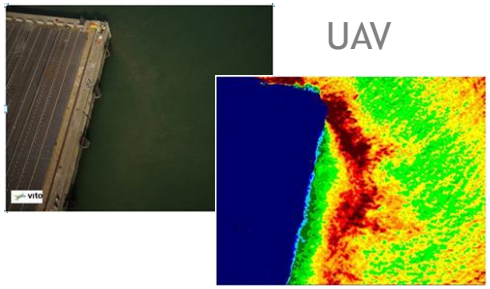
UAV

Satellite

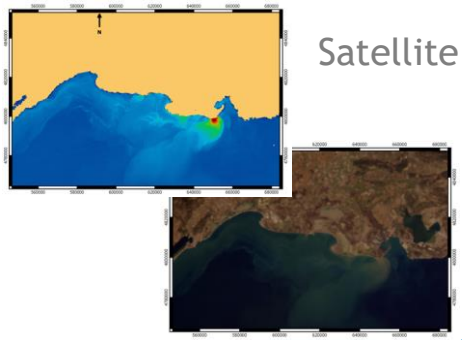
Processing

Sediment maps

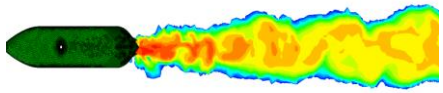
UAV



Satellite

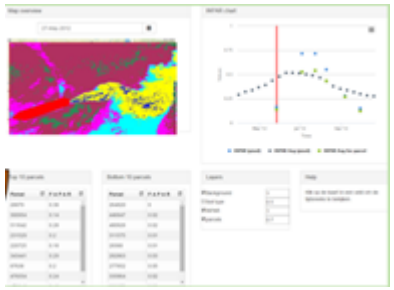


Sediment Modelling



SDI

Data analysis



Decision support

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Thank you!

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