TOPVOYS - Tools for Optimizing Performance of Voyages at Sea

3-years Project Started in October 2018
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Why Ship-routing

• Shipping companies are faced with environment-based requirements on reduction in CO2 and NOx releases from ships;

• Reduced fuel consumption is cost saving and contributes to decline in emission;

• Ship routing should benefit from use of reliable observations of waves, current and wave-current interactions for reduced fuel consumption & emissions and for improved safety;

• Satellite observations are essential in this context;

• This will be tested in post-voyage analyses and real time routes with specific focus on:
  ➢ North Atlantic Ocean crossings;
  ➢ Voyages around Southern Africa;
  ➢ Voyages from Europe to the Far East (e.g. China, South Korea, Japan);
Todays Map of Global Shipping Lanes

Marks areas of Strong wave-current interactions

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TOPVOYS Main Goals and Approach

- Advance analyses tools and decision support system for voyage optimization.

- Combine marine weather analyses and forecasts including wind, wave and surface current conditions, ship characteristics and cargo requirements, with real time analyses of satellite data, including:
  - AIS
  - Altimetry for SWH and surface geostrophic current;
  - Radiometry for SST;
  - High-resolution imageries (SAR, infrared, spectrometer) for snapshots
Wave-Current interaction in the Agulhas Current region on 28-29 March 2016

- ECMWF wind field
- WaveWatch III model sea state
- Altimeter SWH observations
- Simulated swell-current interactions
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ECMWF Wind field

Lp WW3 - Cycle: Jason-2 282 Orbit: 46

Hs WW3 - Altimeter Date 2016.02.29.03.17

innovation
Traffic-Light System

Wave-rays - black lines
Surface current - colored

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Ship density in Agulhas Current

Surface current observations

Real time use of AIS

innovations

Clement Le Goff et al, 2018

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This TOPVOYS project is highly benefitting from active participation of 2 shipping Companies;

- Detailed knowledge of routing requirements and best practice;
- Select some recent reported difficult ship voyages and carry out reanalyses;
  - Run WW3 model with surface current input;
  - Reprocess altimetry SWH data and compute gradients and max/min wave height;
  - Overlay the SST field and surface current field;
  - Examine the AIS data

- Be present at a World Ocean Current user consultation meeting in ESA-ESRIN, 21-22 February 2019;
Recommendations on future investments in the Atlantic Region.

• A multidisciplinary Atlantic Cluster on Marine Litter might be timely;

• Shipping companies should be invited to take part (e.g. in-situ water sampling);

• Surface current and waves are essential physical ocean variables;

• How can satellite-based imaging spectrometry contribute?

• First step might be to call for a brainstorming meeting.

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