CP4O Scientific Road Map and the CP4O CCN Activities

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CP4O CCN Final Presentation,
ESRIN, Frascati, 10 December 2015

CP4O Scientific Road Map

Final Activity of CP4O was to propose a Scientific Roadmap for future activities ranging from research to operational applications.

Objective is to maximise exploitation of SAR altimeter data, starting with CryoSat and to be continued with Sentinel-3

Input from independent expert panel:

Walter Smith	NOAA, USA
Natalia Galin	formerly at NOAA/UCL, USA/UK
Katharine Giles	UCL, UK*
Keith Raney	2kR-LLC, USA
Laurent Phalippou	Thales Alenia Space, France
Rob Cullen	ESA
Xiaoli Deng	Newcastle Univ, AUS

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CP4O Scientific Road Map

- Scientific Priority Areas to further improve SAR altimeter data processing, to support the exploitation of CryoSat data and to prepare for Sentinel-3
- A Scientific Development Strategy for improving the development methods and products
- An outline plan for fostering a transition from research to operation activities
- Strategies for integrating the methods and models developed into existing large scientific initiatives and operational institutions

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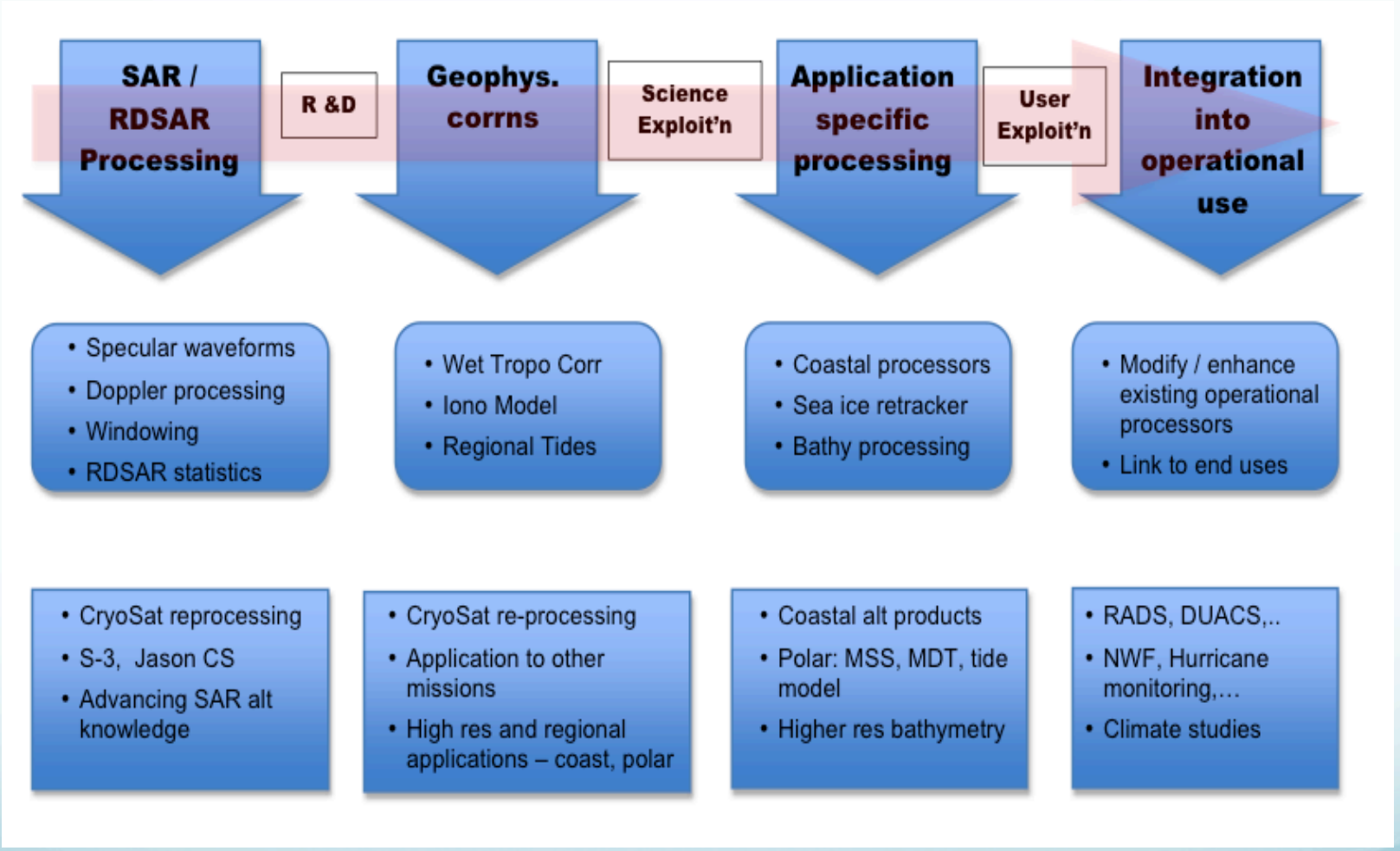
CP4O Roadmap



1. SAR Processing Issues

- Under sampling of "peaky" echoes
- Optimising Doppler processing / selection / weighting
- Purpose / optimisation of windowing
- SAMOSA implementation (Thermal Noise)
- SAR waveform blurring at high rates
- Sensitivity to mis-pointing
- Sea state bias model in SAR mode
- Effects of swell and swell direction on SAR mode
- Quality control / flagging
- Best processing methodology in complex coastal regions?

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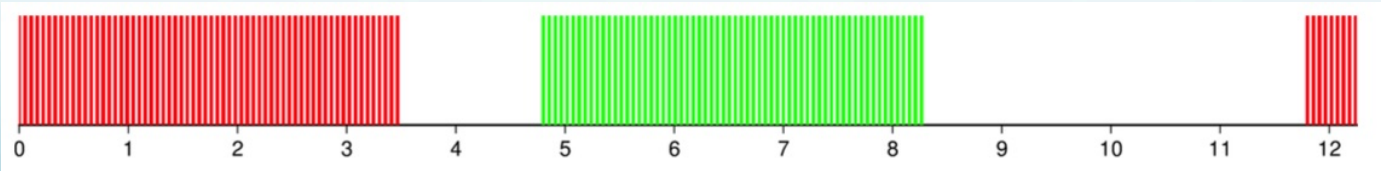
2. RDSAR / PLRM Processing

- Effect of SAR transmission/reception scheduling on statistics
  - How to optimise for CryoSat and Sentinel-3?
  - Use of all echoes, even if they are correlated
  - Smoothing (e.g. ¼ + ½ + ¼)
- Zero padding and "Jensen Sampling" implemented in RADS
  - Zero padding before FFT and then "oversampling" waveform to get more waveform samples (256 instead of 128)
  - CNES tried this approach but got different results
  - Recommendation for some further investigation



3. Geophysical Corrections

- Essential that best possible geophysical corrections are provided to ensure that the gains in measurement precision are not lost because of uncertainties in environmental corrections.
- Recommended developments are:
  - WTC data set for whole CryoSat mission, global along-track and gridded data sets
  - Change ionosphere model used to estimate electron content above CryoSat orbit

4. Processor / Product Development

Open Ocean

- Sentinel-3 DPM should be updated to include best performing implementation of SAMOSA3.
- Further improvements to CPP SAR mode processing scheme should be developed and implemented.
- Apply SARin processing for oceanography (e.g. across track slope)

Coastal Ocean

- Continue SARin investigations, develop schemes to improve processing of SAR data at coast.

4. Processor / Product Development (cont)

Polar Oceans

- Carry out a whole mission reprocessing of Cryosat data so that all polar data are available with a consistent baseline.
- Develop and publish improved Polar tide model.

Sea Floor Bathymetry

- Process a longer period of SAR mode altimeter data for the Pacific SAR region, and apply an improved prior bathymetry.
- Investigations in shallow / coastal regions to investigate potential capabilities of data in this environment.

CP4O CCN Activities

1. **SARin for Coastal Altimetry**: Improved SARin processing for Test Data Set Generation. **isardSAT**
2. Implementation of a Arctic Ocean Tidal Atlas. **Noveltis and DTU Space**
3. **Improvements to the SAMOSA re-tracker** implementation and Evaluation- Optimised Thermal Noise Estimation. **STARLAB and SatOC**
4. Extended evaluation of CryoSat-2 **SAR data for Coastal Applications NOC**

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