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→ 8th COASTAL ALTIMETRY WORKSHOP

23–24 October 2014 | Lake Constance | Germany

Welcome to the workshop of the Coastal Altimetry Community

Welcome to Konstanz!

8th COASTAL ALTIMETRY WORKSHOP

23–24 October 2014 | Lake Constance | Germany

Switzerland
Germany
Konzil building
(CAW-8)
OSTST hotel

Objectives of this workshop

- review the progress in waveform processing, correction and applications of altimetry in the coastal zone
- look at the new/latest/future missions and relevant technology – identify opportunities and synergies
- provide a lively and informal forum for experts and users
- converge on **recommendations** where appropriate (to Agencies and OSTST)
- report to OSTST plenary

We need to prepare for the scientific exploitation of SAR altimetry operational missions in the coastal zone (S-3, S-6/J-CS)

for instance to investigate and monitor:

coastal dynamics / waves

hazards (such as surges)

coastal sea level rise

Foster the Next Generation of Earth Observation Scientists

In which funding framework (Copernicus, SEOM, other …?)

Session co-chairs

- Session co-chairs have a crucial role
  - stimulate discussion (with seed questions that they have drafted)
  - summary of session in bulletpoint format
  - Please **include in the summary all posters relevant to your session**

POSTER SESSION + ICEBREAKER COCKTAIL

Thursday 23 October 17:20 to 19:20

1. Altimetry data for regional applications: the CTOH database | Florence Birol (LEGOS, France)
2. Altimetric Studies of Sea Surface Height and Warm Water Movement Correlations in Coastal Greenland | Charles Brechtel (Colorado Center for Astrodynamics Research, USA)
3. Assessment of Coastal Altimetry Along the Norwegian Coast | Kristian Breili (Norwegian Mapping Authority, Norway)
4. Retracking and Validation of PLRM CrySat-2 Altimetry Data in the German Bight | Christopher Buchhaupt (TU Darmstadt, Germany)
5. Global Sea Level Reconstructions from Tide Gauge and Satellite Altimetry Data | Francisco Mir Calafat (NOC, UK)
6. Characteristics of the Wind Drop-off Along the Peruvian Coast from Satellite Altimeter Derived wind Data and Historical In-site Observations | Alexis Chaigneau (IRD, France)
7. New Altimetry Products Over Shelf and Coastal Zone from the eSurge Processor | Paolo Cipollini (NOC, UK)
8. User Requirements for Climate-Quality Coastal Altimetry | Paolo Cipollini (NOC, UK)
9. Mesoscale Capability of Along-track Altimeter Data in LRM & SARM | Claire Dufau (CLS, France)
10. High-Resolution Altimeter Data Processing for Brazilian Applications | Claire Dufau (CLS, France)
11. Characteristics of Altimeter Sea Level Anomaly in the US Northeast Coastal Ocean | Hui Feng (University of New Hampshire, USA)
12. Coastal CRYOSAT-2 Data in SAR Mode in the German Bight Area | Luciana Fenoglio (TU Darmstadt, Germany)
13. Validation of Envisat RA-2 Coastal-Oriented Altimetry Data In Challeging Zones: The Strait of Gibraltar | Jesus Gomez-Enri (University of Cadiz, Spain)
14. Measuring Large River Freshwater Discharges In Rio De La Plata (South America) Estuary Using In-Situ And Coastal Altimetry Data | Jesus Gomez-Enri (University of Cadiz, Spain)
15. Impact of Different Wet Tropospheric Corrections on Sea Level Change in the Indonesia Region | Eko Yuli Handoko (University of Porto, Portugal)
16. Comparison of Altimetric Datasets Along the U.S. East Coast | Jessica Hausman (JPL, USA)
17. Assessment of Altimeter Observations in the North Sea – Baltic Sea Transition Zone | Jacob Høyer (DMI, Denmark)
18. Surface Circulation Observed by Altimetry Along the Tunisian Coast (Central Mediterranean Sea) | Fatma Jebri (INSTM, Tunisia)
19. Using ExtR Method to Retrack Satellite Radar Altimetry Waveforms, Case Studies: Caspian Sea and Persian Gulf | Mehdi Khaki (University of Tehran, Iran)
20. DOPPIO – A Data-Assimilative Model for the Mid-Atlantic Bight & Gulf of Maine | Alexander Lopez (Rutgers Univ., USA)

21. Bathymetry Changes and Sea Level Trends Sensed by Jason, SARAL/AltiKa and HY-2 Altimeters Around the Coastal Zone of Gavdos/Crete Permanent Satellite Calibration Facility | Stelios Mertikas (Technical University of Crete, Greece)
22. LOTUS Multi-Peak Coastal and In-Land Water Retracking System | Karina Nielsen (DTU Space, Denmark)
23. PISTACH Products for Monitoring Sea Level Variations in the Eastern Mediterranean using different Mean Sea Surface Models | Dimitris Papazachariou (Cyprus Oceanography Center, Cyprus)
24. Spatial Variability of the Annual Cycle in Coastal Sea Level: a Regional Study | Marcello Passaro (University Southampton, UK & ESA/ESRIN, Italy)
25. Validation of Jason-2 coastal Retrackers Using High Frequency Radar Surface Currents on the US West Coast | Carolyn Roesler (University of Colorado at Boulder, USA)
26. On the Accuracy of Jason-2 Satellite Sea Surface High Data in a Highly Dynamical Coastal Environment | Martín Saraceno (Univ. Buenos Aires, Argentina)
27. Database for Hydrological Time Series of Inland Waters (DAHITI) | Christian Schwatke (DGFI, Germany)
28. Coastal Region Applications of SWOT | Margaret Srinivasan (Caltech/JPL, USA)
29. Coastal applications for the Japanese Altimetry Mission, COMPIRA | Akihisa Uematsu (JAXA, Japan)
30. Use of the along-track altimeter data to study the near-surface coastal currents over the continental shelf at the South Atlantic Bight | Yeping Yuan (University of Georgia, USA)
31. Empirical Tidal Mapping from Combined Exact Repeat and Geodetic Mission Altimetry | Ed Zaron (Portland State University, USA)

Housekeeping

- Poster session + cocktail at 17:20 today
- Expect PDFs of presentations to go online on web (*tell us if you don't want to!*)
  - we encourage the same for the posters – please send us/give us the PDF
- don't run away at lunch – we'll take a Group Photo first!

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Enjoy the workshop!

DAY 1	23 October 2014	THURSDAY	FRIDAY
8:00-8:30	Registration		
	Opening Session | Chairs: Jérôme Benveniste (ESA/ESRIN, Italy), Paolo Cipollini (NOC, UK)		
8:30-8:40	Welcome & Introduction | Jérôme Benveniste (ESA/ESRIN, Italy), Paolo Cipollini (NOC, UK)		
8:40-9:10	Keynote: Milestones in Altimeter Performance: Past, Present, and Future | R. Keith Raney (2kR-LLC, USA)		
	Session 1: Waveform Processing | Chairs: Ole B. Andersen (DTU, Denmark), Jesus Gómez-Enri (U. Cadiz, Spain), Remko Scharroo (EUMETSAT, Germany)		
9:10-9:30	The Near-Specular Altimeter Waveforms of Small Inland Water Bodies | Ron Abileah (jOmegak, USA)		
9:30-9:50	A New SAR Altimetry Waveform Model in Combination with Phase Information for Coastal Altimetry | Cristina Martin-Puig (isardSAT Polska, Poland)		
9:50-10:10	Delay/Doppler Waveform Processing in Coastal Zones | Pierre Thibaut (CLS, France)		
10:10-10:30	Geo-referencing of the Delay/Doppler Level-1 Stack with Application on Coastal Altimetry | Alejandro Egido (Starlab Barcelona, Spain)		
10:30-11:00	Coffee Break		
11:00-11:20	What Limits an Altimeter's Resolution of Along-track Geoid Slope? Insights From SARAL, Cryosat, and Coastal and Inland Targets (solicited) | Walter H. F. Smith (NOAA, USA)		withdrawn
11:20-11:40	Discussion for session 1		

SEED QUESTIONS - Session 1

What is the current status of LRM retracking in the coastal zone?

- How do "tailored" techniques like waveform reduction and multi-peak fitting techniques perform?
- Can consistency from "open ocean" to "coastal" retracking techniques be assured?
- Is there room for improvement by employing yet other techniques?
- How does Ka-band altimetry compare to Ku-band altimetry in the coastal zone?
- Coastal tide gauges are an important asset in sea level calibration. How do we ensure consistent coastal retracking for calibration purposes?

SEED QUESTIONS - Session 1

What is the current status of SAR retracking in the coastal zone?

- Are the standard techniques for waveform stacking currently employed for CryoSat sufficient?
- Do we need to consider different techniques to create SAR waveforms from individual echoes?
- How do the current SAR retrackers (most notoriously the SAMOSA family) perform? How do they deal with “artefacts” in the coastal zones?
- Do we have consistency between LRM and SAR retracking at transitions?
- Are we (more) confident that SAR altimetry can produce accurate wind and wave measurements?
- How may the retrieval of geophysical parameters in coastal areas be compromised by, for example, dense marine traffic?
- Are there technical or geophysical showstoppers to SAR altimetry in Ka-band?
- What’s the current status of SAR-in retracking?

SEED QUESTIONS - Session 1

Do we get the best data from the agencies?

- How can we ensure that all parameters to develop retracking are being passed efficiently from the space agencies (in the light of new methods potentially requiring more L0/L1A information)?
- Do we need operational L1A products, in NRT, STC, and/or NTC?

What is in the future for coastal altimetry?

- Looking at a future of SAR mode altimetry in the coastal zone, what issues are ahead or still to be solved?
- Can we recommend a way to combine LRM and SAR mode data if/when future missions will not be SAR only?
- Is there a bright future for Ka-band altimetry while Ku-band SAR altimetry kicks off?

Session 2: Calibration and Validation of Coastal Altimetry | Chairs: Luciana Fenoglio (TUD, Germany), Jessica Hausman (JPL, USA), Walter H.F. Smith (NOAA, USA)

11:40-12:00	Corsica: a Cal/Val Experiment to Link Offshore and Coastal Altimetry | Pascal Bonnefond (OCA-GEOAZUR, France)
12:00-12:20	Assessing SARAL/AltiKa Near-real Time Data in the Coastal Zone: Comparisons with HF Radar | Ananda Pascual (IMEDEA (CSIC-UIB), Spain)
12:20-12:40	An Evaluation of CryoSat-2 SAR Mode Performance Around the UK Coasts | Helen Snaith (NOC, UK)
12:40-13:00	Comparison of Reprocessed Cryosat-2 Altimetry Within SITU Data Around the Gulf of Cadiz (South-Western Ibernian Peninsula) | Jesus Gomez-Enri (University of Cadiz, Spain)
13:00-14:30	Lunch
14:30-14:50	Improving Significant Wave Height Detection for Coastal Satellite Altimetry: Validation in the German Bight | Marcello Passaro (Univ. Southampton, UK & ESA/ESRIN, Italy)
14:50-15:10	Discussion for session 2

SEED QUESTIONS - Session 2

- What can we learn from the comparison of CryoSat-2 SAR data processed in PLRM and in full SAR mode in coastal regions? Which are the differences in the results compared to open sea?

- Can SAR altimeters yield good results closer to the coast than conventional altimeters? Can we quantify the improvements in terms of amount of error at variable distance from the coast? Do the answers depend on the angle between satellite ground-track and coastline?

- Combining coherently transmitted echoes with the SAR processing reduces the surface footprint. How confidently can we estimate an effective along-track resolution over the ocean and in the coastal region?

SEED QUESTIONS - Session 2

- Can we suggest particular ad-hoc pre-processing, re-tracking procedures to be used in coastal regions for LRM? Do they depend on the satellites characteristics?

- In comparing altimetry with in-situ data the sea state bias need to be considered. Which is the error applying the PLRM sea state bias to SAR data?

- Are there noticeable differences in accuracy with different instruments/ frequencies?

DAY 1 | **23 October 2014** | **THURSDAY** | **FRIDAY**

Session 3: Applications I - Coastal Dynamics | Chairs: Kaoru Ichikawa (U. Kyushu, Japan), Ananda Pascual (IMEDEA, Spain), Stefano Vignudelli (CNR, Italy)

15:10-15:30	Use of Altimeter Data over the Broad Continental Shelf in the SW Atlantic Ocean | Ted Strub (Oregon State University, USA)
15:30-15:50	Poleward Circulation off the Pacific Coast of Southern Baja California, Mexico | Armando Trasviña-Castro (CICESE La Paz, Mexico)
15:50-16:10	Aspects of the Variability of the Northern Current (NW Mediterranean Sea) Observed by Satellite Altimetry – Complementarity with a High Resolution Model | Florence Birol (LEGOS, France)
16:10-16:40	Coffee Break
16:40-17:00	PISTACH Estimates of Geostrophic Currents Compared with ADCPs Around Australia | Madeleine Cahill (CSIRO, Australia) withdrawn
17:00-17:20	Discussion for session 3
17:20-19:20	Poster Session + Icebreaker Cocktail

SEED QUESTIONS - Session 3

- What is the accuracy and resolution do you expect?
- Are you interested in delayed and/or real time applications?
- Would you prefer the geophysical and atmospheric corrections to be delivered independently or already applied to retrieve directly the SLA? Filtered or unfiltered?
- Considering the 2014 state of the art, are coastal altimetry and coastal models good and compatible enough to potentially add net value to each other? (Meaning that combined estimates would probably be better than both the altimetry-based estimate and the model-based estimate taken independently) (If not, not yet, or unsure, what steps should be taken?)

SEED QUESTIONS - Session 3

- Are coastal altimetry products ready for assimilation in coastal models? Are the coastal data assimilation methods advanced to the level of assimilating coastal altimetry data? (If not, not yet, or unsure, what steps should be taken?)

- Are current MSSH products compatible with model nesting to the coastal O(1km) scale? (If not, not yet, or unsure, what steps should be taken?)

- What are the perspectives for long-term SSH monitoring in coastal regions?

- What are the perspectives for altimeter-based monitoring of extreme events in regional/coastal oceans?

SEED QUESTIONS - Session 3

- In deep seas, SSH is directly related to the thermocline depth. Can we get similar vertical structures from coastal SSH? In other words, can we neglect barotropic signals even in shallow coastal areas?

- In your analysis, is it important to obtain SSH variations smaller than Rossby radius? Obtaining small SSH structures is one of the major topics in the coastal altimetry. But our models/understanding may not be good enough to utilize those small features.

DAY 2	24 October 2014	THURSDAY	FRIDAY

Session 4: Corrections | Chairs: Mathilde Cancet (Noveltis, France), Joana Fernandes (U. Porto, Portugal), Pierre Thibaut (CLS, France)

8:30-8:50	On the Use of the Peachi Prototype to Improve Ka-band Altimeter Data Along Coastal Areas | Guillaume Valladeau (CLS, France)
8:50-9:10	Performance of Saral/AltiKa over Inland Water – Effects of Atmospheric Water Content | Eva Börgens (DGFI, Germany)
9:10-9:30	High-frequency Airborne Microwave and Millimeter-Wave Radiometer (HAMMR) Flight Demonstration to Improve Spatial Resolution of Wet-Tropospheric Path Delay Corrections for Coastal and Inland Water Altimetry | Steve Reising (Colorado State University, USA)
9:30-9:50	DComb wet Tropospheric Correction for CryoSat-2 Over Open and Coastal Ocean | Joana Fernandes (University of Porto & CIIMAR, Portugal)
9:50-10:10	MSS at the Coast - What Cryosat-2 Revealed About Existing MSS Models in Coastal Regions | Ole Andersen (DTU Space, Denmark)
10:10-10:30	Discussion for session 4
10:30-11:00	Coffee Break

SEED QUESTIONS - Session 4

- With new missions (CryoSat-2, Sentinel-3, SWOT) and new techniques (SAR, interferometry) measuring at higher spatial resolutions than conventional altimeters, what are the demands on corrections/MSS/MDT in the coastal zones ?

- The new missions, in particular SARAL, SAR CS-2 (and then S3) and SWOT, are getting measurements even closer to the coast up to a few kilometers where no altimetry observations have been done yet, with the consequence that the validation of new algorithms (retracking for example) is complex when the coastal corrections are not fully validated. In other words, it is very hard to demonstrate the full potential of these new missions (their capability to measure closer to the coast) with such uncertainties in the corrections (especially MSS). What can be done to address this difficulty ?

SEED QUESTIONS - Session 4

- Are the new coastal altimetry corrections still experimental or can they be used by the entire science community ?
- Are applications making full use of new coastal altimeter corrections ?
- Are the corrections easily available (access) and usable (format) ?
- Would user-cases help to promote these new corrections towards the entire science community ?

DAY 2	24 October 2014	THURSDAY	FRIDAY

Session 5: Applications II - Extremes and Synergy with Models | Chairs: Lifeng Bao (Chinese Acad. Sci., China), Doug Vandemark (U New Hampsh., USA), John Wilkin (Rutgers U., USA)

11:00-11:20	Cyclone Xaver seen by Geodetic Observations | Luciana Fenoglio (TU Darmstadt, Germany)
11:20-11:40	Assimilation of SSH in a Hydrodynamical Model using Tide Gauge and Coastal Satellite Altimetry Observations | Jacob Høyer (DMI, Denmark)
11:40-12:00	Data Assimilation of Altimeter SSH in a Regional Model with Atmospheric Pressure Forcing | Claire Dufau (CLS, France)
12:00-12:20	Sea Level Response to Pressure and Wind Forcing in a Shallow Estuary: Validation of Two Barotropic Models with Tide Gauge and Altimetry Data | Laura Ruiz Etcheverry (CIMA/CONICET-UBA, Argentina)
12:20-12:40	Discussion for Session 5

Session 6: Applications III | Chairs: Andrey Kostianoy (P.P. Shirshov, Russia), Akihisa Uematsu (JAXA, Japan)

12:40-13:00	Climate-quality Estimates of Sea Level in the Coastal Zone from the ESA Climate Change Initiative Sea Level Project | Paolo Cipollini (NOC, UK)
13:00-14:30	Lunch

SEED QUESTIONS - Session 5

- Is coastal waveform retracking a vital additional step needed to enhance data usage in storm surge applications? ..or in shelf sea model data assimilation work such as presented today?

- Is there a need for a database that globally catalogues the infrequent but valuable cases where coastal storm surges are observed with one or more altimeters?

- Is there consensus on how to handle the MSS and MDT when working with along track altimeter sea surface height anomaly data and their assimilation into circulation models?

- Are there particular projects or studies that are quantifying the value of multi-mission, multi-orbit configuration altimeter data to coastal applications?

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Session 6: Applications III | Chairs: Andrey Kostianoy (P.P. Shirshov, Russia), Akihisa Uematsu (JAXA, Japan)

12:40-13:00	Climate-quality Estimates of Sea Level in the Coastal Zone from the ESA Climate Change Initiative Sea Level Project | Paolo Cipollini (NOC, UK)
13:00-14:30	Lunch
14:30-14:50	Coastal Altimetry: Its Potential for Very High Resolution Tide Modelling in the Gulf of Guinea | Raphaël Onguene (LEGOS, France & Univ. of Douala, Cameroon)
14:50-15:10	Applications of Airborne Laser Scanning for Water Surface Altimetry on Lake Balaton | András Zlinszky (Centre for Ecological Research, Hungary)
15:10-15:30	Discussion for Session 6

Session 7: Future Missions | Chairs: Lee-Lueng Fu (JPL, USA), Ted Strub (Oregon State Univ., USA)

15:30-15:50	The Surface Water Ocean Topography Mission: Capabilities for Coastal Oceanography | Phil Callahan (JPL, USA)
15:50-16:10	Coastal applications for the Japanese Altimetry Mission, COMPIRA | Akihisa Uematsu (JAXA, Japan)
16:10-16:20	Discussion for session 7
16:20-16:50	Coffee Break
16:50-19:00	Summary from Session Chairs, Discussion, Recommendations, Roadmap and Conclusions

SEED QUESTIONS - Session 6

SEED QUESTIONS - Session 7

- Aside from avoiding land contaminations, which will be largely resolved by SAR altimeters like SWOT, what are the drivers for spatial resolutions better than 1 km, below which the utility of SSH becomes unclear as non-geostrophic processes become dominant in SSH signals?

- As scales of SSH in coastal regions decreases from 20km to 10km to 1km or less, what features do you expect to represent geostrophic currents and what features do you expect to represent a geostrophic surface height signals?

- Since both space and time scales decrease as one approaches the coast, how can we fill in the higher temporal resolution to match the high spatial resolution of the new sensors? Will we rely on other satellite and in situ data? or will be rely on models? or on some combination?

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