2nd Coastal Altimetry Workshop – Pisa, Italy

Thursday, November 6 – Friday, November 7, 2008
Venue: Aula Magna, Sant'Anna School for Advanced Studies,
http://www.coastalt.eu/pisaworkshop08

Organizing Committee:

Jérôme Benveniste - *European Space Agency - ESRIN, Frascati, Italy*
Nicolas Picot - *Centre Nationale d'Etudes Spatiales (CNES), Toulouse, France*
Stefano Vignudelli - *Consiglio Nazionale delle Ricerche (CNR), Pisa, Italy*
Paolo Cipollini - *National Oceanography Centre, Southampton, U.K.*

OBJECTIVES

1) Review progress in the field since 1st workshop (Silver Spring, US, February 2008)
2) Identify remaining gaps in knowledge and actions needed to fill them.
3) Provide feedback to ongoing projects (COASTALT and PISTACH) and explore future R&D and funding issues

PROGRAM

The workshop is organised into sessions around a specific topic. Participants are also encouraged to break into splinter groups around a common topic of interest as detailed below. Moderators are responsible for organizing the sessions and coordinating splinter groups. Each session include introduction/review papers (specific applications are also collated and summarized where possible) with time for questions and an open discussion on the issues raised. Splinter groups will meet during breaks and will prepare presentations during the splinter session in the afternoon of the second day. There will be then a plenary session where the moderators report back to the workshop as a whole on the results of their groups, with plenary discussion following discussion. Results will be used as a basis for outlining a list of recommendations to be presented at OSTST in Nice the following week.

AGENDA AT A GLANCE

Thursday 6 Nov 2008

Thursday AM (8:30-12:30):

Welcome, Introduction, Summary from Silver Spring Workshop, EU effort
User Requirements (and discussion)
Retracking

Thursday PM (14:00-18:15):

Corrections: Dry/Wet Tropospheric, Ionospheric, Tides & HF
SSB & Waves
18:30 - Evening buffet

Friday 7 Nov 2008

Friday AM (8:30-12:15)

Data Products, quality and dissemination
Synergy with other data and models

Friday PM (13:45-18:25):

Forthcoming technologies
International cooperation and Future Programmes (and discussion)
Splinter meetings, preparation of summary
Summary by moderators, discussion, RECOMMENDATIONS (to be reported at OSTST Meeting Nice)
18:25 – Close of Workshop

DETAILED PROGRAM [*]

DAY 1 - THURSDAY, NOVEMBER 6, 2008

08:30-9:15

- *Stefano Vignudelli (Consiglio Nazionale delle Ricerche, Italy):*
  Welcome
- *Nicolas Picot (Centre Nationale d'Etudes Spatiales, France) and Jérôme Benveniste (European Space Agency, Italy):*
  Yves Ménard in memoriam
- *Paolo Cipollini (National Oceanography Centre Southampton, UK):*
  Introduction to the Workshop
- *Walter Smith (National Oceanic and Atmospheric Administration, US):*
  Summary from previous Coastal Altimetry workshop (Silver Spring)
- *Jérôme Benveniste (European Space Agency, Italy):*
  EU Effort in the Coastal Zone

SESSION 1: USER REQUIREMENTS (AND DISCUSSION) – 45'

Moderators: ***Cristina Martin-Puig***, *Starlab Barcelona S.L., Spain*
Claire Dufau, *Collecte Localisation Satellites (CLS), France*

09 15-10:00

- *Claire Dufau (Collecte Localisation Satellites (CLS), France) & Cristina Martin-Puig (Starlab Barcelona S.L., Spain)*
  Joint PISTACH/COASTALT presentation on user requirements (20')
- Discussion (25')

10:00-10:30 Coffee

SESSION 2: RETRACKING – 2h 00'

Moderators: ***Peter Challenor***, *National Oceanography Centre, Southampton, UK*
Walter Smith, *National Oceanic and Atmospheric Administration, US*

10:30-12:30

- *Luciana Fenoglio-Marc (Technical University Darmstadt, Germany)*
  Retracking in the NW Mediterranean (10'+5')
- *Le Yang (Second Institute of Oceanography, China)*
  Retracking in typical areas along the Chinese coasts (10'+5')
- *Jesús Gómez-Enri (Universidad de Cádiz, Spain)*
  Envisat RA-2 Coastal Waveform Analysis in the Western Mediterranean Sea and West Britain during the ESA COASTALT project (10'+5')
- *Pierre Thibaut (Collecte Localisation Satellites (CLS), France)*
  Contribution from PISTACH retracking team (10'+5')
- *Ole Andersen (DTU Space, Denmark)*
  Retracking and the impact on modelling of geophysical signals (10'+5')
- *Cristina Martin-Puig (Starlab Barcelona S.L., Spain)*
  SAMOSA retracker for SAR Altimeter observations over water (10'+5')
- *Xiaoli Deng (University of Newcastle, Australia)*
  Retracking of Radar Altimetry for Coastal Applications (10'+5')
- Open discussion (15')

12:30-14:00 Lunch

[*] We list only presenters' names, but most presentations are collation of various contributions so intrinsically 'et al.'

SESSION 3: CORRECTIONS: DRY/WET TROPOSPHERIC, IONOSPHERIC , TIDES & HF - 2h 30'

Moderators: ***Franck Mercier***, *Collecte Localisation Satellites (CLS), France*
Phil Woodworth, *Proudman Oceanographic Laboratory, UK*

14:00-15:30

- *Alexandra Nunes (University of Porto, Portugal)*
  Wet Tropospheric correction for coastal altimetry based on GNSS path delay measurements (15')
- *Estelle Obligis (Collecte Localisation Satellites (CLS), France)*
  Land decontamination of Wet Troposphere Correction (15')
- *Shannon Brown (NASA Jet Propulsion Laboratory, US)*
  Improved near-land wet tropospheric path delay corrections for OSTM, Jason-1 and Topex/Poseidon (15')
- *Remko Scharroo (National Oceanic and Atmospheric Administration, US)*
  Ionospheric Correction: experiences with different measurements and models (15')
- *Ole Andersen (DTU Space, Denmark)*
  On differences in the altimeter range dependent on which corrections you apply to the range (wet, dry, iono, SSB, etc). (15')
- Discussion on wet tropo and iono (15')

15:30-16:00 Coffee

16:00-17:15

- *Richard Ray (NASA Goddard Space Flight Center, US)*
  Coastal tides overview (15')
- *Phil Woodworth (Proudman Oceanographic Laboratory, UK)*
  Global storm surge data provision (15')
- *Laurent Roblou (Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, France)*
  Tidal modeling in coastal and shelf seas and application to the alias issue in altimetry (15')
- *Wolfgang Bosch (Deutsches Geodätisches Forschungsinstitut, Germany)*
  EOT08a model performances near coasts (15')
- Discussion on tides (15')

SESSION 4: SSB, WAVES – 1h 00'

Moderators: ***Sylvie Labroue***, *Collecte Localisation Satellites (CLS), France*
Remko Scharroo, *National Oceanic and Atmospheric Administration, US*

17:15-18:15

- *Sylvie Labroue (Collecte Localisation Satellites (CLS), France)*
  Review of SSB issues near coasts (15')
- *Jessica Hausman (NASA Jet Propulsion Laboratory, US)*
  Strengths and Limitations to Compute SSB (15')
- Discussion on SSB & Waves (30')

18:30 Evening Buffet - San Girolamo Cloister

DAY 2 - FRIDAY, NOVEMBER 7, 2008

SESSION 5: DATA PRODUCTS, QUALITY AND DISSEMINATION – 1h 15'

Moderators: ***Helen Snaith***, *National Oceanography Centre, Southampton, UK*
Remko Scharroo, *National Oceanic and Atmospheric Administration, US*

08:30-9:45

- *Remko Scharroo (National Oceanic and Atmospheric Administration, US)*
  Operational use of altimetry products and requirements for coastal altimetry (10')
- *Christine Gommenginger (National Oceanography Centre Southampton, UK)*
  COASTALT processor and products (10')
- *Franck Mercier (Collecte Localisation Satellites (CLS), France)*
  PISTACH products (10')
- *Phil Callahan (NASA Jet Propulsion Laboratory, US):*
  Web-based altimeter service (15')
- Discussion (30')

9:45-10:15 Coffee

SESSION 6: SYNERGY WITH OTHER DATA AND MODELS – 2h 00'

Moderators: ***William Emery***, *CCAR, University of Colorado, US*
Ted Strub, *Oregon State University, US*

10:15-12:15

- *John Wilkin (Rutgers University, US):*
  US East coast applications (including synergy with HF radars) (20')
- *Ted Strub (Oregon State University, US) & William Emery (University of Colorado, US)*
  US West coast applications (20')
- *Jérôme Bouffard (Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, France) & Ananda Pascual (Institut Mediterrani d'Estudis Avançats, Spain)*
  European coast applications (20')
- *David Griffin (CSIRO, Australia):*
  Australia coast applications (20')
- *Kaoru Ichikawa (Kyushu University, Japan):*
  Asian coast applications (20')
- Discussion (20')

12:15-13:45 Lunch

SESSION 7: FORTHCOMING TECHNOLOGIES – 1h 30'

Moderators: ***Christine Gommenginger***, *National Oceanography Centre, Southampton, UK*
Keith Raney, *Johns Hopkins University, US*

13:45-15:15

- *Christine Gommenginger (National Oceanography Centre Southampton, UK; chair):*
  Welcome and opening remarks (5')
- *Keith Raney (Johns Hopkins University, US):*
  Motivation and issues for forthcoming altimeter technologies in the Coastal zone (15')
- *Jérôme Benveniste (European Space Agency, Italy):*
  Exploiting Delay Doppler Altimetry in the coastal zone with Sentinel 3 (15')
- *Alix Lombard (Centre Nationale d'Etudes Spatiales, France):*
  Applications of Alti-Ka in the coastal zone (15')
- *Laurent Phalippou (Thales Alenia Space, France):*
  Wide Swath Altimetry and the coastal zone (15')
- Discussion (25')

SESSION 8: INTERNATIONAL COOPERATION & FUTURE PROGRAMMES – 1h 10'

Moderators: ***Jérôme Benveniste****, European Space Agency - ESRIN, Italy*
Nicolas Picot, *Centre Nationale d'Etudes Spatiales, France*

15:15-16:25

- *Jérôme Benveniste (European Space Agency, Italy):*
  ESA programs (10')
- *Eric Lindstrom (NASA Headquarters, US) via Jérôme Benveniste:*
  NASA programs (10')
- *Eric Thouvenot (Centre Nationale d'Etudes Spatiales, France):*
  CNES programs (10')
- *Laury Miller (National Oceanic and Atmospheric Administration, US):*
  NOAA programs (10')
- *Mingsen Lin (National Satellite Ocean Application Service, China) via Le Yang:*
  The Contribution of Global Ocean Observation of Continuity of HY-2 Satellite (10')
- *Muthalagu Ravichandran (Indian National Center for Ocean Information Services, India):*
  Coastal Ocean state forecasting system for Indian seas (10')
- Open discussion (10')

COFFEE + SPLINTER GROUP MEETINGS, PREPARATION OF SUMMARY – 30' + 30'

16:25-17:25

Groups:

- to answer seed questions
- to achieve consensus on critical/priority issues
- to write down a brief summary
- to outline a list of recommendations

SUMMARY BY MODERATORS, DISCUSSION, RECOMMENDATIONS – 1h

17:25-18:25

Rapporteurs: ***Paolo Cipollini****, National Oceanography Centre Southampton, UK*
Stefano Vignudelli, *Consiglio Nazionale delle Ricerche, Italy*

Moderators report back to the plenary using a 5' Power Point presentation:

- Brief summary of the session
- List of recommendations

Plenary discussion: agree a plan and roadmap for the coastal altimetry

Preparation of proceedings

Next meeting location and dates

18:25 – Close of Workshop

POSTERS

1. *Lifeng Bao* (Chinese *Academy of Science - Institute of Geodesy and Geophysics, China) Houze Hsu:*
   Determination of island height from geopotential
2. *Somayajulu Y.K. (National Institute of Oceanography, India), Ravichandran M., Patil R.V.*
   Preliminary Studies on Coastal Altimetry of the Indian Seas (ALTICORE-India)
3. *Saraceno M. (Centro de Investigaciones del Mar y la Atmósfera, Argentina), Onofrio E.E:, Fiore M.E., Grismeyer W.H.*
   On the Utilization of Satellite Sea Surface Height Over the Argentinean Continental Shelf
4. *Valchev N., Andreeva (Institute of Oceanology, Bulgaria), Trifonova E., Demireva D.*
   Knowledge on wind waves and sea level at IO-BAS and need for remote sensing data
5. *Fenoglio-Marc L. (Technische Universität Darmstadt, Germany), Fehlau M., Becker M., Bouffard J., Vignudelli S.*
   Comparison of improved altimeter coastal sea surface heights to tide gauge data
6. *Rinaldi E., Buongiorno Nardelli B. (Consiglio Nazionale delle Ricerche, Italy), Santoleri R., Zambianchi E., Poulain P.*
   Study of the Tyrrhenian Sea circulation by combined analysis of the altimeter and lagrangian data
7. *Chu P. (Naval Postgraduate School, Monterey, U.S.), G. Amezaga, Gottshall E. L., Cwalina D.*
   Impact of GFO satellite altimetry for antisubmarine warfare

LOGISTICS AND USEFUL INFO

Registration (08:00 to 08:30)
Registration starts at 8:00 a.m. on Thursday, November 6, 2008 at the workshop room entrance. Please check in at the registration desk to receive your name badge and pick up the workshop materials. The Registration Desk will be always in operation to provide you with any information you need.

Presentations
The workshop room will have a Windows based computer with Power Point facilities. Due to a tight schedule there is little time between speakers to upload presentations. Presentations should be pre-loaded prior to the start of your session. To pre-load your presentation, please bring a copy on a USB Memory device. The workshop room will be available during coffee and lunch breaks and authors are encouraged to use this time to run through their presentation and ensure correct final display. An additional Windows based laptop is also available at registration desk.

Posters (all days)
Attendees wishing to display a poster are kindly asked to contact the Organizers as soon as possible. There is space for ten posters on the boards outside the workshop room. Each poster slot will have the following dimensions: 78 cm width by 148 cm height. The width of 70 cm may be exceeded if necessary. Posters can be put up on the boards at the start of the Workshop and will remain up for the two days. We will provide tapes.

Splinter meetings
For the session "Splinter Meetings", the groups can meet in the workshop room and in an extra room equipped with table and chairs. Weather permitting, there will be the option to stay in the garden too.

Coffee Breaks
30 minutes, at “Atrio del Pozzo” (Pit Court) just outside the workshop room (with the option of using the garden)

Morning
Coffee, milk, tea, fruit juices, mineral water, snack foods, pizzas, sandwiches, assorted pastries

Afternoon
Coffee, milk, tea, fruit juices, mineral water

Lunch
Participants may have lunch in a variety of small and nice restaurants/bistros within easy walking distance. Many of favourite places are along Borgo Stretto, around Piazza Cavalieri and Via Santa Maria, towards Piazza dei Miracoli. List and maps will be included in the workshop material.

Evening Buffet (Thursday, November 6, beginning approximately at 18:30)
It will be held in the San Girolamo Cloister, close to the workshop room, with: hors d’oeuvre with liver pâté croutons and tomato croutons, cheese & ham cake, pumpkin flan, minestrone soup with barley and beans, pasta with bacon and tomato, ‘cantuccini con Vinsanto’ (almond biscuits with sweet Italian wine), Italian wine and water.

Internet Access
There will be free Internet access for laptop computers during the workshop. On request at the Registration Desk you will be given a personal username and password valid for the period of the workshop to access the Internet via the WiFi connection. To activate the access, you will be required to sign (it's the Italian law!). To start a session on your laptop you have to:

1) Connect to the nearest or best signal Access Point "Scuola Superiore Sant'Anna".
2) Open a browser program and be sure to disable Pop-up Block (Explorer, Firefox, Google, Yahoo, etc).
3) Go to a web page and wait the Sonicwall Login page.
4) Enter Username and password.
5) Leave open the Logout Window.
6) Use the main browser window to navigate.
7) Logout using the button in the Pop-up Sonicwall window.

Electricity
AC power is 220 Volts, 50Hz. Plugs have three round pins in-line (the central is ground and may be missing sometimes). Adapters for UK and US power plugs are available in several electrical supply stores.

Certificate of attendance
Certificates of attendance will be provided for all participants upon request at registration desk.

Encourage presenters to:

1. Discuss which satellite-derived products have been validated and how? What are the steps for a validation? What is the order of magnitude of uncertainty on the variable or product ?
2. Summarise the Merits/Limitations of the remote sensing technique: what are the main sources of error, compared to other (in-situ) techniques?
3. Discuss what steps are necessary to assimilate the satellite products into the various ocean coastal zone models.
4. Are there any specific tools (beyond what is found in toolboxes, e.g. BRAT) needed to use satellite data?
5. Are there any data (remote sensing, in-situ or auxiliary) that you know of, need, but cannot get access to?

Specific to Radar altimetry:

- In reference to the altimeter data sets, should long-term time series be reprocessed using specific techniques?
- Does any 1 Hz ENVISAT RA-2/MWR GDR parameters need to be accessed at 20 Hz?
- Near Real Time (3 hours) Radar Altimeter products: Are they useful as input to further processing/assimilation?

Specific to combining data:

- Satellite ground and spectral resolution for Coastal Zone Oceanography purpose: does exist a specific spatial scale for each variable (sea level anomaly, SWH)?
- Do we need empirical and/or physically based electromagnetic models for retrieving Coastal Zone Oceanography variables from satellite sensors?
- How campaigns at sea or near shore (tide gauges, buoys) have to be designed for a reliable data comparison between satellite data and ground truth?
- Do satellite and in-situ oceanographic community need to revisit their tools in order to properly combining satellite and in-situ data in Coastal Zone Oceanographic models?

Thursday, 6 November

USER REQUIREMENTS

Cristina Martin-Puig and Claire Dufau:

1. Are there user requirements that we have left out?
2. Are there any further specific requirements from the Sea Level community? What are the expectations of this community from Coastal Altimetry?
3. Are there any further specific requirements from the coastal modelling community? What are the expectations of this community from Coastal Altimetry?

RETRACKING

Peter Challenor and Walter Smith:

1. Are high-resolution DEMs and/or coastlines useful for coastal retracking?
2. Can the statistically expected waveform near the coast be predicted in some environments?
3. Should coastal waveform retracking employ parametric (physical) models, or not?
4. Is there a "one size fits all" retracking algorithm that should be applied near all coasts?
5. What benefits or performance gains can we expect from specifically coastal retracking?
6. How can we assess the track point and sea state biases of different retrackers?
7. How can we assess the benefit of using retracking specialized to the coastal zone?

CORRECTIONS: DRY/WET TROPOSPHERIC

Franck Mercier and Phil Woodworth:

1. What are the requirements for a coastal wet tropospheric correction (temporal and spatial resolution, accuracy)?
2. What are the available global and local meteorological models to provide this wet tropospheric correction? Are they compatible with these requirements?
3. What are the available in-situ data (GPS or radiosonde for example)? How well GPS Met will provide info off-track and over what distance?
4. For the actual missions, what are the proposed methods to improve the coastal wet tropospheric correction? What are their contributions (in terms of quality of the correction, or even in terms of the distance from land)?
5. What effort should be done for the future missions to fulfil these requirements (coverage, sampling, higher frequencies, new instruments...)?
6. All our efforts "go from sea to land", but is there any constrain that could come from land to improve the coastal wet tropo?

CORRECTIONS: IONOSPHERIC

Franck Mercier and Phil Woodworth:

1. How to best use the dual-frequency ionosphere correction (in coastal areas) and why is GIM a better correction than DORIS?
2. Is the dual-frequency ionosphere correction affected by the coast? Is the phenomenon (TEC) itself affected?
3. Can we use models instead? What are their limitations? Which models are best?

CORRECTIONS: TIDES & HF

Franck Mercier and Phil Woodworth:

1. How to get information on the total tidal elevations in coastal areas?
2. How can the community organise itself to get global surge data?

SSB & WAVES

Sylvie Labroue and Remko Scharroo:

1. How important is SSB? How well is it modelled?
2. How is SSB influenced by wave age?
3. Can swell be considered part of SSB? Can it be observed or corrected for?
4. How is the SSB in coastal regions different from the open ocean?
5. Will SSB (as function of wind speed and wave height) be different in coastal zone than open ocean?
6. How are waves transformed from the open ocean to coastal zones?
7. Will the wave heights measured by an altimeter change markedly from the open ocean to the coast?
8. What role do swell and wave age play in measuring wave height and particularly in SSB?

Friday, 7 November

DATA PRODUCTS, QUALITY AND DISSEMINATION

Helen Snaith and Remko Scharroo:

1. What information do you want from altimeter data? (sea level, current, tides, waves)

2. How will the coastal altimetry data be used? As a sole data source, or in assimilation?
3. What update frequency and delay will be needed? (near real time, high quality data with longer delay)?
4. What form of data would be most useful? (along-track data, grids, fully processed SLA)?
5. What are the additional demands of coastal users that current data systems do not address?
6. What kind of metadata would be required to best suit coastal needs?
7. How can we ensure that data products and services meet these needs?
8. What data or products would you be willing to contribute to an altimeter data service to improve quality or usefulness?

SYNERGY WITH OTHER DATA AND MODELS

William Emery and Ted Strub:

1. How do models and other data combine with altimeter SSH to produce better SSH data sets (along-track and gridded 2D fields) in the coastal region (within 50 km of the coast)? What scales are resolved by these fields (space and time)?
2. How can combinations of altimeter SSH with other data sets and model fields reduce the terms in the altimeter error budgets? Consider individual terms in the altimeter error budgets. How can we reduce the largest error budget terms?
3. Do altimeter data provide better "constraints" on models than "traditional" data sources? Do SSH or surface geostrophic velocity fields provide better constraints? Are altimeter data better used in data assimilation within the models or in quantifying errors in the final model fields?
4. Can other types of satellite data (SST, color, winds, SAR) be used to improve SSH fields from altimeters? I.e., this is a purely remote-sensing approach.
5. Will improved spatial sampling (by SWOT or other technology) improve model SSH or velocity fields, without improved temporal sampling (5-10 day repeats)?

FORTHCOMING TECHNOLOGIES

Christine Gommenginger and Keith Raney:

1. How do technological developments in forthcoming altimetry missions contribute to coastal altimetry?
2. Are there mission and technology opportunities outside Earth Observation which are relevant to coastal altimetry?
3. What requirements for coastal applications should drive future mission and instrument designs?

INTERNATIONAL COOPERATION & FUTURE PROGRAMMES

Jérôme Benveniste and Nicolas Picot:

1. What are the user-defined or science-defined parameter requirements? Do the remote sensing methods and/or satellite products meet these requirements?
2. What are the parameters that are missing for Coastal Zone Oceanography and could future satellite missions provide them?
3. Can altimeter accuracy obtained still be improved with present technologies?
4. Can time-series with high temporal resolution be obtained when merging data sets of altimeters? What temporal resolution is achievable?
5. What are the advantages of a single or multi instrument approach (follow-on mission or otherwise)?
6. What is expected from next generation Radar Altimeters (Delay-Doppler/SAR, Interferometry)?
7. How can the Coastal Zone Oceanography community be further involved? Seed research efforts to demonstrate the usefulness of the data in the Coastal Zone? The concentration of research is heavily skewed towards the developed/occidental world. How can we better involve the users in Africa, S. America? What about India and China?