

## **25 Years of Progress in Radar Altimetry**

Papers are invited for a special topical issue of *Advances in Space Research* (ASR) entitled "**25 Years of Progress in Radar Altimetry**".

Radar altimetry is a key component of the Global Earth Observation System of Systems (GEOSS), and over the last 25 years has provided the principal global data source enabling the development of operational oceanography, as well as all other themes observed by altimetry such the cryosphere and inland water hydrology. Radar altimetry contributes to a large number of societal needs, from climate monitoring to weather forecasting, with subsequent applications in a range of activities of socio-economic importance, including agriculture, health, energy, the freshwater resource, maritime safety, coastal impacts, etc. Contributors to the 25 Years of Progress in Radar Altimetry Symposium, as well as any researcher not attending the Symposium, are invited to submit manuscripts describing the evolution of their work and results in the past five to twenty-five years working on the 25-year time series of available multi mission altimetry data (more than 60 cumulative years).

This special issue is intended to gather key papers, presenting the challenges we have overcome to develop our current understanding of the Earth's surface variations observed by altimetry, and the perspectives for future developments in each of the following themes:

### **1) 25 Years of Progress in Radar Altimetry**

- historical review and lessons learned in the last five to twenty-five years
- improvements thanks to SAR, SARin and Ka altimetry and anticipated improvements thanks to the future interferometric wide swath mission SWOT.

### **2) Advances in our understanding of the open ocean**

- ocean currents: how have things improved in 25 years?
- large scale ocean phenomena: intra-seasonal, seasonal cycle, El Nino, Rossby waves, pluri-annual oscillations
- tide modeling, non-linear components, internal waves
- high frequency signals and mesoscale
- detecting rain and air-sea exchange fluxes

### **3) Advances in our understanding of coastal processes**

- coastal retracking (contribution of the CryoSat-2 SARin mode)
- coastal corrections
- integration of multi-mission coastal products
- modeling coastal processes
- data assimilation in coastal/regional models

### **4) Advances in our understanding of wave observations and their applications**

- swell, wave and wind speed measurements
- impact of wave measurements in operational forecasting systems
- extreme events, storm surge and high frequency processes

### **5) Altimetric contributions to gravity field, marine geodesy, bathymetry modeling**

- the impact of CryoSat-2 369-day repeat mission, further improvements, and expectations
- ocean floor topography mapping
- gravimetry results from geodetic missions (CHAMP, GRACE, GOCE, SWARM)
- improved mean sea surfaces (contributions from geodetic missions)

### **6) Precise orbit determination**

- orbit determination and gravity model tailoring
- DORIS, GNSS, laser techniques and altimetry
- terrestrial reference frame

### **7) Advances in our understanding of land processes and inland water storage and fluxes**

- specialised data processing for inland water applications
- river level and river discharge and land-ocean exchange
- lake level and volume variation monitoring
- contribution of the CryoSat-2 SARin modes

- synergy of altimetry with other remote sensing data
  - hydraulic and hydrologic modelling and data assimilation
  - global digital elevation models
  - land processes, surface roughness and soil moisture
- 8) Advances in our understanding of the cryosphere**
- Antarctic and Greenland topography, volume and mass balance
  - continental glaciers (contribution of the CryoSat-2 SARin mode)
  - Sea-ice monitoring, sea-ice thickness, sea-ice extent
  - iceberg tracking
- 9) Extending the 25-year altimetric record: challenges and achievements**
- (cross-)calibration and long-term monitoring of instruments: biases, drift models, shortcomings, improvements
  - validation of long time-series with in situ data
  - from LRM to SAR altimetry: how to insure a seamless transition
  - global and regional multi-satellite sea level change: the spatial and temporal record
  - advances in precision: from 15 cm to the millimeter (and sub mm/yr) challenge!
  - interesting/unexpected scientific results: absolute dynamic topography, global and regional mean sea level trends, lake and river discharge trends, ice volume trends, interannual changes in eddy processes, decadal oscillations.
- 10) Synergy between Altimetry, other data and models in support of operational oceanography**
- altimetry impact in ocean monitoring and operational forecasting systems
  - comparison with in situ data: tide gauges, ship data, buoys, Argo profilers and HF radar
  - synergy of sea level, sea surface temperature, ocean colour, sea surface salinity and wind stress
  - synergistic studies of the interaction of ocean circulation with ocean biology and air-sea coupling processes
- 11) Outreach, education and altimetric data services**
- education programmes
  - science returns towards the public
  - the use of the internet and social media to promote satellite altimetry
  - open and citizen science, tools
- 12) Outlook on future missions requirements**
- requirements for future Altimetric missions (Oceanography, Coastal Zone, Inland Water, Land, Cryosphere)
  - operational oceanography missions, continuity and services
  - third generation altimeters (synthetic aperture and wide swath instruments)
  - big data and deep learning

Papers must be submitted electronically to <http://ees.elsevier.com/asr>. To ensure that all manuscripts are correctly identified for inclusion into the special issue, **authors must select "SI: 25 Years of Altimetry "** when they reach the "Article Type" step in the submission process.

Submitted papers must be written in English and they should include full affiliation postal addresses for all authors. Only full-length papers will be considered for publication, subject to peer review by a minimum of two reviewers. There are no page limits although the length of the paper should be appropriate for the material being presented. While the **deadline for submissions is 28 February 2019**, papers will be published electronically as soon as they are accepted. The printed issue will be assembled within a reasonable time with late papers being printed in regular issues of ASR. All articles will be typeset at no cost to the author; there is a nominal charge for printing color figures although there is no charge for color figures on the electronic version.

Dr. Jérôme Benveniste (Jerome.Benveniste@esa.int) and Dr. Pascal Bonnefond (Pascal.Bonnefond@obspm.fr) are the Guest Editors for this special issue. They (currently Chairmen of the **25 Years of Progress in Radar Altimetry Symposium**) will write the Preface for this Special Issue. Questions can be directed to Drs. Benveniste and Bonnefond or to the Co-Editor for Special Issues, Dr. Peggy Ann Shea (sssrc@msn.com).

The general format for submission of papers can be found on the ASR Elsevier web site at <http://www.journals.elsevier.com/advances-in-space-research>