



Nicolas Bercher

Co-founder of ALONG-TRACK,

Senior Researcher in Altimetry for Hydrology

IT infrastructures Manager

Technical Roles:

Expertise in Altimetry Measurement Physics (FBR to L2), New Processing Approaches in Altimetry, Coordinator of the State Of the Art works, Responsible for Altimetry and In-Situ Data Selection, Integration, Verification and Validation

Qualifications and experience:

Nicolas Bercher's relevant experience summarises with (more detailed further down):

- PhD in altimetry, development of a standardized method for L2 products validation over large rivers
- 10 years' experience among which 7 years as Research Engineer in the frame of projects with CNES, ESA, CLS
- Expertise on CryoSat-2 LRM, SAR & SARin data application for the monitoring of river water levels, spatio-temporal processings
- Recurrent communications (on quality assessment) in the Space Hydrology community
- Experience of Research Project Management at LEGOS lab (Toulouse, France)
- IT Expert in system administration, data management & archiving

CV

From November 2010 to October 2014 Nicolas Bercher worked at LEGOS (Toulouse, France) as a research engineer, CNRS staff. His main activities were:

- to continue **Validation Exercises** [Bercher et al., 2012a]
- to perform investigations using **CryoSat-2 data in LRM, SAR and SARin modes**.
- To develop the **AltiHydro software**, a tool to read, edit, filter and handle Radar Altimetry data as a multi-dimensional and really sparse dataset. The software has been **initially designed to process CryoSat-2 data** for the monitoring of river water level, **dealing the geodesic orbit aspect of the mission**. Notably, the software is able to deal with the mixed signatures of the temporal and spatial variabilities that are inherent to geodesic orbit altimetry data. AliHydro has been used to produce the first know results on CryoSat-

2 over rivers [Bercher et al., 2012b]. Later on, the software was quickly extended to support multi-mission altimetry data (from repeat orbits: ENVISAT, Jason-2, SARAL) since this topic conceptually addresses the questions.

- Permit to the team to be **one of the first to address the opportunities offered by CryoSat-2 for the monitoring of inland waters** [Bercher et al., 2013a, 2013c; Calmant et al., 2013]. Notably, he highlighted the importance of off-nadir echoes thanks to CryoSat-2 SARin mode, a topic with strong impact when revisiting LRM data archives.
- worked onto the **exploitation of the SAR & SARin modes** of the mission and suggested that **dedicated processing of SAR data at low level** would offer important new opportunities (reprocessing from L1a/FBR to L2) [Bercher et al. 2013a, 2013b, 2014a].
- Together with his colleague Sara Fleury (from LEGOS/CTOH), Nicolas Bercher performed trainings about LRM, SAR and SARin processing of CryoSat-2 in Toulouse.
- worked, together with CNES and LEGOS scientists, on the **improvement and robustness of the CPP (CryoSat-2 Processing Prototype)** for the monitoring of inland waters.
- At OSTST 2014, Nicolas **proposed a new methodology to perform altimetry data verification without collocated in situ data** [Bercher et al., 2014b].
- co-authored **peer-reviewed journal papers on rivers discharge modelling** using Space Altimetry [Negrel et al., 2011] and about an **original processing to improve water level time estimation from level-2 altimetry data** [Maillard et al., 2015].
- performed several reviews for Remote Sensing of Environment and Drought journals.
- has been project evaluator in the frame of CNES Call of Opportunity for the scientific use of SARAL/AltiKa data.
- Took part to the initial steps in preparing and testing the SAR Altimetry Training that is now dispensed by ESA ESRIN along with international events such as the OSTST & the CoastAlt Meeting.

From 2002 to 2014 Nicolas Bercher developed a **strong expertise on Linux systems, in system & services administration, networking, security**. He is contributing and involved into the world wide Open Source community and has produce open source code [Github update-conf.d, 2011]. He is also involved in Computer Science on the secured & long-term archiving of digital content for researchers, individuals and companies [Douzal et al., 2011].

In 2008, Nicolas Bercher received the National Doctoral Degree (Ph.D.) in Remote Sensing from AgroParisTech, Montpellier, France. Title of the **PhD thesis: Development of a Standardized Method for the validation of river water level time series derived from Satellite Altimetry**. Implementation of a full featured automated prototype (MSW for Matlab Satellite frameWork) to

(1) automatically produce time series from level-2 Radar Altimetry data (applied to T/P MGDR, PISTACH/Jason-2, CASH T/P) and (2) perform the validation of time series done by comparison to in situ data. The prototype has been used extensively to produce validation results presented on a regular basis during international conferences [Bercher et al., 2005, 2006, 2007, 2009, 2010, 2012]. Developed under Linux and Matlab along with various C and shell tools.

In 2004, Nicolas Bercher received the Master degree in “Signal, Image, Acoustic and Optimization” from ENSHEEIT, Institut National Polytechnique de Toulouse.

From March 2010 to February 2011 Nicolas Bercher was reconducted for one more year as research engineer at UMR Tétis on the demand of the head of SALP (CNES). This led to an extended validation exercise [Bercher et al., 2010]. During this period Nicolas Bercher has also been involved a CNES R&T study for the optimized retracking of Radar Altimetry for river water levels, together with CLS and THALES Space [Amarouche et al., 2012].

From March to October 2010 Nicolas Bercher took a break for the birth of his daughter and continued developing his skills in **IT and archiving**, starting a personal project with researcher on digital archiving that led to a paper in an international conference on operating systems and computer science [Douzal et al., 2011], the 6th IWP9 (International Workshop on Plan 9 from Bell Labs). He also collaborated with hydraulic researchers on the **temporal interpolation of altimetry data coupled with in situ data** [Belaud et al., 2010].

From September 2008 to February 2010 Nicolas Bercher worked at UMR Tétis (Montpellier, France) as a research engineer, Irstéa staff (was Cemagref before 2011). The main activity was the valorisation of the **automated prototype** developed during his PhD. The expertise has been solicited by partners and led to several contracts with ESA for the validation of River&Lake products over rivers, with CLS in the frame of the PISTACH project for the validation of optimized Jason-2 data for inland water and coastal areas.

From 2002 to 2003: Nicolas Bercher developed a **significant background in image processing**, working two years full time in various laboratories (1) on the recognition and isolation of adventices (weeds) in young corn fields (2002-2003, Cemagref, Montpellier, France) and (2) on the recognition of galaxies within telescope images at very low signal-to-noise ratio (2004, IRAP, Toulouse, France).

Relevant publications:

Relevant peer-reviewed papers

Maillard P., Bercher N. et Calmant S. (2015). New processing approaches on the retrieval of water levels in ENVISAT and SARAL radar altimetry over rivers : A case study of the São Francisco river, Brazil. Remote Sensing of Environment, 156(0):226-241.

Negrel J., Kosuth P. et Bercher N. (2011). Estimating river discharge from earth observation measurements of river surface hydraulic variables. Hydrol. Earth Syst. Sci., 15:2049-2058.

Participation to international conferences

Amarouche L., Vernier A., Mercier F., Bercher N. et Steunou N. (2012). Improvement of inland water areas altimeter height estimation using new retracking techniques. In Proceedings of the OST/ST, 24-29 September, Venice, Italy. Poster and paper.

Belaud G., Cassan L., Bader J., Bercher N. et Feret T. (2010). Calibration of a propagation model in large river using satellite altimetry. In Proceedings of the 6th International Symposium on Environmental Hydraulics. June 23-25, Athens,

Greece. Oral communication and paper (7p.).

Douzal V., Bercher N. et Du Colombier D. (2011). From natural hazards to the outer space and to plan 9. In Proceedings of the 6th International Workshop on Plan 9. Oral communication and paper (13p.).

Contributions to the Open Source community

update-conf.d on Github (2011). <https://github.com/Atha/update-conf.d> A script for flexible Linux machines configuration.

Table 3-1: CV Nicolas Bercher