South America Water from Space II Conference
Manaus, Brazil, 4-7 November 2019
hydrologyfromspace.org

SOUTH AMERICA WATER from SPACE II Conference

Short Summary

From the 4th to 7th November 2019, the South America Water from Space II conference was held in Manaus, Brazil, co-organized by CPRM (Geological Survey of Brazil), the Institut de Recherche pour le Développement (IRD), the Agence Spatiale Française (CNES), the Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS-Toulouse), Géoscience Environnement Toulouse (GET) and the Amazon State University (UEA).

This conference is part of a larger working group launched in 2015 by the Institut de Recherche pour le Développement (IRD), the French Space Agency (CNES) and several South American Institutes (Universities, State and Federal Agencies) around scientific activities related to hydrology and the study of the water cycle in the context of the scientific team (ST) of the SWOT satellite mission (Surface Water and Ocean Topography, NASA-CNES).

In order to meet and work together on scientific issues related to Water, the group has set up a series of conferences. The first of these conferences (after two introductory meetings in Rio de Janeiro in April 2015 and May 2016) was held in Santiago de Chile in March 2018, welcoming more than 70 participants from most countries in South America, France and the United States.

In Manus, in 2019, just two years before the planned launch of the SWOT satellite, nearly 100 people gathered to present and discuss the latest scientific and technical advances developed to characterize the variability of the water cycle on a global scale and in some regions of interest in South America, particularly the Amazon basin, Africa and Asia.

The attractiveness of this event once again testifies to the success of the long and historic collaboration, established over decades, between the various French and South American Institutes in the water sciences.

The conference was organized around several presentation sessions and a poster session.

The conference was officially opened by the speech of the French Ambassador to Brazil, Mr Michel Miraillet, who highlighted the importance of studying the water cycle in the current context of climate change, all in a collaborative framework with Brazil and South American countries. This first speech was followed by that of Dr Antonio Bacelar, Director of the Hydrology and Land Management at the CPRM, who also discussed the importance of water-related issues for Brazil and South America. The main partners of the conference (CPRM, IRD, CNES, NASA) then presented their ongoing programmes on the study of the water cycle, hydrology and climate, and their vision of the future, based on a strengthening of collaboration between France and South American countries.

During the six scientific sessions (Session 1: Continental water from Space and SWOT mission; Session 2: Integrated studies for hydrology and water cycle; Session 3: SWOT Early adopters and Water study in the operational context. Session; 4: SWOT-Ocean; Session 5: Satellite-based Hydrological studies worldwide; Session 6: SWOT mission: Cal/val activities before launch, new ST and future projects), the audience attended excellent presentations, often given by internationally renowned scientists, who presented recent advances in the field. Many discussions identified the main current limitations and needs for observation, modeling and data assimilation systems to improve our knowledge of the water cycle and quantify its future changes. Many presentations also showed the value of synergy and complementarity between spatial remote sensing, modeling and in situ observation

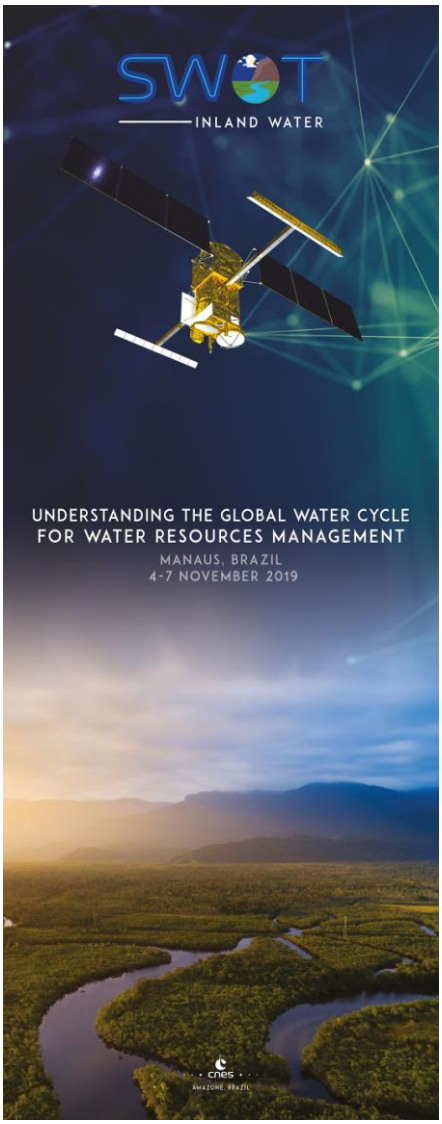
systems, which will serve as a basis for discussion by European and South American research teams and operational institutes to prepare for the development of the capabilities offered by future SWOT satellite observations.

The conference, through a very rich poster session and a technical session on the use of software for remote sensing and hydrology, also provided an opportunity for students and young scientists to be trained in technical activities and to present their work.

Finally, this conference, which received extensive media coverage in Brazil (see hydrologyfromspace.org), once again demonstrated the importance of scientific collaborations between France and South American countries on crucial issues such as the water cycle, climate and better future management of the Earth's resources.

The organizers are already working on a summer school in 2020 and the South America Water from Space III conference, which should take place in 2021, a few months a year.

Organizing Committee: Daniel Moreira (CPRM-Rio), Fabrice Papa (IRD-LEGOS), Stéphane Calmant (IRD-LEGOS), Joecilia Santos Da Silva (UEA Brésil), Nicolas Picot (CNES), Selma Cherchali (CNES) **Local organizing committee**: Jussara Socorro Cury Maciel (CPRM-Manaus), Franck Timouk (IRD, Manaus) (and UEA colleagues in Manaus) **Scientific Committee**: Rodrigo Abarca del Rio (UDEC, Chile), Jean-François Crétaux (CNES, France), Marielle Gosset (IRD, France), Waldo Lavado (SENAMHI, Peru), Juan Gabriel Leon (UNAL, Colombia), Philippe Maisongrande (CNES, France), Alfredo Ribeiro Neto (UFPE, Brazil), Rodrigo Paiva (UFRGS-IPH, Brazil), Tamlin Pavelski (UNC, USA), Frederique Seyler (IRD, France), Javier Tomasella (CEMADEN, Brazil), Santiago Yepez (UDEC, Chile)



Conference report

All details can be found on the webpage of the conference, hydrologyfromspace.org with links to all presentations, program, press release, list of participants and photos.

Monday 4 November 2019

Opening by country representatives

The event was officially launched by Mr Michel Miraillet, Ambassador of France to Brazil, who stressed out the importance of studying the water cycle and hydrology in the context of climate change. This is an important challenge to achieve a better management of global water resources for the benefits of all. Mr the Ambassador highlighted also how the event will reinforce the long scientific collaboration between France, Brazil, the USA and South American countries on those key topics, especially 2 years before the launch of the SWOT mission. The discourse of Mr the Ambassador was followed by a discourse by Dr Antonio Bacelar, Director of the Hydrology and Territory at CPRM (Brazil Geological Survey), who also discussed about the importance of to better understand freshwater resources, hazards and climate in Brazil and South America. He warmly welcomed all participants to the event, and was thankful to all foreign participants that made the long journey to Manaus.

Institutional presentations by officials

CPRM
Representing CPRM, Dr Bacelar and Dr Peixinho presented general overview of the importance of water for Brazil, and more generally for South American countries and their population. They show how CPRM work in hydrology is now moving towards creating an integrated network between organisms, including hydrology from space as a key tool, to tackle vital questions related to water information and management.

IRD
Representing IRD, Frédérique Seyler, from the DISCO department at IRD, gave an overview presentation, emphasizing the work and collaboration between France and South American countries on water sciences and hydrology, especially dealing with the Amazon basin, over the last 40 years.

CNES
Representing CNES, Jean-Francois Cretaux gave an overall talk on SWOT satellite mission and its various applications fro hydrology, the water cycle and water resources.

Introductory keynote talk: "World water issues and a focus on South America" by Ernesto Rodriguez, JPL, USA.
Ernesto Rodrigues, from JPL-NASA-CalTech, Pasadena, USA, gave an overall talk on critical issues related to water in South America and globally. The talk introduced the key questions around water related issues -demand changes from population growth and relocation, as well future changes in availability due to climate change. It then proposed an exhaustive presentation on the use of satellites to provide vital data to complement in situ data collection and how important is the involvement by South American science, operations, and government entities to improve the usefulness of data collected by space missions

Session 1: Continental water from Space and SWOT mission

Chair persons: Rodrigo Paiva – Ernesto Rodriguez

George Allen (TAMU, USA) talked about "Tracking the global extent and seasonality of rivers from space". He showed details on the global river width dataset developed from Landsat, showing potential applications as input for global hydrological models and global river gas emissions. Discussions with the audience related to challenges as monitoring new reservoirs, ephemeral rivers, dynamic water masks, among others.

Stéphane Calmant (IRD) with Joecila Santos da Silva (UEA) presented "Woldwide River monitoring form altimetry". The motivation is the loss of in situ gauges in last decades. They showed the basis of altimetry technology, and the evolution of satellite missions from research to pre operational phase. It was discussed perspectives from future SWOT mission and SMASH constellation that is under discussion. Questions from audience include details on SMASH orbit, corrections related to atmospheric issues and the size of rivers that can be monitored.

Rodrigo Abarca del Rio (Universidad de Concepción) gave a talk on "Hydrology and Climate Variability". He discussed the worldwide precipitation trends, that has no statistical significance; How ENSO regulates precipitation variability across the globe; How vegetation controls evapotranspiration and as a consequence runoff. Analyses using GRACE satellite and complex networks. He concluded on the importance understanding the role of ENSO on hydrology as billions of people live in areas directly affected by it. Discussions with the audience included questions about trends on precipitation extremes.

Jean Michel Martinez (IRD) talked about "Water quality in South America from satellite". Among several motivations, he defined unknown water quality as part of an invisible water crises. And remote sensing could be used to monitor it and for several applications as erosion, Nutrients. Mining, Dam failure, Euthophisation. He mentioned the development of techniques, ranging from: intensive field campaigns to monitor optical properties of water, image processing (e.g Sentinel) and retrieval algorithms and effective production of data for solid discharge and applications. Examples as monitoring Itaipu reservoir and Brumadinho hazard was shown. Prospects on coupling water color with SWOT observations to monitor solid discharge. Questions from audience include the accuracy of local to global remote sensing estimated of sediments and use of ICESAT2 to enhance estimates of sediment concentration.

Fabrice Papa (IRD) presented "Amazon Freshwater dynamic from multi-satellite observations. Towards the surface/groundwater storage and fluxes". The motivation is the unknown dynamics of continental water storage at appropriated spatiotemporal resolution and decomposition of hydrological cycle into groundwater, soil and surface water. He presented estimated from different satellites products, including GRACE and GIEMS and how to improve spatial resolution with downscaling methods as GIEMS-D3. Discussions with the audience included the difficulties to validate groundwater storage from in situ level observations (e.g. data from CPRM).

Jefferson Ferreira-Ferreira (Mamirauá Institute) presented "SAR Remote Sensing in South American Wetlands". He discussed the motivations on using SAR for wetland monitoring, and the timeline of past and current SAR satellite missions. Several applications were presented, as the mapping of flood inundation frequency, land cover, hydrodynamics of wetlands, ecosystem functioning and fishing effort. Questions from the audience included on how to expand wetland mapping from site to large areas as all the central Amazon.

Marielle Gosset (IRD), Romulo Oliveira (GET-LEGOS) and Daniel Vila (CPTEC) gave a talk on "Remote Sensing of Precipitation". It was presented details on the physics of precipitation measurement from remote sensing, current satellites ,

sensors and orbits. Issues over South America including products and validation of its performance. It was highlighted the need for hourly in situ gauge data for improved validations of spatiotemporal variability of satellite observations.

Tuesday 5 November 2019

Session 2: Integrated studies for hydrology and water cycle.

Chair persons: Eduardo Martins – Marielle Gosset

This session was dedicated to recent advances in the synergetic use of satellite data from multiple sources and/or with models, to study hydrological behaviors and the water balance over a range of spatial and temporal scales. The session counted with all 7 presentations listed in the conference program. The session had active participation of the audience with several comments/questions after each presentation.

The concept of hydrological reanalysis over South America was introduced by Paiva et al. together with other studies based on the MGB model to analyze flood risk, hydro-climatic variability or some detailed hydrological processes such as flood plain functioning or hydro-sedimentary fluxes.

Aires et al. demonstrated how multiple-satellite and in situ information (rainfall ; discharge ; evaporation ; continental water stock variations) together with consideration on the water budget closure at basin scale can help quantifying water storage and fluxes in the various compartment (surface ; ground etc…) , and even help studying surface and underground lateral fluxes. CPRM identified an opportunity to apply it in the Urucuia Aquifer.

Several presentations dealt with the use of altimetry data and its use in association with hydrological or hydraulic models to retrieve or forecast discharge in Tropical basins which are generally lacking in situ observations:

Paris et al. focused on the Congo basin ; Pedinotti et al. on the Niger basin with prospect for operational flood forecasting ; Emery on the Amazon basin and finally Oubanas et al. provided a detailed analysis of altimetry data assimilation in hydraulic models.

To complement river studies, Cretaux et al. presented an overview of lake monitoring from satellites and described the essential role of lakes as ‘sentinels of climate change’ with many examples over various latitudes and altitudes. Grippa et al. complemented the session overview with a focus on ‘small water bodies’, which are a challenge for a remote sensing because of their size, while they are central to many scientific and societal issues. Cretaux stressed out that : « SWOT is not for the future, it is for now! »

Many questions rose from the audience on several topics : uncertainties in models and satellite data and how to account for them in the forecast quality ; the use of the presented results by operational agencies in South America ; the possibility to transfer the presented studies (model ; water budget) in different basins ; prospect of using of the SWOT simulator to include *swot-like* data in the presented studies ; many technical questions were also asked on data assimilation (use of additional information and data to reduce uncertainties ; need for a priori data ; impact of resolution ; impact of lateral connection ; qualification of uncertainties and error structure).

All the topics presented in this section will benefit from the high-resolution SWOT data when they will be available and will provide test-beds for the first use of this new type of information on water.

Signature of IRD-CPRM Inter-institutional agreements

The agreements to renew the cooperation and the project “Dinamica fluvial” between CPRM and IRD for the period 2020-2024 were signed by Dr Bacelar (CPRM) and Dr

Marie-Pierre Ledru (IRD representative to Brazil).

Session 3: SWOT Early adopters and Water study in the operational context.

Chair persons: Rodrigo Abarca del Rio – Stephane Calmant

This session was dedicated to the use of satellite data, in particular in the context of the future SWOT mission, by operational agencies, over a range of different applications over South America. The session included 5 presentations. The session had active participation of the audience with several comments/questions after each presentation.

The first presentation dealt with the various activities from CPRM in the context of operational hydrology using satellite in Brazil. In particular it includes the future developments of the newly extended project called Dinamica Fluvial, in cooperation with IRD. The presentation emphasizes the key role played by satellite-based observations in CPRM activities, and how CPRM is already preparing the launch and the future use of SWOT observations (Cal/Val, integration of altimetry measurements,...).

The second talk presented the use of satellite-based observations to study and monitor water resources in Nordeste Brazil. It first introduces FUNCEME, a state level institution in Ceara, which provides information to support decision and public policy in climate, water and environment. In the context of Ceara and Nordeste Brazil, monitoring network is an important tool to manage water resources (water quantity and quality), especially during droughts or other climate-related events. In this context, the use of satellite-based observations is essential to monitor irrigated areas, fisheries, small water infrastructures, in combination with other database. SWOT, in a possible operational context will offer a new important tool foster those activities.

The third presentation, by SENAMHI, focused on the hydroclimate of Peru using space and land observations. SENAMHI, the National Service of Meteorology and Hydrology from Peru, plans, organizes and coordinates activities related to meteorological and hydrological services at the country level, with a roadmap going from landslides to precipitation networks. Several current applications were presented, from the use of hydroclimatological stations to the distributions online of free data through national portals, in the context of operational monitoring of drought and floods events. New technologies, including satellite observations will be needed in the near futures to sustain the actual networks of monitoring.

The fourth presentation of this afternoon session dealt with the “Early warning system under implementations at Cemaden-Brazil, and potential interfaces with SWOT. The systems were illustrated through two case study, the Tocantins and the SouthEast region basins of Brazil. The presentation first focusses of the hydrological model validation, and shows that in general, hydrological models are calibrated using rainfall interpolated from the rain gauge network. However, most of the data available comes from manual rain gauges, which is a strong restriction in case of early warning systems since the initial conditions of the hydrological model depends on the previous rainfall. CEMADEN is using hybrid dataset between satellite and manual rain gauge network. Then the presentation focussed on hydrological-related risk warning and how to obtain accurate level of alert, using ensemble streamflow forecast, data assimilation and ROC (relative operation characteristics) in the context of Brazil. Finally, the presentation showed the use of satellite altimetry to calculate water storage in reservoirs and small basins. The conclusion of the studies show that because most of the disasters are concentrated in headwater catchment, data availability on real time can certainly benefit early warning. In the context of SWOT, the problem is that the revisit time is about 7 days. We need to check how much that frequency can “harm” the forecasts and at which scale. Nevertheless, there is a huge potential form monitoring ungauged reservoirs on real-time during drought events (for planning mitigation actions, etc).

The last presentation was dedicated to HYBAM –The observatory of the Amazonian rivers, a multi-partner initiative to study and monitor the hydrology and geochemistry of the Amazon catchment. It represents now an International network between France and the Amazon basin countries (Brazil, Bolivia, Peru, Ecuador, Venezuela) since 2003, with important cooperation with Stakeholders: Universities/research centers and national agencies. The presentation dealt with the context of the network and database building a community working on the water resources of the Amazonian basin. It emphasizes, among many activities, the strong links between HYMAB and the remote sensing community and the importance of the synergetic use of in situ and satellite data and models to study and manage the environment of the Amazonian "Super Catchment", in particular in the context of the current crisis and threats.
After the presentations, discussions were made on how to better integrate satellite data, especially in the SWOT context for operational agencies. Many comments from the audience and representatives of the agencies emphasize the need for SWOT to be "operational", in particular regarding the latency of the space agencies to distribute observations.

Session 4: SWOT-Ocean

Chair persons: Otto Rotunno Filho and Fabrice Papa

Firstly, the main points of the presentations will be described. Then wet provide an overall comment on the session and important questions that have been raised by the participants of the Conference.

Fabrice Hernandez (IRD/LEGOS, France) – Physical oceanography of Tropical Atlantic in the context of SWOT, the SWOT-Ocean Brazil project
Summary - The scope of the presentation addressed the SWOT- Ocean initiative in Brazil under the perspective of oceans studies developed in the context of South America and SWOT as a break-through in satellite altimetry, as it goes from SAR Nadir (Cryosat-2010, Sentinel-3- 2016, Jason-CS-2020) to SAR interferometry (SWOT-2021). Expected improves are with respect to 2D surface height images for studying: meso and sub-mesoscale ocean dynamics; sea ice freeboard; coastal, high and internal tides; ocean bathymetry; coastal dynamics. **Main issue:** role of the ocean on the regional climate with focus on the West Tropical Atlantic Warm Pool. Key point: identification of SSH signature of ocean dynamics (15-150 km). **Questions:** How observable are these processes with SSH; What is the relation between mixed-layer processes (SST, SSS, reflectance, color) and deeper dynamics (altimetry)? What is their signature in wavenumber spectra (spatial scales)? **Final remark:** SWOT is expected to contribute to characterize incoherent tidal signatures, propagation and dissipation aspects.

Fabien Durand (IRD/LEGOS, France) – The hydrodynamic continuum of the lower Amazon in the SWOT context: from the estuary to the western Atlantic ocean
Summary – The presentation discussed the complex dynamics of the Amazon river estuary, including hydrological processes and oceanic forcing and how the floodplains affect river-ocean connection and impacts on global climate. **Main issue:** Amazon river outflow as an essential ingredient of the regional sea level. **Key point:** an accurate knowledge of the oceanic forcing and tide magnitude is needed with respect to the Amazon river estuary. **Questions:** How do seasonal flows affect (flood season versus low water season? How does the distance from the mouth of estuary interfere on tidal propagation with respect to distortion due to non-linearities and shallow-water effects? Which could be methodology to be chosen for conducting tidal analysis and developing modeling approaches for calibration and validation of outflows in the estuary since standard harmonic analysis methods do not work? **Final remark:** Develop a hydrodynamic model taking into account present limitations

of tidal models (for example, need of better representation of bed topography and bottom friction parameterization). The objective focuses on de-alising the altimetry data set provided by SWOT to understand the mechanisms of water level variability and flooding during climatic extremes using in situ data sets.

Eduardo Negri (UERJ) – Multidisciplinary approaches to describe, understand and monitor eutrophication in the tropical coastal ocean
Summary – The presentation focused on the mechanisms of propagation at the land-sea interface, vulnerability of mangrove blue carbon to eutrophication and aspects related to microbiology, carbonate chemistry and bio-calcification in hypersaline lagoons. **Main issue:** Besides climate change, ocean acidification and sea level rise, eutrophication, which is characterized by excessive algal growth, is a major threat to health and biodiversity. **Key point:** Forcing mechanisms of circulation in coastal regions may come from local agents such as the effect of wind and local variations in the thermohaline structure and due to remote agents such as large-scale ocean circulation. Active vertical exchanges linked to these scales may have important impacts on the local and global budgets of heat, carbon and nutrients, particularly relevant to phytoplankton productivity because the timescales on which they act are similar to those of phytoplankton growth **Question:** How to better use SWOT data to identify signatures (waveform signal) with respect to coastal bathymetry and tidal gauge network jointly with additional field campaigns for monitoring eutrophication and corresponding hydrodynamic and biogechemical modelling? **Final remark:** There is interest to use SWOT data to better address eutrophication phenomenon, with special interest in the case study adopted for the analysis which encompasses the state of Rio de Janeiro coastal area. As a final comment, it was made a very brief presentation on a project named MOVAR, which is related to monitoring regional variability of heat and water volume in the superficial South Atlantic ocean layer between Rio de Janeiro and Trindade island with emphasis in developing better understanding about the variability of the Brazilian current.

Since SWOT is based on a new technology (Ka-band Radar Interferometry – KaRIN), it is designed to acquire elevation of ocean and terrestrial water interfaces at unprecedent spatial and temporal scales covering global water cycle, water management, ocean circulation and the impacts of climate change. Despite the advancements have been made with respect to use of altimetric data in ocean and terrestrial applications since the sixties of the last century, there is still need of an enormous effort to better understand the SWOT signature, which represents a new paradigm in this technological area. Therefore the three presentations raised key issues to be answered by the SWOT mission planned to be launched in 2021.
The first one is that the role of oceans should be better understood with respect to the impacts they cause in the water balance in the continents. How does ocean circulation affect rainfall and streamflows in South America?
Similar thoughts could be developed with regard to ITCZ. How does it change (more to the south or more to the north) with respect to the Equatorial line? And what about El Niño and La Niña phenomena? In addition, we should add the evaluation of SACZ (South Atlantic Coastal Zone). How does SACZ vary and influence rainfall and streamflows along its path in Brazil?
The patterns of ocean circulation has changed in the last 40 years when we examine the currents that come from the Indic Ocean (close to India and China) and moves towards the south of Africa (Needles current). Such current moves northeast in the direction of South America, more specifically towards the Brazilian coast, then splitting up into the Brazilian current moving to the south of Brazil and the North Brazil current going towards the Gulf stream and then Europe. Oceanographic, environmental and climatic changes are being detected.

On the other hand, which temporal scales are involved? Are we talking of 50-100 years scale or are we talking 1000-10.000 (even larger) years scale? Probably we need to add paleohydrology and paleoclimatology perspectives jointly with biogeochemical evaluation in the analysis. Ocean temperature and ocean salinity are key factors to better understand such changes that can vary accordingly to the spatio-temporal scale we evaluate the problem.
In addition, another important issue that came up in the discussion is how to combine SWOT dataset with remotely sensed data and bathymetric information? More specifically, how to combine different scales of measurement? How does the SWOT mission can effectively contribute with respect to water level heights and variation of lake volumes jointly with hydrological and hydrodynamic modeling? In particular, how does SWOT might contribute to identify coastal bathymetry, modeling of ocean tides and ocean currents, especially in the estuary of the Amazon basin?
Discussion was also made to better understand water quality issues strongly related to water quantity and water volumes that are displaced by means of water movements in the ocean and in the continent. In this sense, coastal eutrophication was commented.
Final comments for the session were made with regard to use remotely sensed data jointly combined with *in situ* data and the need to develop field campaigns to better calibrate and validate SWOT dataset, remotely sensed products and hydrological, hydraulic, hydrodynamic and water quality modeling approaches.

Poster Session

Hydrology Science and Water Resources from Satellites with special focus in South America. All poster are available at the conference website.
More than 30 posters were presented.

Wednesday 6 November 2019

Session 5: Satellite-based Hydrological studies worldwide

Chair persons: Javier Tomasella and Jean-Francois Crétaux

In this session, the first work was about using cell network to estimate rainfall for hydrological modeling studies over the uruguay river basin. The questions were about the attenuation of signal for high intense rainfall, distances between cell antennas, latency time for the delivering of information for the companies, timesteps for rainfall integration and about the possibility of using the signal for estimating evaporation
The second work was about monitoring of South American rivers using SAR and optical data, showing several examples for the Orinoco basin in Venezuela.
For the presentation about hydrological studies over India, questions were about water extraction for agriculture and impacts on the water table levels
The third presentation showed several environmental integrated basin experiments, including the set up of a radar network in rio the janeiro
The presentation about Hydrological studies over the São Francisco river showed several applications for hydrological forecast and a software for processing raw data.
Next presentation showed applications of smos and following missions in soil moisture. Questions were about the calibration of smos for higher latitudes and, in particularly, how to resolve the problems of smos due to interference if ice
The next presentation, Surfwater dynamical and following missions with sentinel 1 and 2 showed applications with 100 m resolutions integrating optical and radar products for water monitoring. The questions were about radar processing and the time frequency
Next presentation showed software development for preparing swot use with the swot large-scale simulator. The questions were about processing for wetlands and how rivers were separated from other water bodies.

Finally, there was a presentation of Orpheo toolboxes and several features of the applications.

Session 6: SWOT mission: Hydroweb, GDRI, cal/val activities before launch, new ST and future projects

Chair persons: Philippe Maillard and Adrien Paris

This session was devoted to present two major on-going activities: the Hydroweb database and the current and future activities around the CAL/VAL for current satellite missions and SWOT, pre- and post-launch.

Conclusion, discussions, announcements:

From 3pm to 5pm, there were several discussions among the participants. Many acknowledge the success of the conference.

Rodrigo Abarca del Rio announced the preparation of a "Special issue in the journal Remote Sensing related to South America Water from Space". It will be opened from February 2020 to December 2020.

Many persons raised the question where to find fundings in South America to continue our work. Several propositions need to be investigate: FAPESP calls (agreement FAPESP/States– more questions can be send to Javier Tomasella, CEMADEN that can be the Sao Paulo State partner).

The french embassy introduced the new program CLIMAT-AMSUD from the MEAE/MESRI (French ministry of foreign affairs). The call for 2020 is now open and accessible at :

http://www.sticmathamsud.org/fr/climat/convocatoria-climat/

The goal is to developed research projects between French Research Institutes and South America research agencies (from any country in South America).

Following GUYAMAZON, there is a possibility for a new call in the near future for Amazonian states with a gaol to develop multidisciplinary subject (socioeconomics, science, etc);

Brazilian scientists reminded the opportunity to apply to CAPES call to support meetings in 2020 (submit from 03/2020 to 12/2020, but a question is still pending to know is it needs to be linked to a university?).

The idea for 2020: a summer school for ~25 students on remote sensing and water resources. The goal will be to train students to use data to study the water cycle and water resources. For the location, several ideas came on the table: Tabatinga/Leticia? But FUNCEME is also very interested since we could join the summer school to a workshop on hydrology/extreme events/risks and satellites, probably in October 2020.

In the next few months, we need to look for new ways on communications to reach other communities and countries which are not involved (Argentina, Bolivia...). May be through a website or a blog? This could be started from the website that already exists.

Finally, we started the discussions on our next conference to be held in 2021, the year of SWOT launch. We are thinking to organize it at SENHAMI/Peru. To be discussed in detail over the first semester of 2020.

Thursday 7 November 2019

Field trip

Field trip on CPRM boat to measure discharge and water level variations on the Negro River. Demonstration by CPRM/ANA and IRD staffs on the use ADCP, GPS, radar and software to estimate discharge, water quality. Visit of the “meeting of the waters”, where the Amazon meets the Rio Negro, south of Manaus.