BAMS
Meeting Summary

The Early Adopter Program for the Surface Water Ocean Topography Satellite Mission

Lessons Learned in Building User Engagement during the Prelaunch Era

Faisal Hossain, Matt Bonnema, Margaret Srinivasan, Ed Beighley, Alice Andral, Bradley Doorn, Indu Jayaluxmi, Susantha Jayasinghe, Yasir Kaheil, Bareerah Fatima, Nicholas Elmer, Luciana Fenoglio, Jerad Bales, Fabien Lefevre, Sébastien Legrand, Damien Brunel, and Pierre-Yves Le Traon

2019 SWOT Early Adopters Training Workshop

What: A workshop was organized on the Surface Water and Ocean Topography (SWOT) mission that is planned for launch in 2021. Eleven early adopters representing a wide range of stakeholders of the SWOT mission presented projects for evaluation of SWOT's application potential and helped identify pathways to achieving successful application of data from the SWOT mission.
When: 20–21 May 2019
Where: Paris, France

AFFILIATIONS: **Hossain**—University of Washington, Seattle, Washington; **Bonnema and Srinivasan**—NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California; **Beighley**—Northeastern University, Boston, Massachusetts; **Andral**—Centre for National D'Etudes Spatiales, Paris, France; **Doorn**—NASA Applied Sciences Program, Washington, D.C.; **Jayaluxmi**—Indian Institute of Technology, Bombay, India; **Jayasinghe**—Asian Disaster Preparedness Center, Bangkok, Thailand; **Kaheil**—FM Global, Norwood, Massachusetts; **Fatima**—Pakistan Council for Research in Water Resources, Islamabad, Pakistan; **Elmer**—NASA Short-Term Prediction Research and Transition Center, Huntsville, Alabama; **Fenoglio**—University of Bonn, Bonn, Germany; **Bales**—Consortium of Universities for the Advancement of Hydrologic Science, Inc., Boston, Massachusetts; **Lefevre**—Collectie Localisation Satellites, Paris, France; **Legrand**—Compagnie Nationale du Rhône, Paris, France; **Brunel**—BRL Ingénierie, Paris, France; **Le Traon**—Mercator-Ocean, Paris, France

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The Surface Water and Ocean Topography (SWOT) satellite is a research mission (Alsdorf et al. 2007; Biancamaria et al. 2016), planned for launch in 2022. It is being jointly developed by NASA and the Centre for National D'Etudes Spatiales (CNES), with contributions from the Canadian and U.K. space agencies. The SWOT mission will serve both the hydrology and oceanography communities by providing for the first time a global survey of Earth's surface water, including spatially distributed and high-frequency measurement of elevation data for rivers, reservoirs, lakes, and wetlands, as well as unprecedented detail in the topography of the ocean surface (Morrow et al. 2019). The NASA Applied Sciences Program, the SWOT Applications Working Group (SAWG), the CNES SWOT Applications Program, the SWOT Project, and members of the SWOT Science Team (ST) have been coordinating these efforts. During spring 2019, a workshop was organized at CNES headquarters (HQ) in Paris (France) to assess the status of the Early Adopter Program (EAP) that was launched for SWOT Early Adopters (EAs) in 2018. Here, the key lessons learned from this program are shared.

The EAP supports recommendations of the National Research Council's 2017 report "*Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space*" (NASEM 2018). In the vision of the EAP, each selected EA proposed an activity for the use of SWOT data. EAs were defined as those groups and individuals who will have a potential or clearly defined need for SWOT surface water or ocean topography data or information, and who are planning to apply their own resources to demonstrate the utility of SWOT data for their use, system, or model. The goal of this EAP is to accelerate the use of SWOT products after launch of the satellite by providing specific support to EAs who commit to engage in prelaunch research that would enable integration of SWOT data in their real-world applications. This research would provide a fundamental understanding of how SWOT data products may be scaled and integrated into their organizations' policy, business, and management activities to improve decision-making efforts (Hossain et al. 2017).

In the initial cohort (beginning in 2018), 11 EAs were selected from various hydrology and oceanography domains. These were Asian Disaster Preparedness Center (ADPC)/SERVIR-Mekong; NASA Short-Term Prediction Research and Transition (SPoRT) Center; Pakistan Council of Research in Water Resources (PCRWR); Indian Institute of Technology (IIT Bombay); University of Bonn (UBonn); Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI); FM Global;[1] Collecte Localisation Satellites (CLS); Compagnie Nationale du Rhône (CNR); BRL Ingénierie (BRLi); and Mercator Ocean.

WORKSHOP GOALS AND OBJECTIVES

The key goal for the workshop was to provide a voice for selected EAs to share their application projects involving SWOT data, their decision-making activity, and their progress, and to highlight their concerns and future needs. This workshop aimed to bring the EAs to a focal point for collaborative learning and sharing of lessons on what has worked for exploring the utility of SWOT data, and what more can be done in the years remaining before launch.

Over the span of 2 days, the workshop was designed to achieve the following objectives:

1) to provide selected EAs an opportunity to share their SWOT-related application projects and their progress with the SWOT Mission and Science Team;
2) to facilitate peer-to-peer collaborative learning for selected Early Adopters through lessons learned in other early adopter projects;
3) to provide hands-on training on cloud computing to train Early Adopters to use an available cloud-computing platform to process, analyze and make decisions using massive amounts of satellite data in the cloud. [Note: This objective is designed to acclimatize EAs to

[1] Current FM global representative and project lead is Dr. Alain Dib (alain.dib@fmglobal.com).

NASA's Physical Oceanography Distributed Active Archive Center (PO.DAAC), which will jointly host SWOT data products with the CNES data center, and their plans for hosting SWOT data on a cloud-computing platform.]; and
4) to identify concerns and needs of EAs for successful completion of their projects.

To maximize the effectiveness of the workshop and the chances of fulfilling the workshop objectives, organizers worked proactively with many EAs to explain the purpose and specific expectations. EAs were mentored individually by SAWG leads and were encouraged to think carefully about the core issues in advance of the workshop. Each EA was requested to imagine desired future press releases or newspaper headlines that their EA project might enable. This could be an outcome of their use of SWOT data that they would like to aspire to as a success story of their project. These press releases are hypothetical and their realization is dependent on numerous conditions beyond the control of the EA or the SWOT mission. However, the workshop organizers felt that this was a good way to design a project trajectory for each EA, delineate a tangible goal as a shared-vision, and then work closely with EAs to realize that press release.

The supplementary file to this article provides a summary of the progress made by each EA, their needs, concerns, hurdles, and their desired future press release. Based on feedback from EAs and discussions, we present here the key findings from the EAP for SWOT mission.

COMMON UNDERLYING NEEDS OF EARLY ADOPTERS

Based on feedback shared by EAs, the following key underlying needs emerged as common to all EAs:

1) EAs need simulated SWOT data for hydrology applications that mimic the real-world geophysical constraints of SWOT observation due to topography, climate, and vegetation.
2) EAs need clear and timely metadata information on SWOT data products now to begin their projects if they are to use SWOT simulated (or actual) data properly and be acclimatized to actual SWOT data after launch.
3) Many EAs require engagement support to visit a research center/collaborator relevant to their SWOT mission that can allow them to engage in weeklong immersive training to solve the specific application problems.
4) Many EAs require online training programs and tutorials/webinars on how to handle SWOT data.
5) EAs would benefit from SWOT-specific "hackathons for Early Adopters" to rapidly prototype solutions for their EA project, particularly for building components that require team-based thinking.

The key risks of the EAP can be summarized as follows:

1) lack of access to simulator data for hydrologic application over river basins with steep topography, vegetation, and humid climates;
2) lack of training in managing large volumes of data in cloud computing environment; and
3) lack of prompt guidance/engagement from SAWG and ST for troubleshooting problems with EA projects as they emerge.

FUTURE IMAGINED PRESS RELEASES BY EAs

The future imagined press releases suggested by EAs with fictitious newspaper/magazine titles and years were as follows:

SWOT helps supporting early flood preparedness in Myanmar (ADPC),

SWOT data enables popular and blameless management of waterlogging in Sindh Province of Pakistan (PCRWR),

SWOT data helps in rationalizing irrigation supplies while preventing loss of land to waterlogging (PCRWR),

SWOT data improves reservoir outflow forecasting to reduce downstream flood risk in Kerala (IIT-Bombay),

The NOAA National Water Model forecast accuracy is improved (NASA SPoRT),

Demand for CUAHSI workshops on use of SWOT streamflow products is high (CUAHSI),

SWOT data improves navigability prediction and integrated resources water management on the Sangha River (CNR),

SWOT mission improves mapping of potential sites for hydropower projects in the Congo basin (CNR),

Assimilation of SWOT data improves forecasting skill of NOAA National Water Model (NASA-SPoRT),

SWOT follow-on mission in development after successful use of SWOT data in operational forecasting (NASA-SPoRT),

SWOT helps in predicting the 100-year event of Elbe water level extremes from Hamburg City to coast (UBonn), and

SWOT helps in understanding small scale dynamics in ocean circulation in Danish Straits (UBonn).

Assuming that all "press releases" were achievable through very close mentorship from the SAWG leads, the press releases were subjected to a vote by workshop participants for prioritization for future action by SAWG leads. Each workshop participant therefore chose their three favorite press release that they thought were most feasible and important to show the unique value of SWOT. The top three (with one tied) most popular future press releases were

1) Assimilation of SWOT data improves forecasting skill of NOAA National Water Model (by NASA SPoRT)
2) SWOT helps supporting early flood preparedness in Myanmar (by ADPC)
3) (tie) SWOT data enables popular and blameless management of waterlogging in Sindh province of Pakistan (by PCRWR)
3) (tie) SWOT follow-on mission in development after successful use of SWOT data in operational forecasting (by NASA SPoRT)

CONCLUSIONS FROM THE WORKSHOP

The following conclusions emerged from the workshop for the SWOT Project and science community:

1) The SWOT Early Adopters have all made the demonstration of the usefulness of the future SWOT data in their tools and decision-making covering a wide range of applications from flood prediction, hydropower potential, and water resources management to operational oceanography.
2) SWOT hydrology simulated datasets that represent accurate performance characteristics due to geophysical constraints (lay-over, vegetation, dark water) and to spatiotemporal sampling and that follows the SWOT data product definition need to be made available to EA for their projects.
3) A faster SWOT simulator is an acceptable start and can help EAs acclimatize to SWOT data product structure. Such a simulator can be useful for large water bodies (lakes and reservoirs) in flat terrains.
4) The EA community would benefit from additional online resources for tutorials on 1) cloud computing using platforms such as Google Earth Engine; 2) explanation of SWOT mission, how it works, and its data type; and 3) collection of existing tools and datasets that may be relevant to SWOT for the EA projects.
5) SAWG leads should consider organizing hackathons for SWOT EA projects to solve specific hurdles and build tangible solutions. The EA projects are now gradually maturing and will likely need to start using high-resolution SWOT simulated data soon to complete the first run of proof of concepts for next year's reporting. This means that hackathons tailored to enable rapid prototyping of real-world solutions for EAs using SWOT data are now timely.
6) Programs that encourage deeper engagement for EAs at academic or research centers for immersive learning or training in the United States/France are required for EA organizations and future SWOT user communities.
7) Close and more frequent mentoring support for EAs is needed as projects mature and they begin facing new challenges with data structure and processing. EAs will continue to require guidance, pointers on data access, and answers to queries on data structure/handling. Effective support of EAs will set a good precedent to maximize the user readiness of SWOT data after launch.

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BAMS Supplement

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PROGRESS UPDATES BY EARLY ADOPTERS

Below we present the summary of the Early Adopter project update by each EA.

ASIAN DISASTER PREPAREDNESS CENTER (ADPC)

Title: Plugin SWOT to Enhance Water Resource Management in Lower Mekong Region

Leads: Susantha Jayasinghe, Technical Specialist-ADPC; Chinaporn Meechaiya, Hydrologist-ADPC

Summary: ADPC has embarked on assessing the value of SWOT for improving water management in Lower Mekong countries. In particular, ADPC aims to address the value added by SWOT in four types of applications: 1) Enhancement of an altimetry-based virtual stream monitoring network with SWOT; 2) Enhancing web-based water accounting at the basin level; 3) Improve regional drought prediction and monitoring through SWOT data assimilation; 4) Improving hydrologic model-aided satellite altimetry flow forecasting with SWOT data.

What questions will SWOT answer in your process, workflow, or organization?
Can SWOT enhance water resource management in Lower Mekong nations?

Can SWOT improve water availability/flow forecasting?

Can SWOT data assimilation in RHEAS improve drought management?

What is the improvement with the use of SWOT data in resource (water-agriculture) management in terms of skill, longer lead-time, faster response time in decisions?

Which countries in Lower Mekong might be bigger beneficiaries of SWOT?

Will SWOT supplement an information stream or product that exists, or will it replace?
No

What are your key risks and challenges to completing the Early Adopter project?
Lack of access to SWOT simulated data and lack of access to adequate training on handling data

What are your desired future press releases for project success?
"SWOT Helps Supporting Early Flood Preparedness in Myanmar"

NASA SHORT-TERM PREDICTION RESEARCH AND TRANSITION (SPORT) CENTER

Title: Assimilation of SWOT WSE to Improve National Water Model Initialization and Streamflow Prediction

Leads: Nicholas Elmer (NASA SPoRT/University of Alabama in Huntsville); Christopher Hain (NASA SPoRT/NASA MSFC)

Summary: NASA SPoRT is exploring the transition of NASA satellite capabilities to operational forecasters and operational models. For the EA project, the SPoRT project will develop a methodology to assimilate SWOT water surface elevation (WSE) into the National Water Model (NWM) to expand the spatial coverage of observations to regions of the world without adequate in situ streamflow information. To use SWOT data to initialize the NWM, case studies will be examined within Alaska related to rain-generated flooding events. First synthetic

SWOT data will be assimilated into WRF-Hydro followed by simulated SWOT data

What questions will SWOT answer in your process, workflow, or organization?
Do SWOT measurements provided value-added impacts in basins where in situ gauge networks exist?

Will the assimilation of SWOT water surface elevations provide measurable improvements to National Water Model performance?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will supplement the current information stream through assimilation

What are your key risks and challenges to completing the Early Adopter project?
Lack of access to SWOT simulated data and lack of access to adequate training on handling data. A hydrology simulator that accounts for error sources beyond random noise (e.g., topographic and vegetation layover) would be beneficial.

More accurate estimates of channel geometry/bathymetry are needed, both from measurement perspective and model perspective

What are your desired future press releases for project success?
"Assimilation of SWOT data improves forecasting skill of NOAA National Water Model"

"SWOT Follow-on Mission in development after successful use of SWOT data in operational forecasting"

PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES (PCRWR)
Title: SWOT applications for determining water surface area change to manage highly regulated transboundary rivers and artificial wetland management

Leads: Bareerah Fatima PCRWR (Pakistan Council of Research in Water Resources), Islamabad, Pakistan

Summary: This project will use SWOT-relevant data products to enhance the quality of trans-boundary flow monitoring, river flux at the outflow points of trans-boundary for improving flood management in Jhelum basin. This will allow for early preparation by downstream dam operators and inhabitants. For delineating and management artificial wetlands, SWOT-based model simulations will be created for southern Pakistan, Sindh Province. Ground data will be used for calibration/validation of the water inundation simulation. Once a simulation is created, SWOT-like products will be connected whenever available to gain monthly/cross seasonal variations in the wetlands developed on waterlogged soil.

What questions will SWOT answer in your process, workflow or organization?
Can SWOT provide a complete and trustworthy package ranging from trans-boundary river flow monitoring to water use in agriculture and climate impacts in water consuming sectors?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will create a new information stream, a new service (such as proactive management of Mangla reservoir) and in other cases supplement the traditional hydrologic data

What are your key risks and challenges to completing the Early Adopter project?
Lack of understanding SWOT mission skill prior to launch

Lack of access to SWOT simulated data for hydrologic applications in steep and narrow rivers subject to layover

What are your desired future press releases for project success?
"SWOT data enables popular and blameless management of waterlogging in Sindh Province of Pakistan"

"SWOT Data helps in rationalizing irrigation supplies while preventing loss of land to waterlogging"

INDIAN INSTITUTE OF TECHNOLOGY–BOMBAY (IITB)
Title: Examining the potential of SWOT mission in Hydrometeorology over India

Lead: * J. Indu, Assistant Professor, Department of Civil Engineering, IIT Bombay;
* Prof. Subimal Ghosh, Department of Civil Engineering, Professor, IIT Bombay;
* Prof. Subhankar Karmakar, Professor, CESE, IIT Bombay;
* = Associated faculty, IDP in Climate Studies, IIT Bombay

Summary: To derive weekly/monthly estimates of river discharge, this project will use data assimilation to generate continuous fields of SWOT-relevant observables by merging them with model predictions. This will provide hydrologic information in areas where SWOT data gaps will prevent direct observation. The research objectives of this project are;

1. Evaluate various data assimilation (DA) techniques on synthetic SWOT measurements to generate improved SWOT observables
2. Uncertainty quantification of SWOT orbital data products
3. Using SWOT measurements for the creation of a data inventory toward flood forecasting for different hydro-climatic scenarios

What questions will SWOT answer in your process, workflow, or organization?
Can SWOT improve urban flood inundation modeling and forecasting for cities in India?

What is the optimal way to assimilate SWOT data for river flow and reservoir modeling in Mahanadi river system?

Can data size and its processing negatively impact flood forecasting lead-time?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will supplement the current information stream through assimilation of the data in hydrologic and hydraulic models. SWOT will also improve the space-time frequency of the information availability.

What are your key risks and challenges to completing the Early Adopter project?
Lack of access to SWOT simulated data at hydrologically relevant scales that simulates layover due to steep topography and realistic error characteristics in humid basins.

What are your desired future press releases for project success?
"SWOT data improves reservoir outflow forecasting to reduce downstream flood risk in Kerala"

UNIVERSITY OF BONN/Helmholz Zentrum Geesthacht
Title: Monitoring estuaries and coastal zone with SWOT

Lead: Dr.-Ing. habil Luciana Fenoglio, University of Bonn, Institute of Geodesy and Geoinformation; Dr. Joanna Staneva, Helmholz Zentrum Geesthacht (HZG)

Summary: The proposed activity aims to investigate the new SWOT data to study the ocean processes at different scales from regional (North Sea and Baltic Sea) to coastal/estuarine/tidal inlets and along the German coasts. In the 1-day phase data calibration will be attempted and the high temporal and space variability investigated over ocean and in-land water. The synergy between SWOT observations and in situ, model simulation and SAR altimeter data will be further used in the following science phase to improve the actual understanding of physical phenomena. The modeling tool will be based on the high spatial and temporal-resolution integrated coupled (ocean, wave, sediment transport and hydrology) model system GCOAST for river-to-ocean continuum scales

What questions will SWOT answer in your process, workflow, or organization?
How well can SWOT capture the high spatial and temporal variability of estuarine processes during the SWOT fast sampling phase?

What type of synergies can be built between SAR and SWOT during the SWOT science phase and how can that inform coastal city vulnerability?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will augment the current information stream through assimilation of the data over estuarine regions.

What are your key risks and challenges to completing the Early Adopter project?
Lack of access to high-resolution SWOT simulator tailored for coastal and estuarine regions

Lack of guidance on the use of SWOT data and its data products

What are your desired future press releases for project success?
"SWOT helps in predicting the 100 year event of Elbe water level extremes from Hamburg City to coast

"Small scales dynamics in ocean circulation in Danish Straits"

CONSORTIUM OF UNIVERSITIES FOR ADVANCEMENT OF HYDROLOGIC SCIENCE (CUAHSI)
Title: Connecting the water science community to SWOT

Leads: Dr. Jerad Bales, Executive Director, CUAHSI

Summary: Building on CUAHSI's Water Data Services, CUAHSI, in collaboration with the SWOT Science Team (ST), Applications Working Group (SAWG) members and NASA PO.DAAC representatives, will explore optimal methods for: (i) hosting of available synthetic SWOT data products, and (ii) enabling web services for exploring available synthetic SWOT data products and subsetting non-SWOT datasets (e.g., in situ or simulated water surface elevations, water extents, and river discharges for lakes and rivers) to reflect the space/time sampling characteristics of SWOT. Corresponding SWOT data product uncertainties will also be included

based on findings and simulator developments from the SWOT ST. The subsetting web services are primarily intended to help users explore SWOT's space/time sampling within their river basin(s) prior to launch.

What questions will SWOT answer in your process, workflow or organization?
Can SWOT data fill in gaps to provide a more complete inventory of the state of water bodies (lakes, rivers) as standardized data products for CUAHSI?

Can SWOT data improve granularity of hydrologic data?

Can SWOT data improve visibility of CUAHSI services for hydrologic data for the community?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will add new data streams and improve existing data products for CUAHSI in terms of space-time coverage.

What are your key risks and challenges to completing the Early Adopter project?
Depending on the size of NASA products and the extent of pre- and post-launch adoption, some cyber-infrastructure challenges may arise, especially if SWOT products are offered as services upon which operational forecasts are dependent.

What are your desired future press releases for project success?
"The National Water Model skill improves with SWOT data"

"National Water Model now assessable at 72,000 km of streams in the U.S. rather than at 8,000 individual points."

"Demand for CUAHSI workshops on the use of SWOT streamflow products are in high demand."

FM GLOBAL
Title: Calibration of hydrologic and hydraulics models used for flood hazard mapping using synthetic SWOT data products

Leads: Dr. Yasir Kaheil, Staff VP, Principal Research Scientist [Current FM global representative and project lead is Dr. Alain Dib (alain.dib@fmglobal.com)]

Summary: FM Global plans to make incremental assessments of synthetic SWOT data products to: (i) ensure they meet suggested accuracy and uncertainty expectations, (ii) fully understand the unique space–time sampling impacts, (iii) quantify how they may add value to local/regional hydrologic and hydraulic understanding, and (iii) integrate relevant data products into the flood mapping workflow if needed. Case studies will be explored in collaboration with SWOT Science Team and Applications Working Group member, Ed Beighley (Northeastern University), to address the above.

What questions will SWOT answer in your process, workflow, or organization?
Can SWOT data be effective in flood risk reduction and minimize losses?

How much can SWOT support extreme event forecasting using models?

How can SWOT be helpful in global water management?

Can SWOT improve the understanding of trends in the vulnerability of cities to coastal inundation and storm surge?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will supplement the current information stream through assimilation

What are your desired future press releases for project success?
"Assimilation SWOT data Improves Flood Forecasting Skill in the Mississippi"

"Near real-time SWOT data helps insurance field engineers prioritize their visits after Hurricane"

COLLECTIE LOCALISATION SATELLITES (CLS)
Title: SWOT data to be included in a Water Resources

Leads: Fabien Lefèvre, Guillaume Valladeau

Summary: CLS collects analyses and disseminates satellite hydrological parameters to provide databases and services monitoring surface water and natural resources based today on remote sensing observations and in situ data. CLS works also on numerical modeling data. It develops also management tools and databases for hydrological parameters, hydrological monitoring and in the future plans to include forecasting services. CLS will integrate SWOT data in the Hydroweb database and plans to use SWOT data for validation and calibration of numerical models.

What questions will SWOT answer in your process, workflow, or organization?
How does catchment size impact the assimilation of SWOT data for water management?

Can SWOT facilitate "fair & transparent" management of water resources in large and transboundary river basins?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT data will be included in a water resources management system of a river basin with satellite in situ and numerical modeling technologies.

What are your key risks and challenges to completing the Early Adopter project?
Getting at least one year of simulated SWOT to be compared to numerical model and in situ data

Accessing the data at least one year before the launch of SWOT

COMPAGNIE NATIONALE DU RHÔNE (CNR)
Title: Examining the potential of SWOT in hydropower and navigation

Leads: Sébastien Legrand

Summary: Since 1933, based on the concession received by the French Government, CNR has been developing the Rhone River according to three core missions: hydropower generation, inland navigation and irrigation. CNR is particularly interested in ungauged basin/river and long time series of water level that could be made available to end users thanks to SWOT. CNR already uses altimetry data to develop operational applications in the field of water resources management, hydropower potential assessment and navigation forecasting. CNR plans to

assess the value of SWOT data in ungauged and transboundary basins for improving navigation and hydropower assessment

What questions will SWOT answer in your process, workflow, or organization?
Can SWOT data be complementary to CNR's hydrometric database?

What is the added value of SWOT data for improving navigation and, and how can assessment hydropower potential be determined (such as for Congo)?

Will SWOT provide data at current virtual stations that will be comparable with current data?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will supplement the current information stream through assimilation

What are your key risks and challenges to completing the Early Adopter project?
Lack of access to SWOT simulated data at high resolution for hydrologic studies

What are your desired future press releases for project success?
"Near real-time SWOT data improves navigability prediction and integrated resources water management on the Sangha River"

"SWOT data help mapping potential sites for hydropower projects in the Congo basin"

BRL Ingénierie (BRLi)
Title: Toward a better water resources management with altimetry and SWOT mission

Leads: Damien Brunel, Laurent Tocqueville, Stéphane Delichère

Summary: BRLi is a consulting firm that specializes in areas related to water, the environment, and regional planning, providing design and construction engineering, management services, integrated water resource management, hydraulic, port, and navigation infrastructures, protection of the environment and coastal areas, and natural risk management. BRLi is part of the French working group on Space Hydrology lead by CNES, AFD—the French development agency and IOWater. This groups aims to promote the use of space data in hydrology and to prepare the use of SWOT data. In this project, BRLi will explore the value of SWOT and is particularly interested in ungauged basins/rivers to provide a basin's holder with better water resources management. It also has applications on navigation and flooding maps and forecasts.

What questions will SWOT answer in your process, workflow, or organization?
How can the temporal frequency of SWOT data be managed with model-driven estimation of flow using more frequent satellite observations?

Can SWOT improve navigation (Congo River) and reservoir management (Ethiopia)?

Will SWOT supplement an information stream or product that exists, or will it replace?
SWOT will supplement the current information stream through assimilation.

What are your key risks and challenges to completing the Early Adopter project?
Lack of access to SWOT simulated data at high resolution for hydrologic studies

Mercator Ocean

Title: Assimilation of SWOT in the Mercator Ocean analysis and forecasting systems

Leads: Pierre-Yves Le Traon

Summary: In routine or in real time, on a global or regional scale, both on the surface and beneath it, Mercator Ocean describes, analyses and forecasts the state of the ocean. This capacity encompasses the description of the current situation (analysis), the prediction of the situation 10 days ahead (forecast), and the provision of consistent retrospective data records (reanalysis). Mercator Ocean provides a sustainable response to user needs in four areas of benefits: (i) maritime safety, (ii) marine resources, (iii) coastal and marine environment, and (iv) weather, seasonal forecasts, and climate. Mercator Ocean prepares the assimilation of SWOT data in the Mercator Ocean analysis and forecasting systems. It plans to combine SWOT, nadir altimeters, other satellite data (e.g., sea surface temperature), and in situ data (e.g., Argo) with high-resolution global models to allow a dynamical interpolation of SWOT data and to describe and forecast the ocean state worldwide.

What questions will SWOT answer in your process, workflow, or organization?

How will SWOT data improve Mercator Ocean monitoring and forecasting systems, in particular, at small scales (<150 km) that are not well constrained by conventional altimeters?

What will be the demonstrable impacts for key ocean applications such as marine safety, pollution monitoring, ship routing?

Will SWOT supplement an information stream or product that exists, or will it replace?

SWOT will improve Mercator Ocean ocean analyses and forecasts.

What are your key risks and challenges to completing the Early Adopter project?

Capability for near real time processing of SWOT data (<2 days).

Ensuring consistency with other altimeter missions (S3, S6/Jason-CS). Including cross calibration methods to be applied in near real time.

Preparation for the assimilation of SWOT data in very high-resolution models.

What are your desired future press releases for project success?

"Use of SWOT data in Mercator Ocean global ocean forecasting system provides a major improvement of our upper ocean forecast skill that directly benefits key ocean applications such as marine safety, pollution monitoring or ship routing"