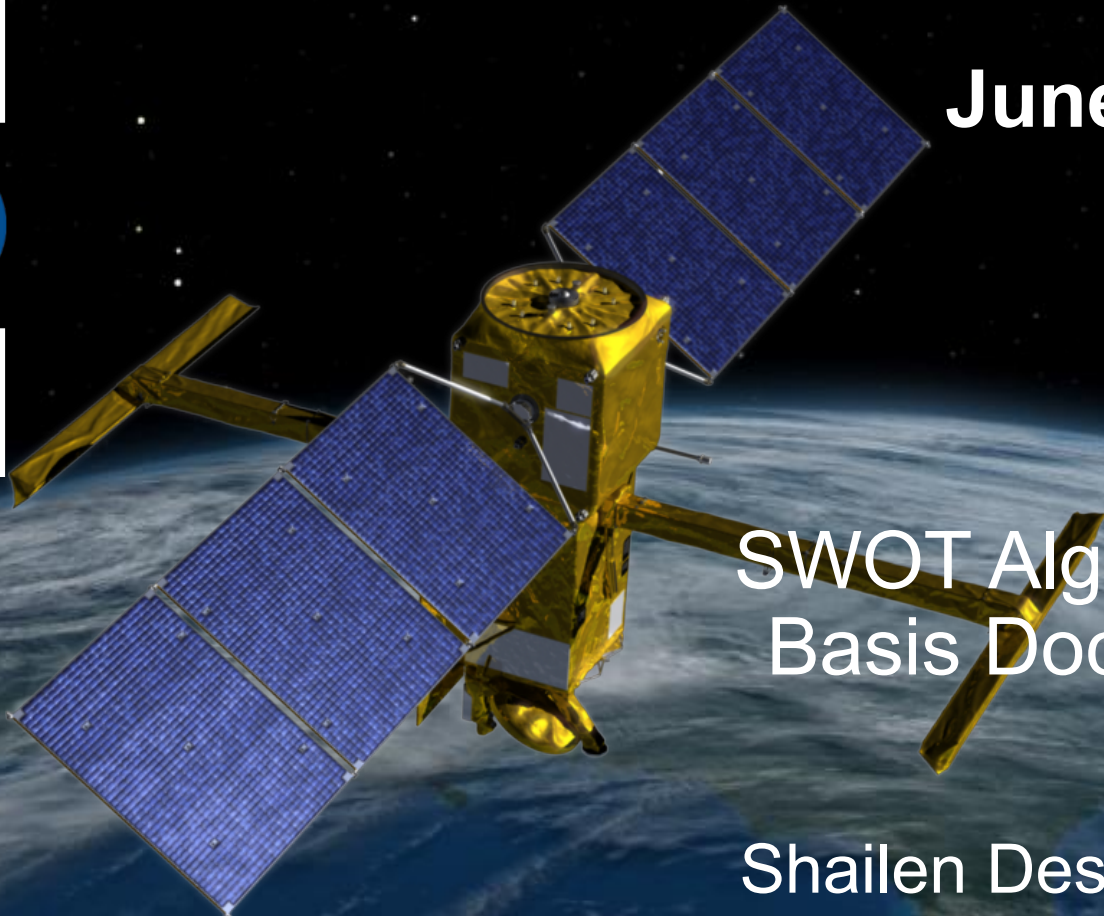# Surface Water and Ocean Topography (SWOT) Mission

June 24, 2017

SWOT Algorithm Theoretical Basis Documents (ATBDs)

Shailen Desai

Jet Propulsion Laboratory, California Institute of Technology
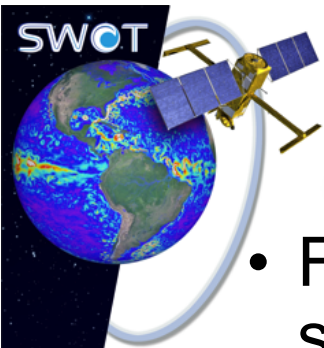
Nicolas Picot

Centre National d'Etudes Spatiales

Introduction

- ## What are the ATBDs?

  – Algorithm Theoretical Basis Documents

  – Describe the physical and mathematical basis for the algorithms used to generate the science data products.

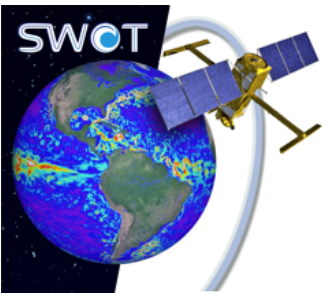 – Describe the auxiliary data (static and dynamic) used by algorithms.

SWOT Approach

- Focus on algorithms used to generate the KaRIn science data products.
  - These algorithms are novel for SWOT.
  - Generated by algorithm development team.
  - Reviewed by science team for inputs and concurrence.
- Algorithms for nadir altimeter science data products, including orbit determination(e.g., POE/MOE) have strong heritage from Jason-series (Jason-1/2/3).
  - SWOT to use best available Jason-series standards.
  - ATBDs were comprehensively reviewed during Jason-1 mission development by Ocean Surface Topography Science Team.
 - ATBDs available to SWOT science team on request.
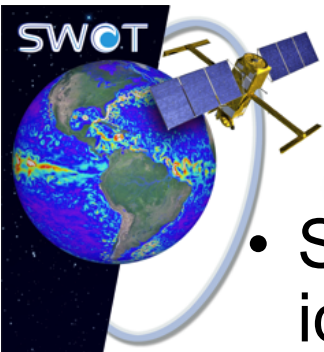
SWOT ATBD Review Approach

- Subject matter experts (SMEs) from science team identified by science leads.

  - Responsible for formal approval of KaRIn ATBDs (including auxiliary data).

  - Provide detailed review and input.

  - Identify single lead point of contact with lead author of each ATBD.

    - Consolidate input from other members of science team.

      - Welcome input from all members of science team through the subject matter experts.

    - Resolve conflicts between science team requests.

  - Iterate with algorithm development team as necessary.

- Prototype software provide basis for generating ATBDs.

  - Algorithm development team currently developing prototype software using simulated data.

  - Baseline algorithms serve as basis for iteration with SMEs.

KaRIn Low Resolution (Oceans) Science Algorithms

Science Algorithm	Description	Subject Matter Experts
L2_RAD	Generates Level 2 radiometer product with measurements of wet troposphere delay and sigma0 atmospheric attenuation from downlinked data.	Shannon Brown FR (TBC)
XOVERCAL	Generates cross-over calibration product to mitigate systematic errors (e.g., bias, roll/phase, baseline length) from KaRIn and nadir altimeter sea surface height measurements.	Ernesto Rodriguez Pascal Bonnefond Christopher Watson
L1B_LR_INTF	Generates Level 1B product with 9-beam interferometric, correlation, and power data corrected for instrument effects from 9-beam downlinked data.	Tom Farrar FR (TBC)
L2A_LR_SSH_PRECAL L2B_LR_SSH_PRECAL L2A_LR_SSH L2B_LR_SSH	Generates Level 2 sea surface height data products. L2A at KaRIn native center-beam with 2/2 km and 250/500 posting/resolution. L2B on geographically fixed grid with 2/2 km posting/resolution. LR_SSH appends crossover calibration to LR_SSH_PRECAL.	Sarah Gille Ed Zaron Emmanuel Cosme Coastal: Nadia Ayoub (TBC)
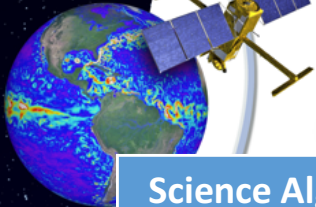
KaRIn High Resolution (Hydrology) Science Algorithms

Science Algorithm	Description	Subject Matter Experts
L1B_HR_SLC	Generates Level 1B single-look-complex (SLC) data product with SLC images, calibration information, time-varying platform and radar system parameters, and digital elevation model.	Scott Hensley
L2_HR_PIXC	Generates Level 2 pixel cloud data product from SLC product by performing height reconstruction, phase unwrapping, water detection, flagging.	Mike Durand
L2_HR_RIVER_TILE L2_HR_RIVER_SP L2_HR_RIVER_AVG	Generates Level 2 river data products from pixel cloud data and provides center-line locations, widths, heights, slopes, discharge, and flags for sub-reaches and total reach. _TILE product extends over single tile of data. _SP product extends over single pass over continent. _AVG product aggregates over one basin (or region) within one repeat cycle.	Larry Smith
L2_HR_LAKE_TILE L2_HR_LAKE_SP L2_HR_LAKE_AVG	Generates Level 2 lake data products pixel cloud data and provides height, geolocation, and shape. _TILE product extends over single tile of data. _SP product extends over single pass over continent. _AVG product aggregates over one basin (or region) within one repeat cycle.	Yongwei Sheng
L2_HR_RASTER	Generates Level 2 raster product from pixel cloud data product by resampling single-pass data onto a 2-D fixed grid.	Marc Simard

ATBD Schedule

- Through mid-2018: Algorithm development team developing prototype software.
  - Engaging with subject matter experts as prototypes mature.
- mid-2018: Baseline ATBDs provided to science team.
  - Subject matter experts coordinate science team inputs with algorithm team.
- End of 2018: Release version 1 of ATBDs.

- Staggered development approach to various algorithms.
  - ATBDs provided as they become available during 2018.