Surface Water and Ocean Topography (SWOT) Mission

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SWOT Algorithm Theoretical Basis Documents (ATBDs)

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• 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

<table>
<thead>
<tr>
<th>Science Algorithm</th>
<th>Description</th>
<th>Subject Matter Experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2_RAD</td>
<td>Generates Level 2 radiometer product with measurements of wet troposphere delay and sigma0 atmospheric attenuation from downlinked data.</td>
<td>Shannon Brown FR (TBC)</td>
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<tr>
<td>XOVERCAL</td>
<td>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.</td>
<td>Ernesto Rodriguez Pascal Bonnefond Christopher Watson</td>
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<tr>
<td>L1B_LR_INTF</td>
<td>Generates Level 1B product with 9-beam interferometric, correlation, and power data corrected for instrument effects from 9-beam downlinked data.</td>
<td>Tom Farrar FR (TBC)</td>
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<tr>
<td>L2A_LR_SSH_PRECAL</td>
<td>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.</td>
<td>Sarah Gille Ed Zaron Emmanuel Cosme Coastal: Nadia Ayoub (TBC)</td>
</tr>
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<tr>
<td>L1B_HR_SLC</td>
<td>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.</td>
<td>Scott Hensley</td>
</tr>
<tr>
<td>L2_HR_PIXC</td>
<td>Generates Level 2 pixel cloud data product from SLC product by performing height reconstruction, phase unwrapping, water detection, flagging.</td>
<td>Mike Durand</td>
</tr>
</tbody>
</table>
| L2_HR_RIVER_TILE | 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_Ŕ্ＡＩＫＥ(Tile) | 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_RＡＩＫＥ 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.