

National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California



Surface Water and Ocean Topography (SWOT) Mission

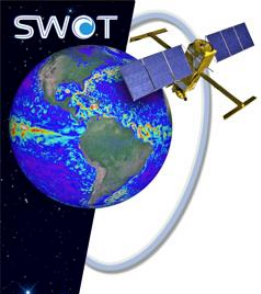
SWOT Science Team Meeting

June 19, 2019

Bordeaux, France

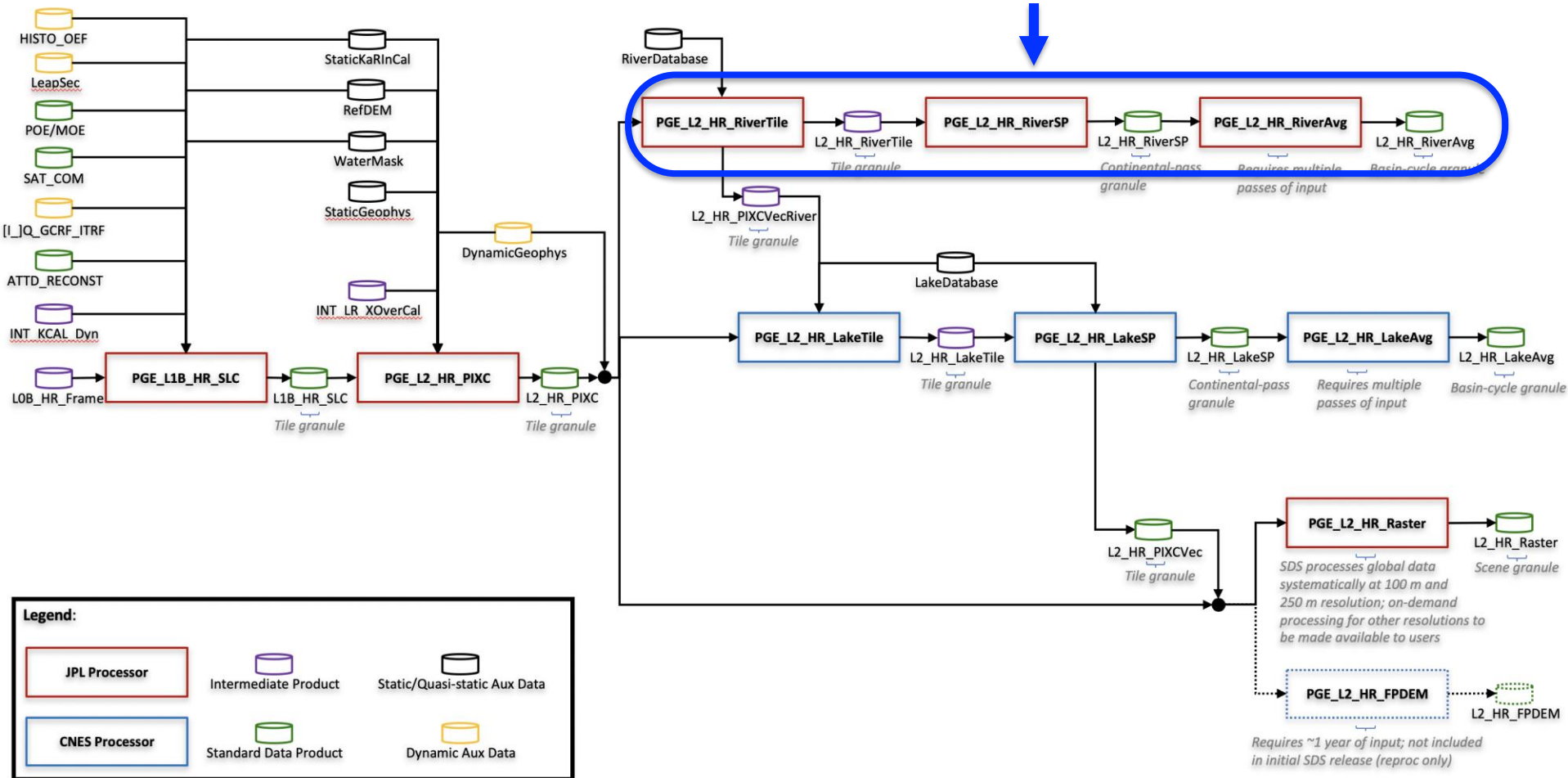
HR Level-2 Hydrology
Products: Rivers

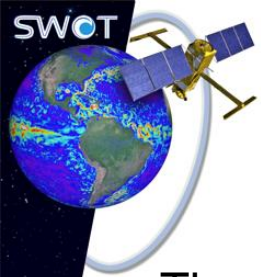
F. Joseph Turk (JPL)
Claire Pottier (CNES)



KaRIn HR Processing Flow

River processing



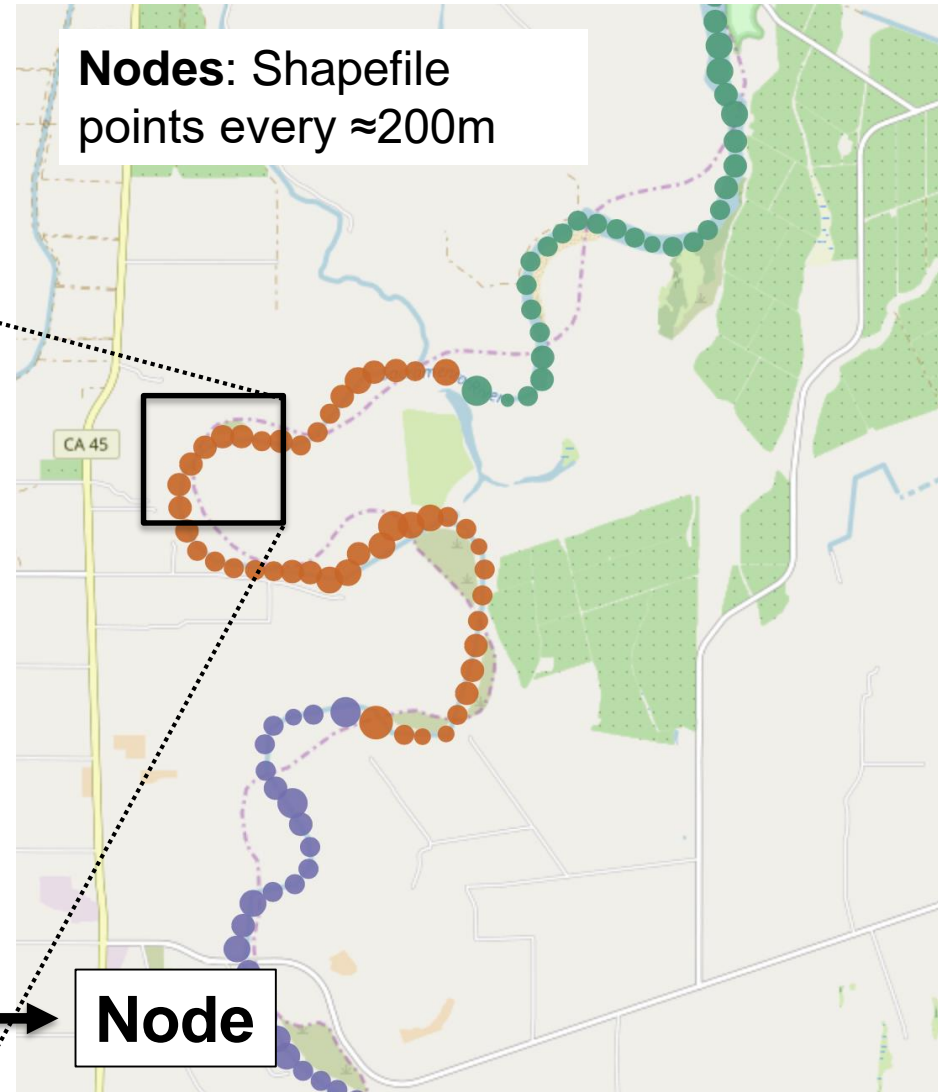
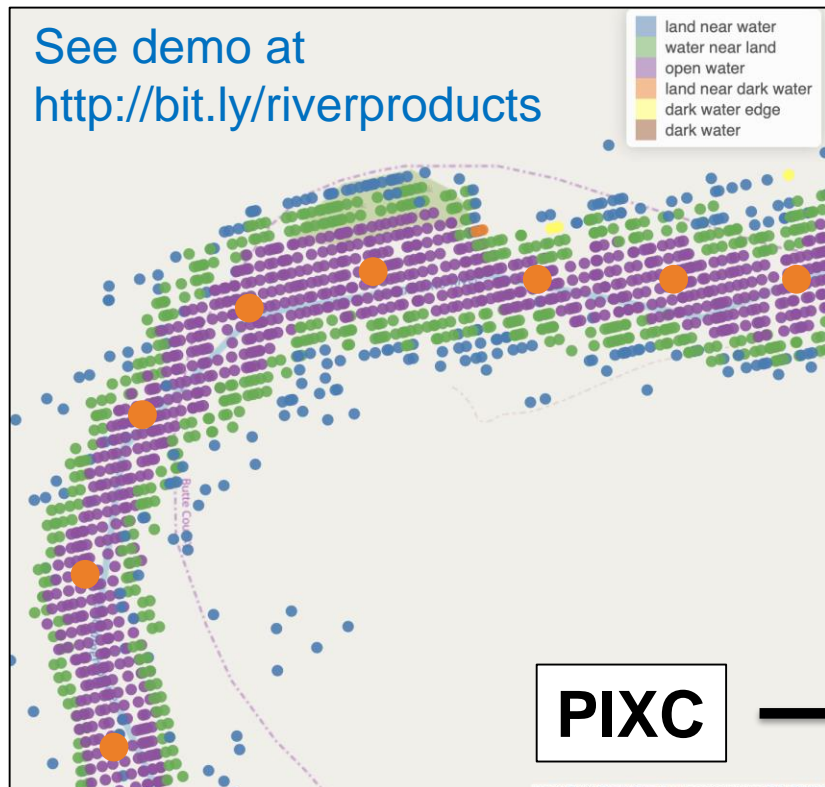


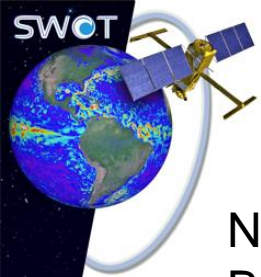
From PIXC to River Vector Products

Figures courtesy Mark Hagemann, OSU

The role of the **river vector single pass (SP) processor** is to aggregate the PIXC medium pixels at the node and reach scale, into continent-pass granules

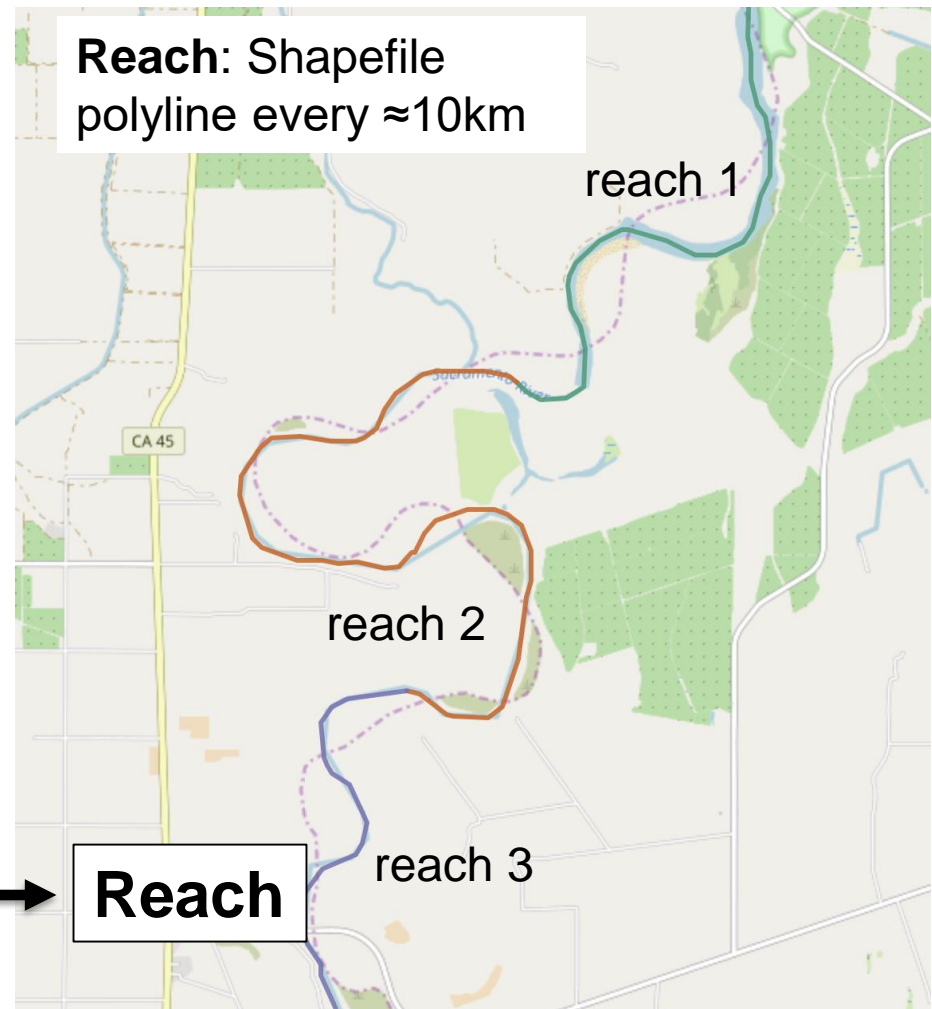
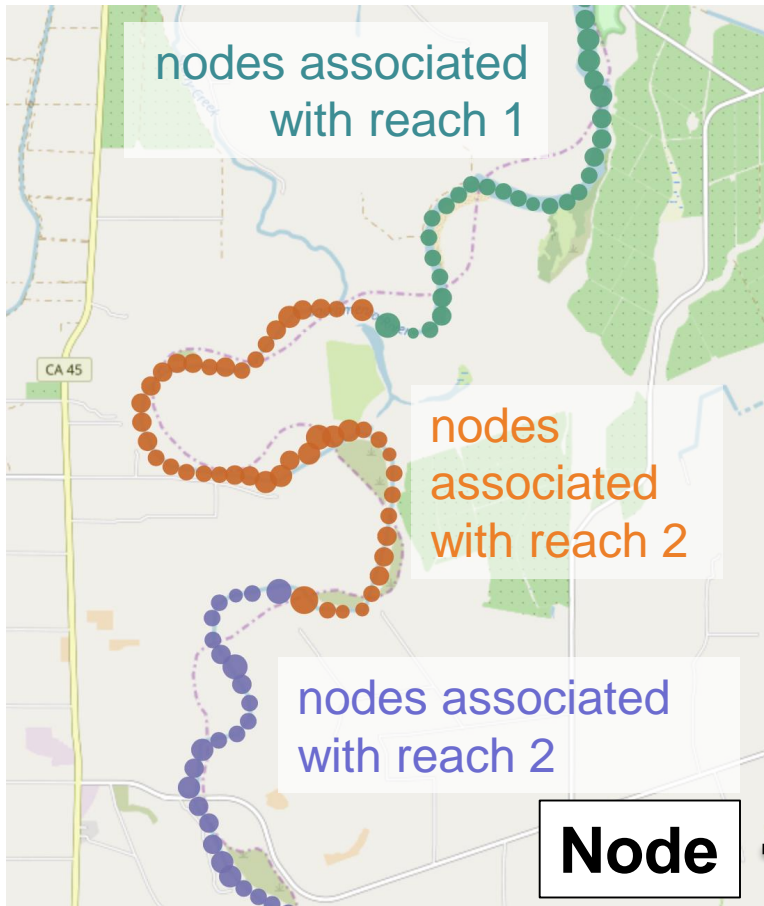
See demo at <http://bit.ly/riverproducts>



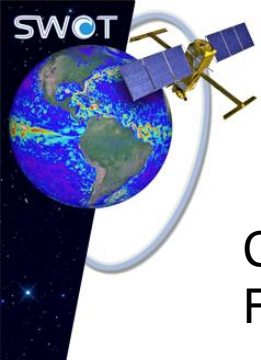


From PIXC to River Vector Products

Node level quantities are aggregated to the reach level
Basin-averaged node/reach products are produced for every 21-day cycle

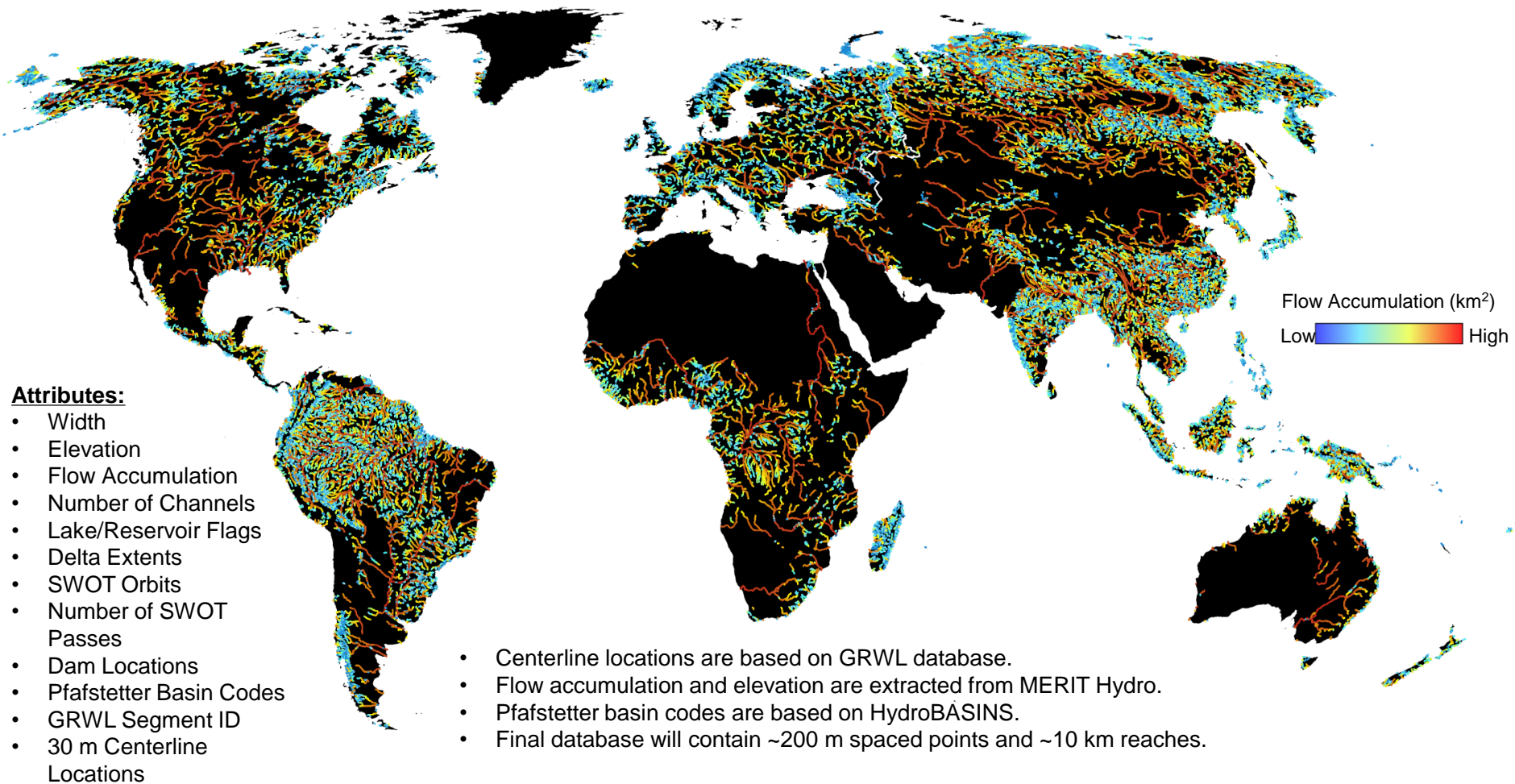


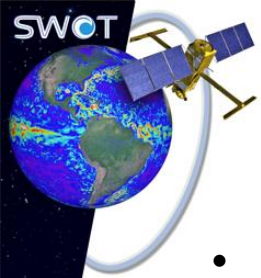
Figures courtesy Mark Hagemann, OSU



River Prior Database (Improvements Ongoing)

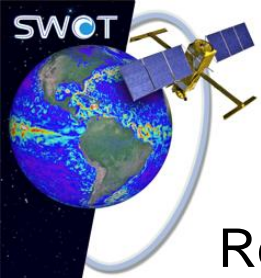
Current prior database does not extend poleward of 60-degree latitude. Figure shows first draft of global merge between GRWL and MERIT Hydro





River Vector Products

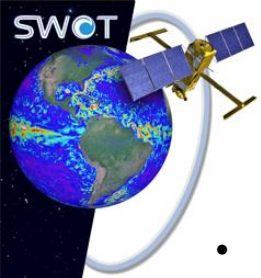
- Output format: Esri shapefiles
 - **Nodes:** nodes approx every 200m. Shape = Point
 - **Reaches:** Collection of nodes ~ 10km long. Shape = Polyline (centerline with 30m points)
 - Nodes and reach definitions come from the prior river database defined by the ST representatives of the ADT
- Temporal representation:
 - Single Pass (**RiverSP**): Nodes and reaches observed in either side of the swath for a single pass. Distributed as one shapefile file per continent.
 - Cycle average (**RiverAVG**): aggregation of all passes in a cycle, distributed as one shapefile per basin (basins defined by the ST)
 - Basins do not cross continent boundaries
 - Basin definitions are shared between river and lake products



River Vector Products

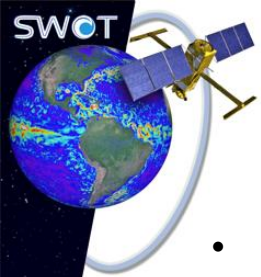
Reach and Node Product attributes are divided into 11 categories, common across reach/node unless otherwise specified:

- Reach (or Node) Identifier
- Time
- Location
- Measured Hydrology Parameters (and Uncertainties)
 - water surface elevation, area, width
 - cross-sectional area, slope (reach only)
- Discharge (*Reach only*)
- Quality Indicators
- KaRIn sigma0 (*Node only*)
- Geophysical References
- Geophysical Range Corrections
- Instrument Corrections
- Copy of various Prior River Database attributes



Status

- RiverSP PDD under review at JPL and CNES
 - Expected to be released for SME review by July 2019
- Validation of pixel assignment algorithm is ongoing
 - Using connectedness of water to define desired (ideal) pixel assignment
 - Multiple types of “stress cases” identified for further evaluation
 - ◆ e.g., multichannel rivers, lakes near rivers in the PRD, etc.
- Random uncertainties attached to hydrological attributes
 - water surface elevation, area, width (node/reach), slope (reach only)
- Initial ice flag will be climatological-based
 - Subsequent reprocessing will implement a second, dynamical ice flag
- Consensus on basin geographical boundaries for RiverAVG and LakeAVG basin-cycle granule products
- River (and lake) products adopt $[-180, 180]$ longitude convention



Plans

- Release RiverSP PDD along with sample dataset
- Prepare RiverSP ATBD
- Prepare RiverAVG PDD; ATBD to follow
- Deliver Version-1 software for SP processor
- Further evaluation of pixel assignment issues
 - Examine surface water in USGS lidar scenes to simulate some of the complex cases
 - Utilize hydrology simulations, large scale simulator (CNES SWOT hydrology toolbox) as necessary
- Determine systematic uncertainty components
- Updated prior river database under construction
 - Reach and node database including prior attributes and river topology
 - Merger of GRWL and Merit-Hydro to extend latitude coverage
- Discharge will not be produced during the first year of SWOT data
 - More extensive testing making use of simulated SWOT scenes are under development by the Discharge Algorithm Working Group