National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

Surface Water and Ocean Topography (SWOT) Science Team Meeting

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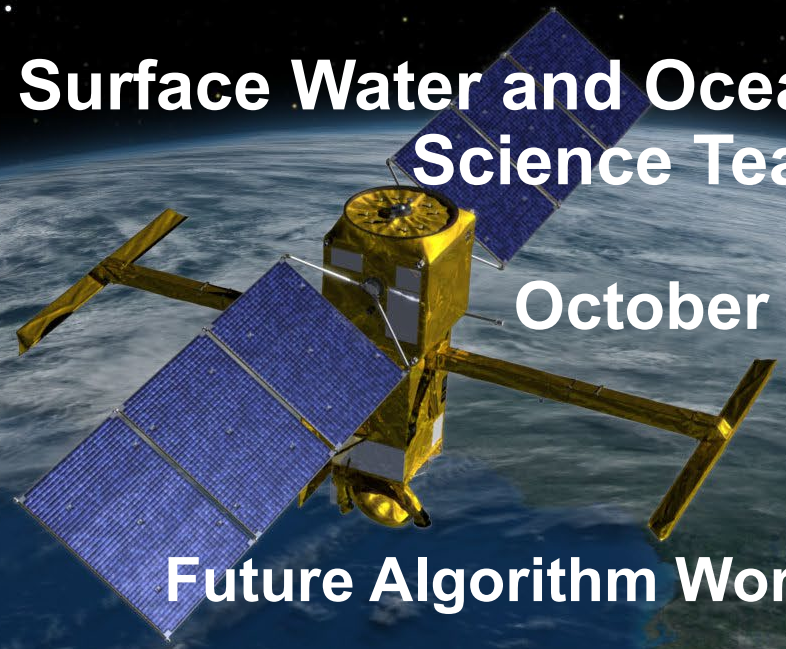

Future Algorithm Work – River Processing

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on behalf of JPL/CNES Algorithm and Cal/Val Team

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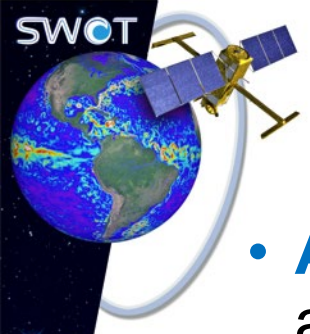


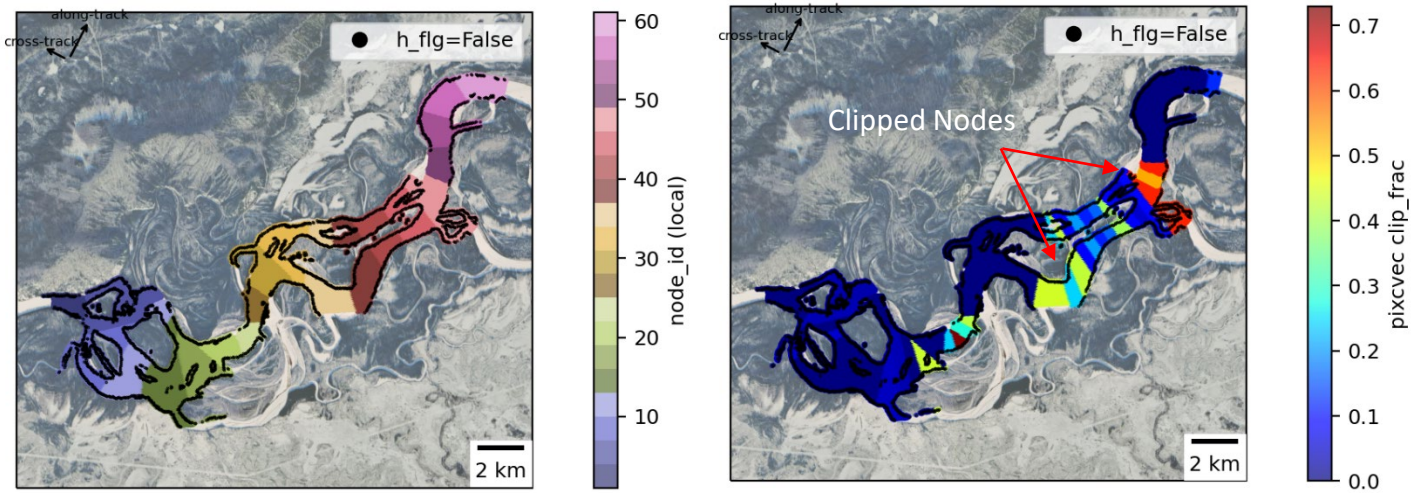
Future Algorithm Work – River Processing

- **ADT plans to prioritize potential improvements to river width** over WSE and slope, as there is a larger gap between current river width errors and pre-launch expectations
- **ADT has identified a cross-track dependent bias in river width**; per-pass width biases can be significant
  - Investigations suggest that there is not a single root cause, but rather multiple confounding causes
  - This bias could be resolved with an empirical correction, but first ADT priority is to identify and fix the root causes
- Short Term: **Improved Node to Reach Aggregation**
- Exploratory: **Improved Pixel Assignment**
- Long Term: **Using Multitemporal Information in L2 or L3 Algorithms**

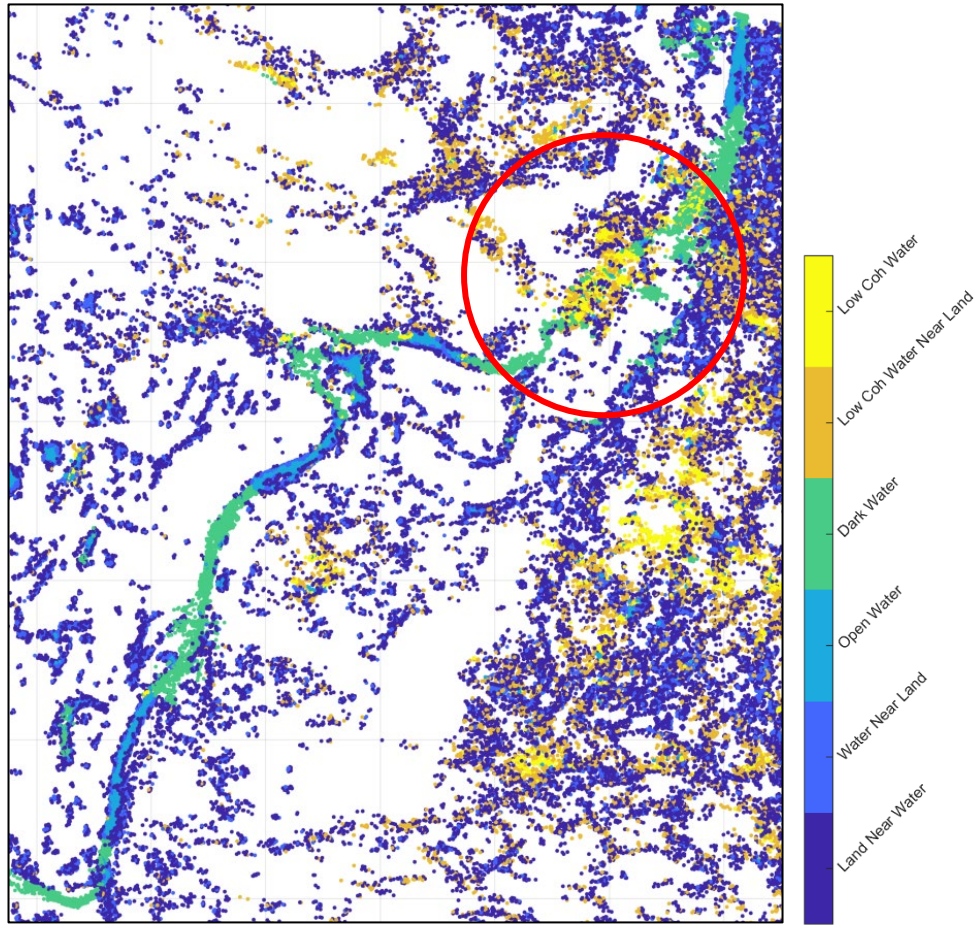
Node to Reach Aggregation

- **Validation efforts suggest that reach-level results can be improved by identifying and discarding more poor-quality nodes**
- Developing new flagging methods to determine which node-level parameters contribute most to reach-level width errors such that those nodes can be discarded or de-weighted
- **Some investigated metrics seem potentially useful**
  - clip_frac: fraction of pixels in a node that were excluded because they are farther than the “extreme distance” threshold
  - low_coh_frac: fraction of pixels in a node that have low-coherence classification

Prototype clip_frac Identifies Nodes Where Width Errors are Likely



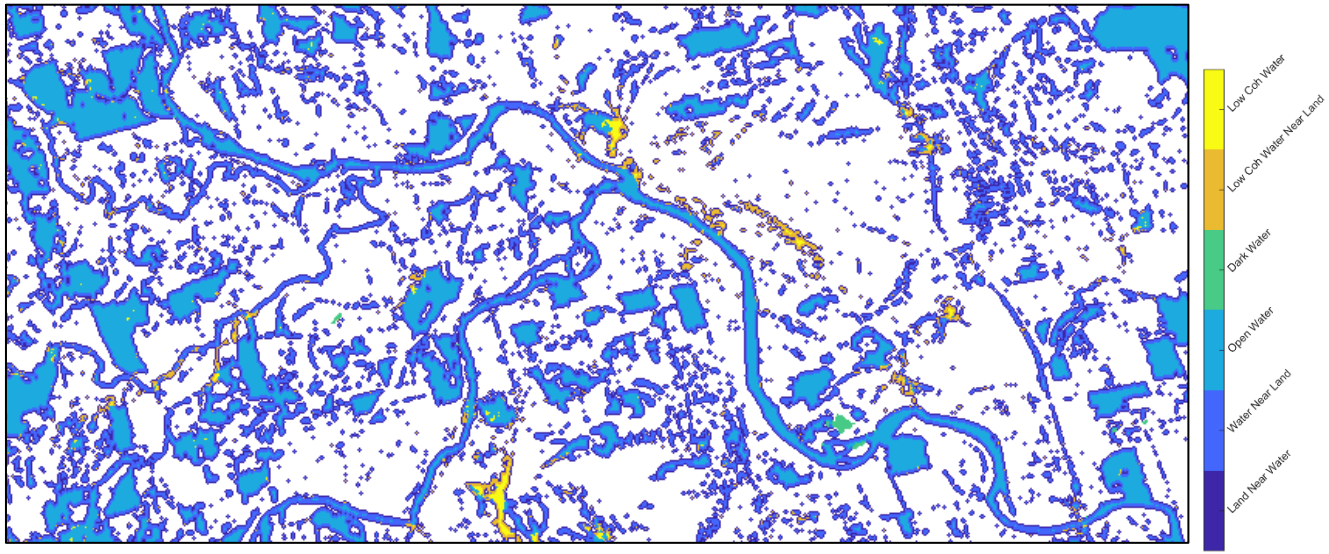
Classification: Low Coherence Corruption Due to Layover



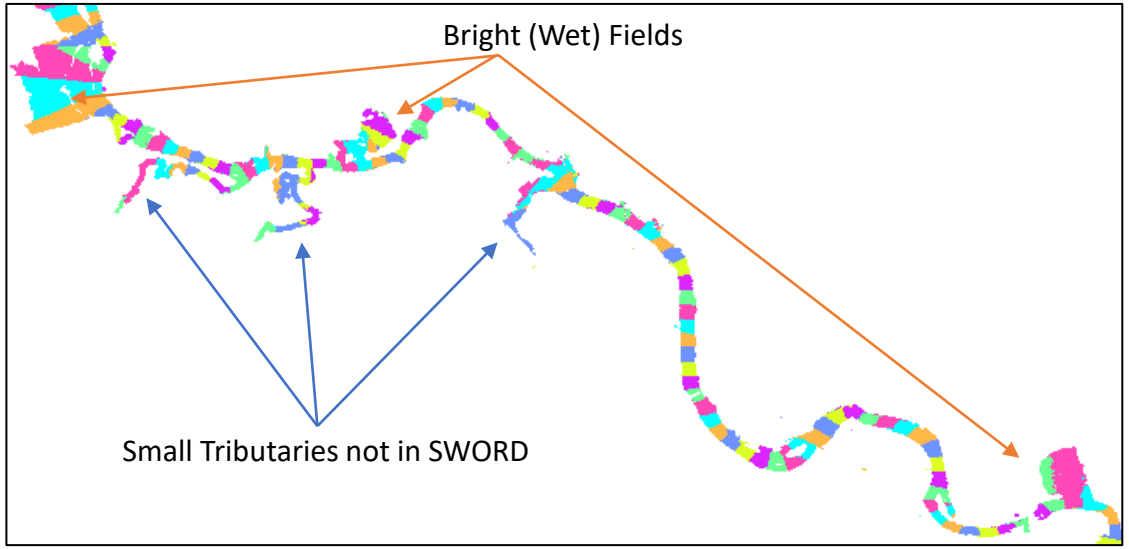
Pixel Assignment Improvements

- Bright features (e.g. wet fields, cities) near rivers are difficult for pixel assignment
- Assignment can often pull-in sections of connected tributaries and nearby water
- **Pixel assignment algorithms could make better use of estimated WSE, prior water probability, etc. to distinguish river from non-river pixels**
- **Improvements still in the exploratory/prototyping stage**

Classification

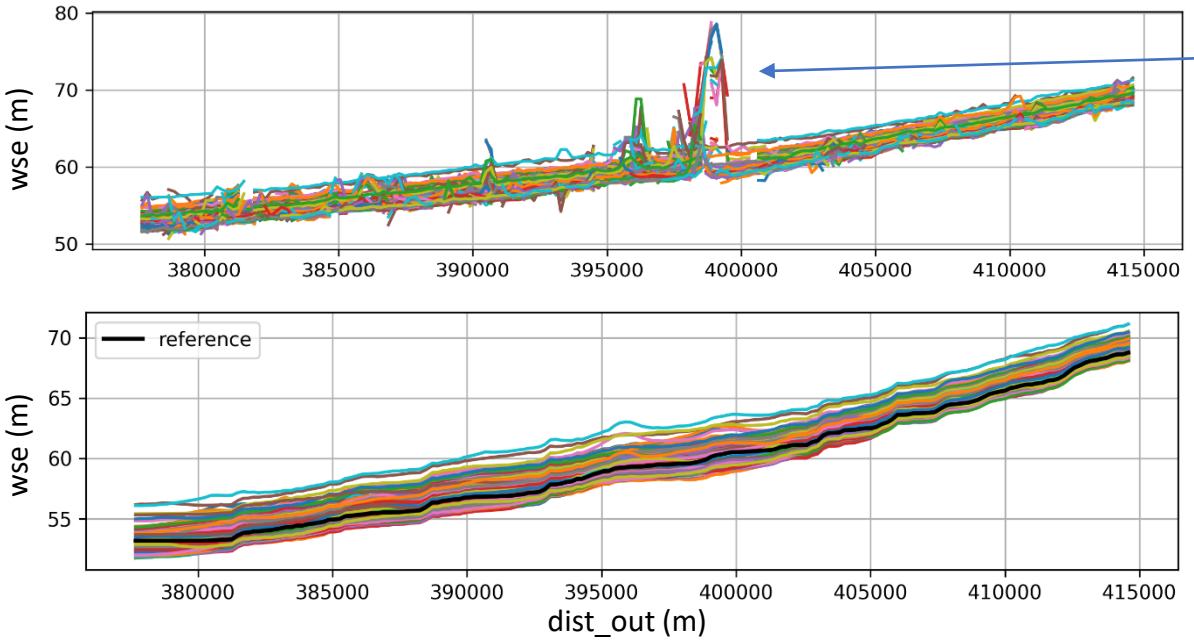


Pixels Assigned to River Nodes

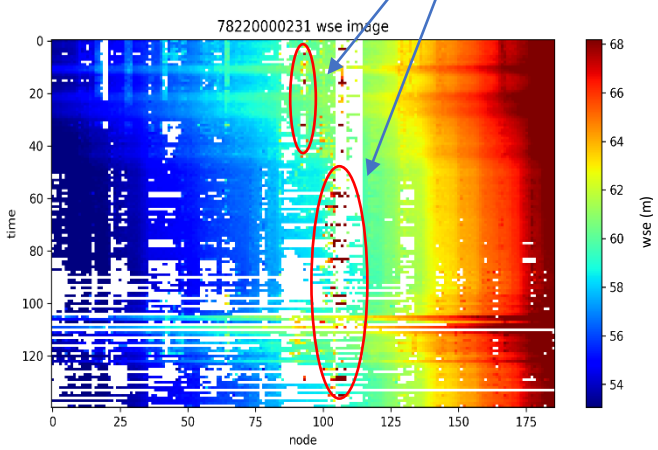


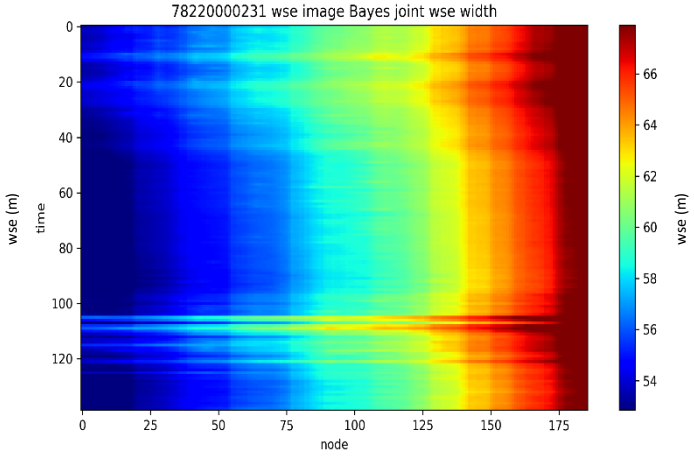
Multitemporal Processing

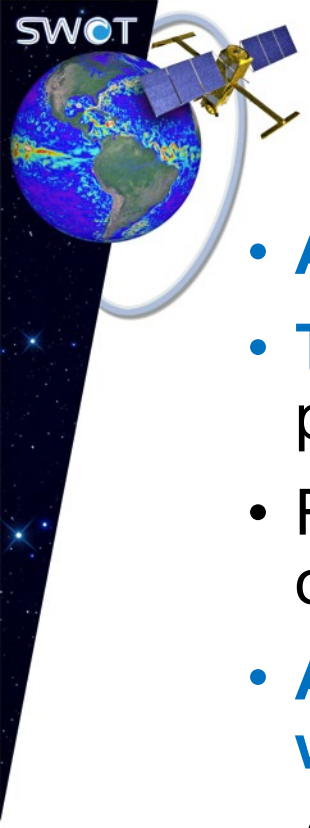
- Long-term potential to use multitemporal information to feed back into pass-based processing
- **Initial analysis shows promise for improved node-level WSE and width from Bayes reconstruction using multitemporal-derived priors to estimate height/width fits and reject outliers**
- This may involve changes to L2 algorithms, or may make more sense as an L3 product



Outliers can be rejected using multitemporal information







Conclusions

- **ADT plans to prioritize potential improvements to river width**
- **There is a width bias as a function of cross-track**, which manifests as a per-pass bias in multitemporal analysis
- River width estimation from SWOT is difficult as there are many mechanisms of error
- **An empirical correction could be made to remove residual cross-track width bias; but first ADT priority is to identify and fix the root causes**
- ADT has identified short and long-term algorithm improvement opportunities with potential promise for improving width, and is currently investigating additional mechanisms of error