SECOND SWOT APPLICATION WORKSHOP REPORT

Engaging the User Community for Advancing Societal Application of Surface Water Ocean Topography (SWOT) mission, USGS HQ, Reston, Virginia, USA. April 5-6, 2017

SWOT Applications Working Group (SAWG) Leads:
Alice Andral, Margaret Srinivasan,
Craig Peterson, Ed Beighley and Faisal Hossain
Special Thanks to Annette deCharon

cnes

UK SPACE AGENCY

CSA ASC

NASA

KEY WORKSHOP QUESTIONS

- *What are the specific applications that stakeholder agencies/users need to carry out on water issues that can benefit from high frequency mapping of water elevations?*
- *What are specific latency requirement of such data for an agency's application?*
- *How compelling in terms of beneficial impact (economics, quality of life improved) is the availability of SWOT data products in near real-time?*
- *Is there a specific latency of SWOT data products that can capture most, if not all, of critical societal applications around the world?*
- *What does each stakeholder agency see as potential roadblocks to sustainable and organic uptake of SWOT data in their agency environment?*

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- *What does each stakeholder agency see as potential roadblocks to sustainable and organic uptake of SWOT data in their agency environment?*

KEY WORKSHOP GOAL

Document the feedback and interaction for SWOT along the following themes:

- Specific societal applications (including latency)
- Specific stakeholder needs for sustainable uptake of SWOT data
- Prioritization of action items (a To-Do list) for SWOT Applications Working Group (SAWG)
- Wide-audience articles in various professional societies (AGU, AMS, ASCE)

END USER/STAKEHOLDER APPLICATION COMMUNITY PARTICIPANTS

United States Geological Survey
United States Bureau of Reclamation
US Army Corps of Engineers
Wildlife Fund for US
CLS (France)
Mercator Ocean (France)
US Navy
US Naval Research Laboratory
National Geospatial Agency
FM Global
Meteo-France
Indian Institute of Technology/India
SERVIR (NASA-USAID)
ESRI

SAWG and ST Members

In total: *50 participants (Day 1); 46 participants (Day 2)*

Special thanks to CNES/French contingent (Selma Cherchali, Nicolas Picot & others), ST members

PARTICIPANTS IN ACTION

Wide-audience articles in EOS (in press), ASCE Civil Engineering (Sept 2017 issue) and Bulletin of Amer. Met Soc. – BAMS (In review)

UNITED STATES GEOLOGICAL SURVEY

SWOT to add value and synergy in the following areas:

1. Extension of network of discharge estimates via SWOT observations (and vice versa);
2. Application of hydraulic-hydrologic modeling with SWOT data calibrated against USGS data at strategic locations (such as weirs and notches);

3. Dynamic mapping of reach-scale river hydraulic characteristics;

4. Dynamic mapping of river, lake and wetland surface water extent and height.

MERCATOR OCEAN

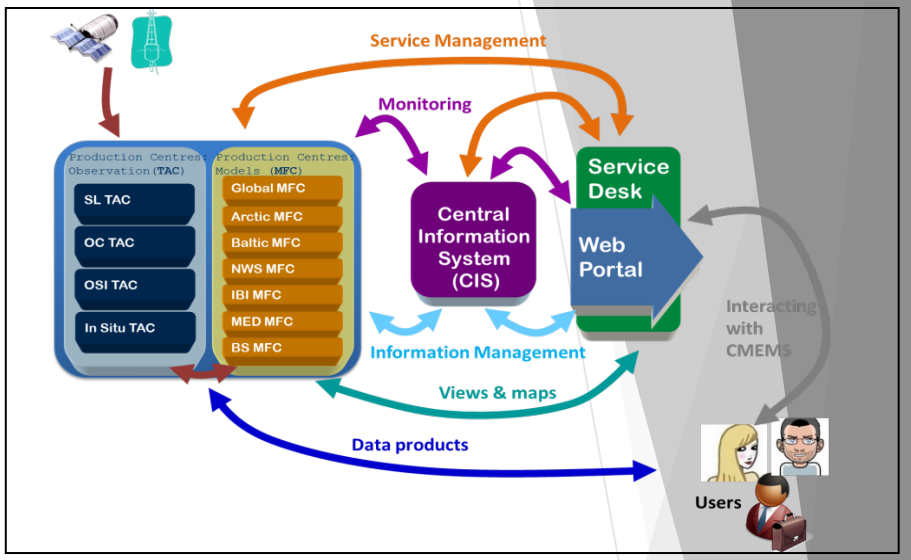
DESIRED FROM SWOT MISSION:

1. A capability for NRT processing of SWOT data (< two days).

2. A need to define/refine required products and data latency requirements (trade-offs to be analyzed);

3. Consistency with other altimeter missions with cross platform calibration applied in near real time;

4. Assimilation of SWOT data in very high resolution models and assessment of the added value of SWOT and data latency.

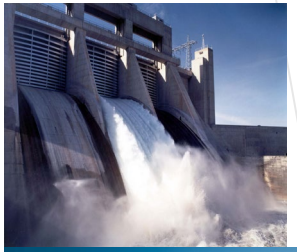


UNITED STATES BUREAU OF RECLAMATION

SWOT may be useful for USBR mission for:

1. Improved prediction of reservoir evaporation;
2. Expansion of streamflow gauges (including ungauged locations) and reservoir elevation information;
3. Improved modeling and prediction of snowmelt runoff;
4. Data and information to support reservoir operations and long-term water supply planning.

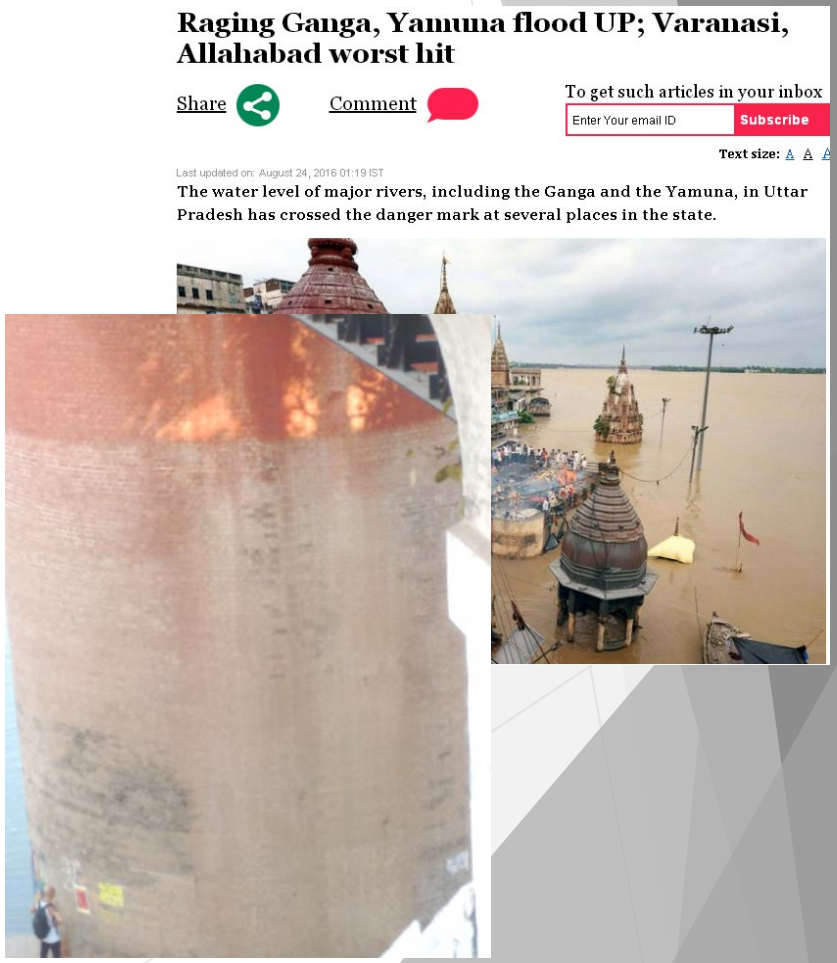
USBR suggested the need for a ***Water Operations Working Group*** (involving various stakeholder agencies such as USACE, USBR, USGS, from France, Europe etc.) and holding workshops on SWOT data application.



FROM INDIA STAKEHOLDERS ON WATER MANAGEMENT

SWOT useful for the following:

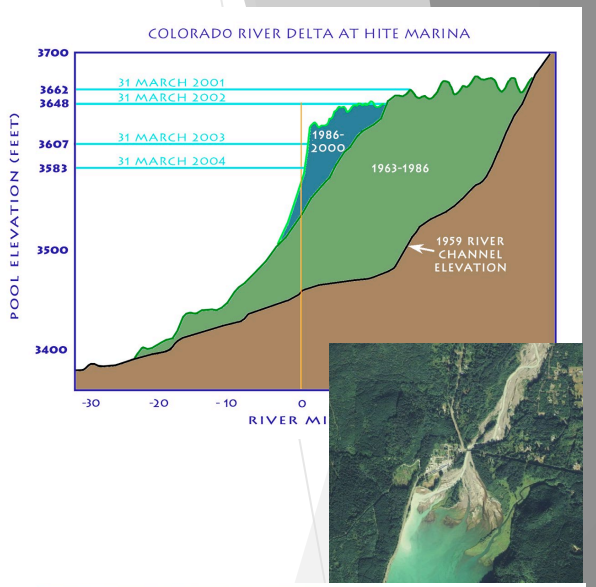
1. Calibration and validation of routinely used models in water management decision support systems;
2. Conjunctive use of ground and surface water;
3. Surface and sub-surface ocean dynamics for coastal applications;
4. Surface water-groundwater modeling for more integrated groundwater and agricultural management ;
5. Surface water storage prediction to improve predictions of future surface and groundwater inventory for India.

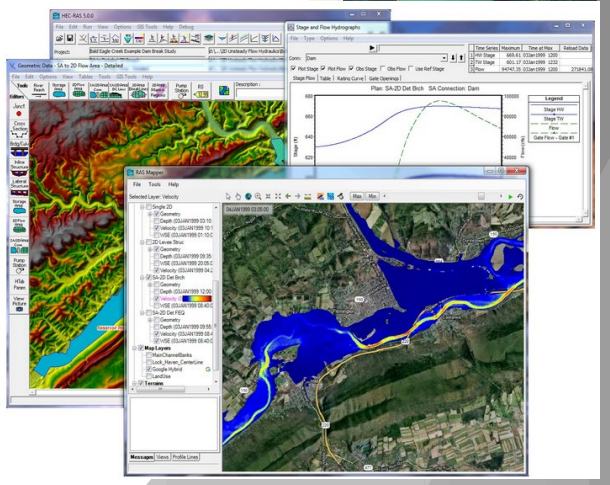


US ARMY CORPS OF ENGINEERS

Value of SWOT data in:

1. Calibration/validation of flood mapping tools (such as HEC RAS-developed by USACE);
2. Coastal engineering and reservoir sedimentation estimation.
3. Large river basin management (monthly timescales)
4. Overseas applications (NRT and non NRT data)





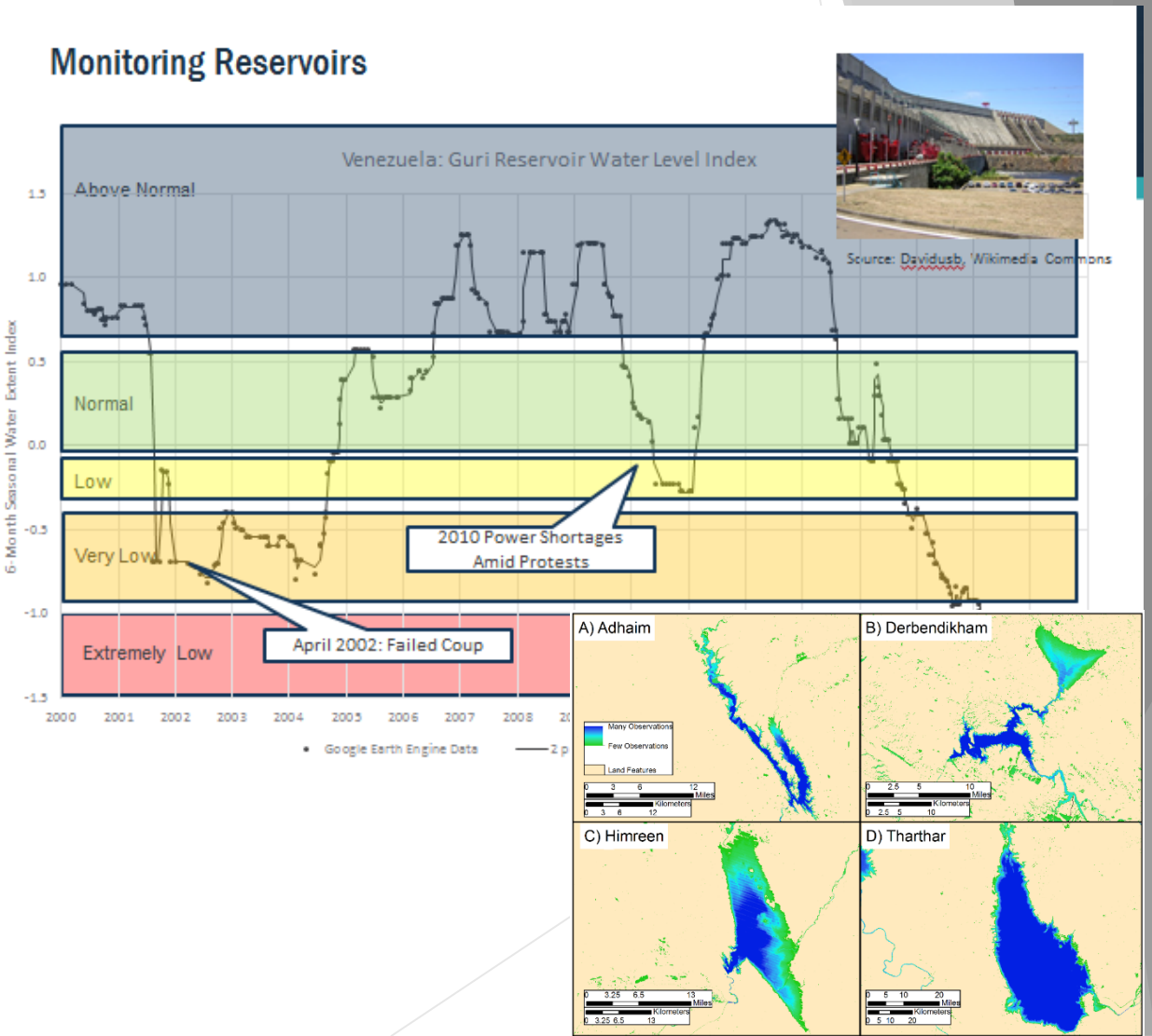
Encourage partnership with the following USACE institutions and SWOT ST:

- ✓ Hydrologic Engineering Center (HEC – developers of HEC RAS)
- ✓ Engineering Research and Development Center (ERDC)
- ✓ Institute of Water Resources (IWR)

NATIONAL GEOSPATIAL INTELLIGENCE AGENCY

SWOT would have direct relevance to:

1. NGA's mission on reservoir monitoring and how that could help flood, water, and agricultural management downstream.
2. Building long-term water budgets and for quantification of uncertainty in remote or denied locations.



STAKEHOLDER/APPLICATION COMMUNITY INPUT ON WORKSHOP GOALS

- ✓ All participants asked to fill out a questionnaire on key issues on Day 2 afternoon.
- ✓ Total of 26 'collective' responses received
- ✓ Responses combined, discussed and further condensed into capsule summaries and action items

APPLICATIONS ENABLED BY SWOT

Disaster Response and Management

SWOT can potentially help with flood mapping/modeling. Real-time flood mapping would require NRT products, although development of better flood inundation and hydrodynamic models does not have latency requirements. Coastal flooding/storm surge is also a fruitful application to pursue given the value that SWOT's wide swath altimetry measurement could add to existing applications (both in NRT and post-event analysis).

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Water Resources Management

Reservoir level and water storage measurements are a key product for water security/resources that SWOT data would enable, and therefore must be pursued. Using SWOT to develop better global river models will also help with understanding of water resources. While many aspects of water management at seasonal or annual planning scales are not NRT-critical, availability of NRT products will certainly open new vistas of innovative water management for many large stakeholder agencies.

Ocean Applications/Estuarine Applications

SWOT data will be useful for marine safety, transport, and pollution management. This is particularly important in coastal environments and at river/coastal interfaces. Sea ice forecast models are also a potential application of SWOT, as are ocean acoustics and derived bathymetry.

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STAKEHOLDER INPUT ON SWOT DATA LATENCY AND FORMAT

Tremendous demand and interest in an NRT/STC product, with latencies desired between less than one day to five days. Data latency of ~ two days was the most requested product. Compromise between accuracy and latency acceptable. Many applications that not latency-critical.

A wide range of data formats acceptable given the versatility of today's data processing tools. NetCDF, GeoTIFF, vector and gridded raster formats were more popular.

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NEEDS OF APPLICATION COMMUNITY FROM SWOT MISSION

1. *Education and outreach workshops are very important.*

2. *Tutorials involving example datasets and real world case-studies to understand how SWOT data 'fits' in agency scheme of business (beginners and advanced level).*

3. *Multiple languages (beyond English) in education/tutorials for reaching out to application communities worldwide.*

4. *Close coordination with SWOT Science Team/PIs/Project and NASA Applied Remote SEnsing Training (ARSET) and CNES Education/Outreach program.*

SOME KEY TASKS AHEAD FOR SAWG

1. Using existing application workshop reports, real-world examples and data from past surveys, prepare a report on the value and need for NRT data. Needed by early Fall.

2. Develop required tutorials, training, outreach (explore available resources COMET/MetEd – ARSET; different languages when possible).

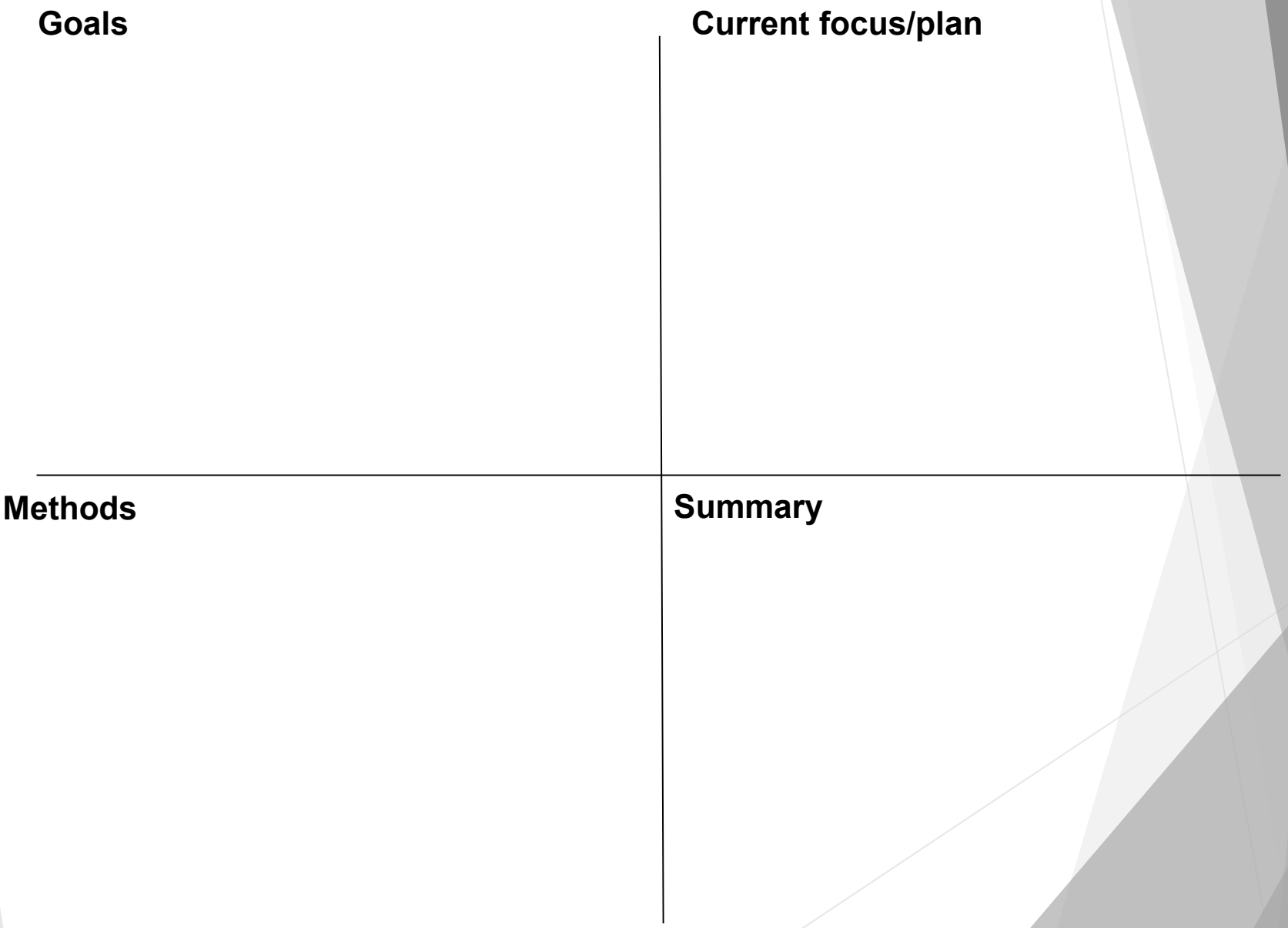
3. Provide early adopters with case studies/simulated “SWOT” like data

4. Explore synergies with NISAR mission

5. Explore developing a hyperwall for SWOT applications (develop content; resources are available to help with the graphics)

See workshop report for complete details and full list of tasks

2017 SWOT Early Adopters Program Approach



2017 SWOT Early Adopters Program Approach

Goals

- Stakeholder engagement; find innovators in partner organizations, advocates
- Initial focus: Demonstrate utility and societal value of SWOT data through applied research
- Facilitate feedback on mission products *pre-launch*
- Accelerate the use of mission products *post-launch* by providing specific and continuous support to Early Adopters

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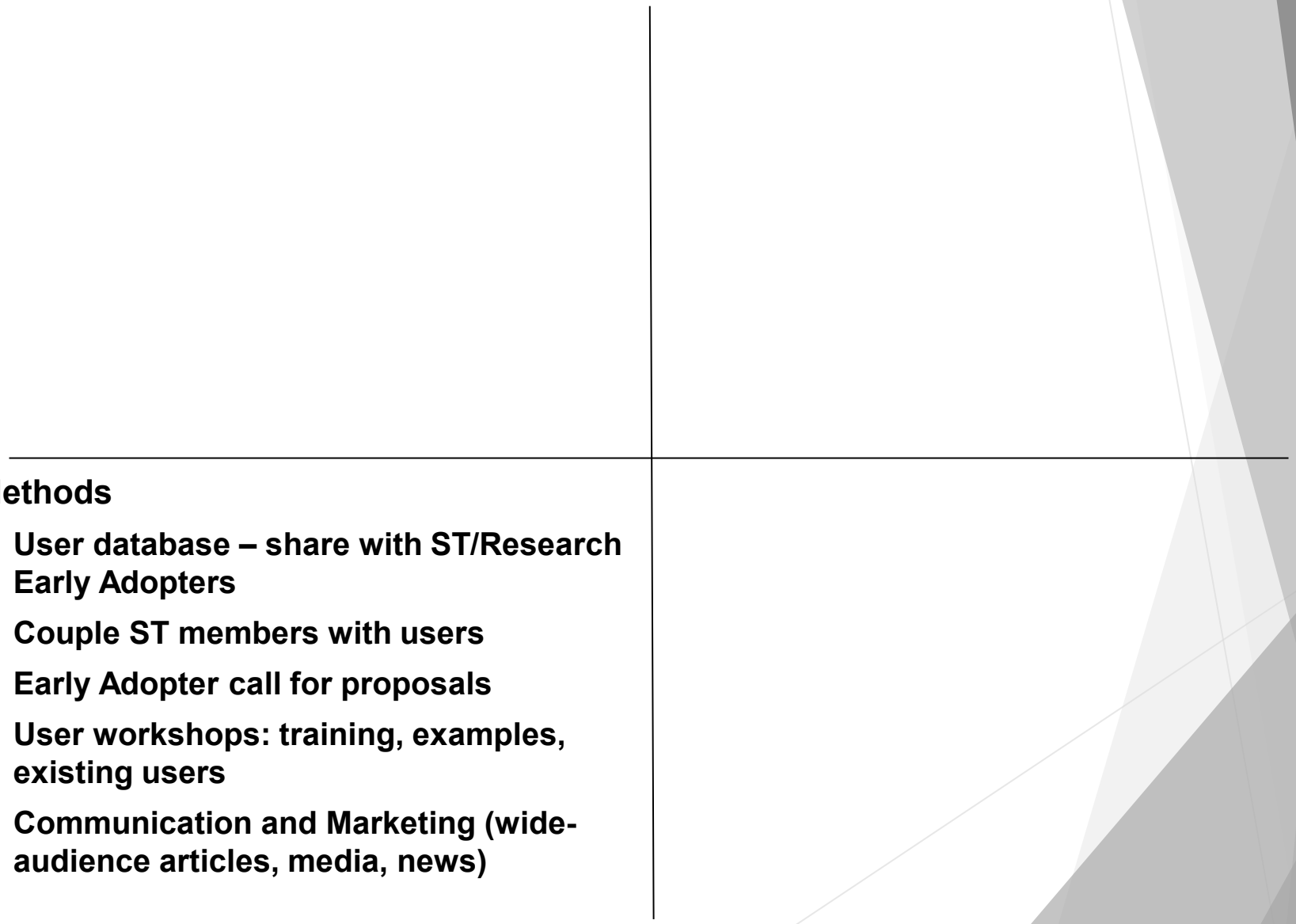

Methods

- **User database – share with ST/Research Early Adopters**
- **Couple ST members with users**
- **Early Adopter call for proposals**
- **User workshops: training, examples, existing users**
- **Communication and Marketing (wide-audience articles, media, news)**

2017 SWOT Early Adopters Program Approach

Current focus/plan

- **Proxy/simulated data sets – SAWG Leads will work with ADT on needs and optimal timing for availability to EAs**
- **Ocean data sets "closer" and may be available sooner**
- **Hydrology data sets need review and pause**
- **Focus on training new users in remote sensing data sets**
- ***Level 2 data will be core datasets for EA projects and post-launch applications***

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Summary

Early Adopters are users who have clearly defined need for SWOT mission data, and who are planning to apply their own resources to demonstrate the utility of mission data

The EA program initially on training on SWOT basics, what SWOT will measure, how to use remote sensing datasets. Later focus on SWOT data after by ADT & ST.

SAWG Meeting on June 28th- PLEASE ATTEND!

SUMMARY

i) SWOT data availability at a latency of ~ two days has overwhelming demand and critical societal need wherein a compromise between accuracy and latency appears widely acceptable.

ii) While the availability of NRT SWOT data will spur the most innovative societal applications, non-NRT data will remain valuable.

iii) The SWOT mission needs to provide education and training on data, uncertainty, access for various levels of expertise among users and in multiple languages.

POST WORKSHOP ACCOMPLISHMENT

i) Wide Audience Articles on user engagement for SWOT – EOS (in press), ASCE Civil Engineering Magazine (Sept 2017) and BAMS (in progress)

ii) Early Adopter Program

iii) Continued outreach & engagement building with end users towards post-launch SWOT success stories

iv) Latency report (from existing reports)

v) Workshop report available on SWOT site

vi) Discussion on future tutorials/education etc.

POST WORKSHOP ACCOMPLISHMENT

i) Wide Audience Articles on user engagement for SWOT – EOS (in press), ASCE Civil Engineering Magazine (Sept 2017) and BAMS (in progress) - *DONE*

ii) Early Adopter Program –*Ball rolling* (lots of interest!)

iii) Continued outreach & engagement building with end users towards post-launch SWOT success stories –*on going and EA program will add synergy*

iv) Latency report (from existing reports)– *first draft prepared; should be ready by Aug/Sept*

v) Workshop report available on SWOT site- *soon*

vi) Discussion on future tutorials/education etc. – *just starting*

QUESTIONS?

"Humanity's greatest advances are not in its discoveries – but in how those discoveries are applied to reduce inequity" – ***Bill Gates***