

EGU 2020 SAR Townhall Summary

EGU session TM12 - *What will it take to get YOU to use SAR? A Conversation about Capacity Building in the Field of SAR Remote Sensing.* Materials available [here](#).

Co-convened by:

- Tyler Erickson (Developer Advocate, Google Earth Engine)
- Andrea Nicolau (Research Associate, NASA SERVIR)
- David Saah (Professor, University of San Francisco)

This town hall facilitated an open discussion on the SAR community's efforts to build capacity in synthetic aperture radar (SAR) analysis and to identify what are the most important actions we could undertake to build additional capacity. This town hall builds upon a similar town hall meeting held at the AGU 2019 Fall Meeting. To facilitate this discussion, we, along with a panel of experts, compiled a list of key topics that were discussed. The panel of experts represent four important components of capacity building (research, infrastructure, end-user applications, and curriculum development) and included the following members:

- **Franz Meyer** - Chief Scientist, Alaska Satellite Facility / Associate Professor, University of Alaska Fairbanks
- **David Small** - Senior Research Scientist, Remote Sensing Laboratories at the Department of Geography, University of Zurich, Switzerland
- **Iain H Woodhouse** - University of Edinburgh, Carbomap and Earth Blox
- **Josef KelIndorfer** - President, Earth Big Data LLC
- **Erika Podest** - Scientist, Jet Propulsion Laboratory-NASA
- **Robert Eckardt** - FSU Jena, SAR-EDU/EO College

Questions

For each question presented, we first invited the panel to start the discussion and then opened it up for the community to give input. Below is a summary of the spectrum of responses to each question with an intent of making no value judgments on the responses received.

[Question 1] Is more capacity needed in processing raw SAR data vs. starting with “Analysis Ready Data” (ARD) products?

- ARDs are less complex to work with and can lower the barrier to entry.
- CEOS is working to standardize SAR ARD workflows. <http://ceos.org/ard/>
- Processing SAR to ARD products can make certain analyses easier, but there are lots of different processing options (ex: # of looks). It is not clear there is a single "standard" ARD product that will satisfy most users... no "one size fits all".
- The usefulness of ARDs depends on the specific user community. ARD is great for the SAR applications community, but less so for experts in the SAR research community.
- Processing that starts "raw" data can help users understand processed data products, and will decrease the likelihood of false interpretations.
- Strong documentation on the processing workflow is needed for ARDs to guard against improper use/interpretation.

- Example ARDs: "geocoded SLC", "wide-area coverages using data from a tight time-window"
- Summary: More capacity is needed in processing both raw/traditional SAR products and ARD SAR products.

[Question 2] Is there really a difference between SNAP vs. GAMMA processing?

- There are differences in price (free vs. commercial). However, there is also a cost to working with suboptimally processed data.
- There are differences in availability of documentation. Some find the SNAP to be well documented, others note a lack of tutorials.
- There are differences in access to the source code. SNAP is open source Java code, but few contributions (pull requests) from the community have been made.
- There may be differences in quality of data products. Benchmark datasets and comparison studies are needed.

[Question 3] What type of computing infrastructure is necessary? (Local development vs. HPC vs. Cloud)

- Cloud or HPC processing is important for global scale analyses.
- Cloud is very beneficial for teaching in low-bandwidth environments. But if an internet connection fails, thumb drives are still very useful.
- Future SAR missions are planning for cloud-based processing.
- Local processing is quite useful for algorithm development or small projects, but Cloud and HPC environments are useful for high-volume applications.

[Question 4] Is the current set of available learning resources sufficient, and if not what changes are needed?

- There is a lot of raw digital material available, however many resources use outdated technology. A central repository of educational materials is needed.
- Training material at different levels is needed. 1. Practical exercises are needed for beginners. SAR analysis can be intimidating for students. 2. For deep understanding of SAR, knowledge of electromagnetics is needed.
- Once more jobs require SAR expertise, universities will be incentivised to offer more courses.

[Question 5] What is preventing the remote sensing community from using SAR for operational applications? What are more pressing limitations, data, or processing capabilities?

- Actually capacity building, potential users are not aware of what SAR can offer. SAR data is more complex than optical data. More awareness/outreach is needed. Promoting SAR learning resources would help.
 - Colorized SAR products help new users be comfortable.
- Data availability
 - There is skepticism about availability, however, SAR providers have dramatically increased availability in recent years.
 - Some compelling use cases need access to long time series, while others need real-time access to data products.
- Fear of users misinterpreting the data.

[Question 6] Is more information or are more services needed to facilitate the joint analysis of available SAR sensor constellations (e.g., Sentinel-1; NISAR; Radarsat Constellation)?

- Joint Level 3 composite backscatter products integrating data from multiple constellations would require a high level of geometric and radiometric calibration in all the input sensors.
 - A good quality DEM is needed to produce joint products.
- Need examples of how SAR AND optical data are complementary.

[Question 0] Based on the discussion so far, what are the 3 most important activities that the SAR community could focus on in the next year in order to build capacity?

- Building awareness of SAR. Fuel curiosity and build excitement. Twitter can be useful.
- Establishing SAR ARD products.
- Creating a common pool of materials for learning SAR.

List of Learning Resources

- [EO College](#)
 - [Echoes in space](#) (self-paced course)
 - Soon to be published: 'Understanding radar backscatter'
 - EO College YouTube [channel](#)
 - [SNAP tutorials](#)
- ESA Publications
 - [ESA TM-19 - InSAR Principles: Guidelines for SAR Interferometry Processing and Interpretation](#)
- Research and User Support (RUS) for Sentinel Core Products
 - [RUS Training](#)
- SERVIR Global
 - [SAR Handbook](#)
 - [Synthetic Aperture Radar \(SAR\): For Forest Structure](#) (video)
 - [University of Alaska Fairbanks radar course](#)
 - [SAR Tutor](#)
 - [EO4GEO](#)
 - [GI-N2K](#)
 - [awesome-sar](#) "A curated list of awesome Synthetic Aperture Radar (SAR) software, libraries, and resources."
 - Data resources
 - [CEOS Analysis Ready Data for Land \(CARD4L\)](#)
 - [SAR STAC Specification](#)
 - Benchmarking
 - Towards Sentinel-1 SAR Analysis-Ready Data: A Best Practices Assessment on Preparing Backscatter Data for the Cube <https://doi.org/10.3390/data4030093>

Community of Practice

Ideas on how the SAR community can stay connected

- Twitter hashtags suggested: #SAR #SARisBeautiful #GoldenAgeOfSAR #gotSAR #SARCrowdsRock
- Virtual meetups
- There was interest in many participants in continuing the conversation, but no there was now consensus on the mechanism or who could lead the effort. We have setup a Google Group that can be used to continue the discussion at:
<https://groups.google.com/forum/#!forum/sar-capacity-building>
- A proposal has been submitted for a SAR capacity building town hall meeting at the 2020 AGU Fall Meeting. Assuming it is successful, we hope to see you there