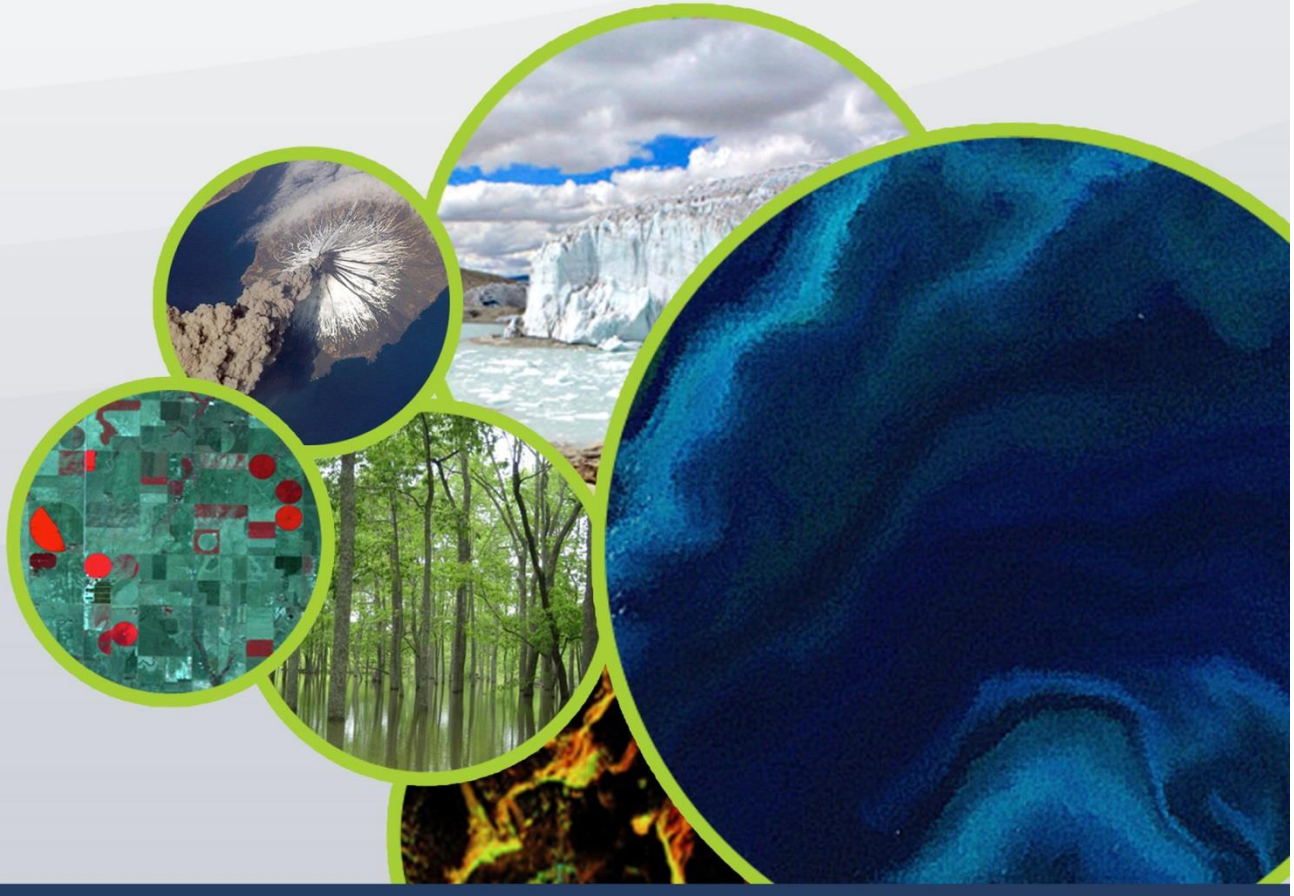
Committee on Earth Observation Satellites



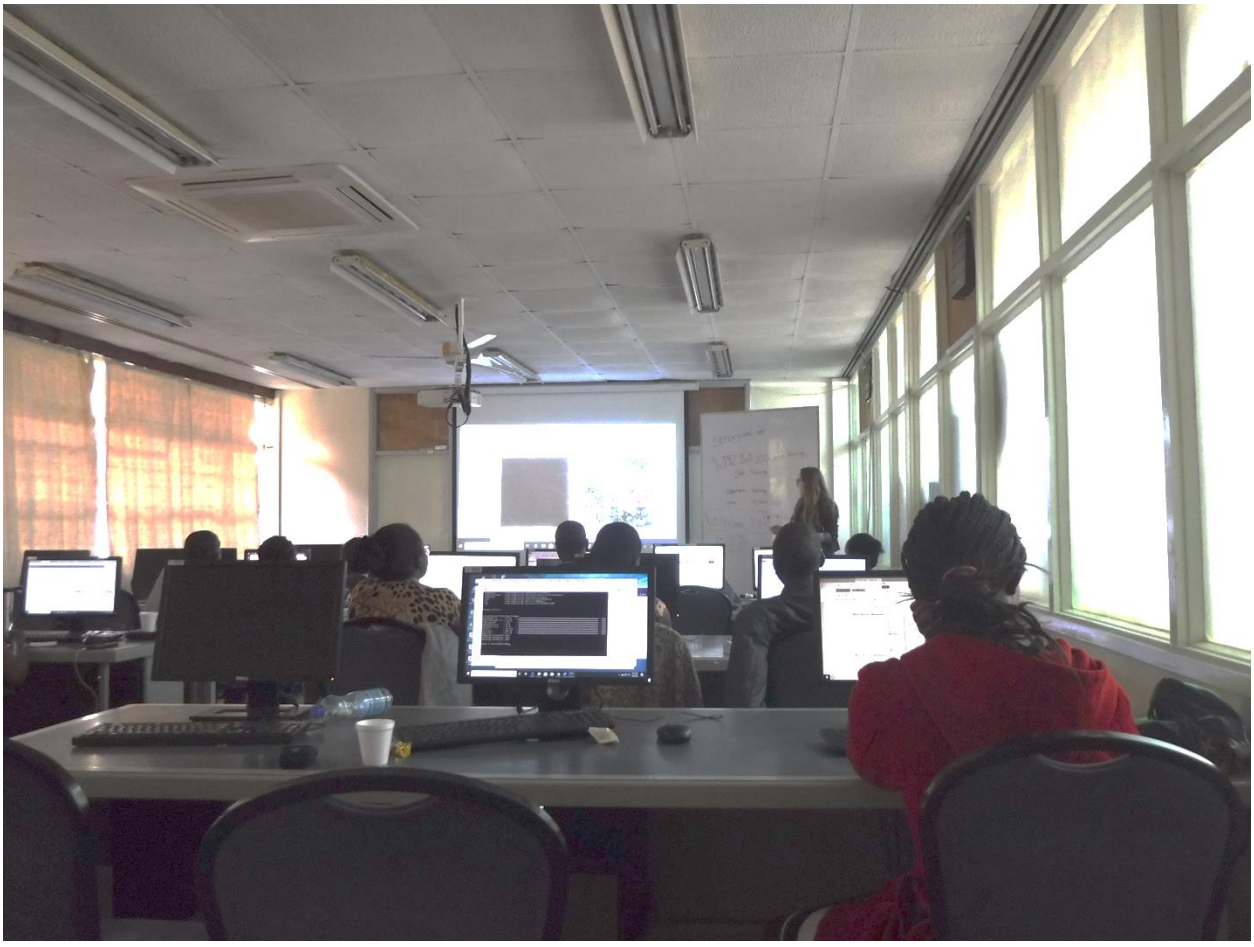
CEOS WGCapD EO Training Workshop

9 August, 2019, RCMRD, Nairobi, Kenya

Committee on Earth Observation Satellites (CEOS)
Working Group for Capacity Building and Data Democracy (WGCapD)

Training workshop report

Application of Synthetic Aperture Radar (SAR) data to Forestry Change



Pictured Above: Rebekke Muench (NASA SERVIR Science Coordination Office) walking through the SAR exercises (Photo Credit: Emily Adams)

9 August 2019
4th Annual AfriGEO Symposium and 3rd Annual RCMRD International Conference
Nairobi, Kenya

Contents

1. Summary

In collaboration with the Regional Centre for Mapping of Resources for Development (RCMRD), the host of the 4th annual AfriGEO Symposium and 3rd annual RCMRD International Conference (RIC), the Committee on Earth Observation Satellites (CEOS) Working Group on Capacity Building and Data Democracy (WGCapD) organized a tailored pre-conference training on the use of SAR for forestry applications. This training was held on the 9th of August, 2019 at the RCMRD campus, prior to the AfriGEO/RIC conference the 13th – 16th of August 2019. The training benefited 22 participants from various sectors in Kenya. The instructors were from the United States of America's National Aeronautics and Space Administration (NASA) but represented the CEOS through course content designed to reflect a multi-agency approach to SAR data processing.

This training was one of many offered by RCMRD during pre-conference training events. Other trainings included 'Implementing Enterprise Wide Multiuser Geodatabases,' 'Publishing Geodatabases as Map services using ArcGIS Server,' 'Introduction to Google Earth Engine,' and the 'Application of SAR data to Forestry Change.' Over 50 people applied to be considered as a participant for the SAR training, however, participation was limited to 22 participants due to classroom size. At the end of the training, participants were familiarized with the following topics for environmental monitoring:

- What is SAR?
- Basic SAR data preprocessing
- Basic SAR data interpretation
- SAR data strengths and limitations
- SAR applications for forestry change

These topics were identified as needs by the RCMRD during communications prior to the event. However, it was noted that more time to identify and fulfill needs would have been ideal. RCMRD will host the AfriGEO Secretariat for the next 2 years and has committed to identifying future training needs in advance of the next AfriGEO events. The full training agenda is included as Annex 1.

2. Objectives

The main objective of this training event was to introduce participants to SAR data and its applications to forestry change. More specifically, the participants were introduced to SAR data, polarization, scattering fundamentals, speckle, and other basic topics for SAR data interpretation. They were also exposed to SAR data strengths and weaknesses, and data access. This training focused predominately on Sentinel-1 data, but additional SAR data sources were discussed and additional resources including the NASA Applied Remote SEnsing Training (ARSET) webinars and the European Space Agency (ESA) Massive Open Online Courses (MOOC) were provided.

Pictured Above: Emily Adams (NASA SERVIR SCO) provides and overview of SAR (Photo Credit: Rebekke Muench)

These concepts were reinforced through hands-on activities during the afternoon session. Basic SAR data preprocessing steps in the ESA Sentinel Application Platform (SNAP) toolbox were discussed, followed by several exercises using Python and Jupyter notebooks, developed for the SERVIR-SilvaCarbon SAR Handbook (https://www.servirglobal.net/Global/Articles/Article/2697/release-of-synthetic-aperture-radar-sar-handbook-to-empower-the-monitoring-and).

3. Profile of Participants

The 22 participants were based in Kenya but had experiences across sectors. Representatives were from Kenya National Highways Authority, Kenya Forest Service, private geospatial consulting firms, university students and professors from several universities around Kenya, and SERVIR colleagues. Fifty-two percent of participants identified as female. Participants were asked to have basic knowledge of GIS, remote sensing and programming as pre-requests to attending the course.

4. Instructors

NASA -SERVIR Science Coordination Office / The University of Alabama in Huntsville

- Emily Adams – Eastern and Southern Africa Science Coordination Lead
- Rebekke Muench – West Africa Science Associate
- Andi Thomas – Eastern and Southern Africa Science Associate

5. Participant feedback and suggestions for improvement

A post-training assessment was delivered to the participants via Google forms. Thirteen participants took the assessment. All but one survey respondent indicated their knowledge of SAR has increased due to this training, and that they had accomplished their goals for the training. Additionally, most participants who completed the survey said that their knowledge of coding had increased (10/13). Most of the survey respondents (10/13) said they would feel confident training others in SAR and 11 of 13 respondents found SAR useful for their line of work following the training.

The main improvement identified by the survey respondents and by the trainers themselves was the need to provide more time. It was apparent that one day was probably not enough to discuss the key topics. While we were very clear from the beginning that the goals of this course were to provide basic information and provide access to additional self-guided tools, the demand was very high for continued in person training. This should be kept in mind for any future events. It is also worth noting that RCMRD plans to engage stakeholders in future SAR training events.

Pictured Above: Rebekke Muench (NASA SERVIR SCO) discussing SAR pre-processing (Photo Credit: Emily Adams)

We were also limited by software installation issues. We did send a list of software installations and instructions ahead of time, but the participants were either unable to install prior to the event, or were using the provided lab computers which were not preloaded. Future trainings should consider software installation issues carefully. We were able to demonstrate all the exercises on the projected computer, but some students were limited in their ability to follow along. Resources for where participants could access these training materials, including the SERVIR – SilvaCarbon SAR handbook, were provided to participants so they could take a deeper look on their own time.

Pictured Above: Rebekke Muench (NASA SERVIR SCO) providing individual assistance to a workshop participant (Photo Credit: Emily Adams)

The participants also recognized the trainer's expertise in SAR and appreciated the general organization of the event. We found the ratio of 3 trainers to 20 students to be sufficient to provide individual assistance when required. Additional topics advanced topics requested by the participants included time series analysis, land cover change detections, and agricultural or crop monitoring applications, among others.

Annex 1: Participant List

NAME	Organization	Gender
Rebekke Muench	NASA SERVIR SCO	female
Andi Thomas	NASA SERVIR SCO	female
Charles Mwaniki	Kenya Forest Service	male
Lillian Waithaka	Oakar Services Limited	Female
Emily Adams	NASA SERVIR SCO	Female
Douglas Mwangi	KeNHA	Male
Joy Jeruto	University of Eldoret	Female
Elizabeth Lusweti	kenyatta University	Female
Zipporah Nyokabi Mureithi	University of Eldoret	Female
Maro Josephine	KeNHA	Female
Assumpta Jebichii	KeNHA(Kenya National Highways Authority)	Female
Felix Kasiti	SERVIR-ESA	Male
peninah okinyi	university of eldoret	female
Enock kibet	Technical University of Kenya	male
Vincent Kipsang	KISM	male
Faith Muthami	Technical university of kenya	female
Albert Njema	Kenya National Highways Authority	Male
Mariam Sebit	University of Eldoret	Female
Mlati Ochieng	Kenyatta University	Male
Alice Gaceri	KeNHA	female
Alain Buhendwa	Kenyatta University	Male
Farai Maxwell Marumbwa	SERVIR-ESA	Male

Annex 2: Agenda

Time	Topics Covered
8:30-9:30 am	Registration
9:30-10:30 am	Ice-breaker game
10:30-11:00	Tea Break
11:00-12:30	Introduction to SAR Lecture, SAR pre-processing, software installation instructions
12:30 – 14:00	Lunch Break
14:00 – 16:30	Hands on exercises – SAR for Forestry Change
16:30 – 17:00	Final discussions / wrap up

Pictured Above: Andi Thomas (NASA SERVIR SCO) leading the introductory ice breaker activity (Photo Credit: Rebekke Muench)