# Higher Resolution SRTM Data & Flood Modelling Workshop

## REPORT

23-27 March 2015
Hosted by: The South African National Space Agency (SANSA)
Location: SANSA Space Operations, Hartebeesthoek, Gauteng, South Africa
Presented by: The CEOS Working Group on Capacity Building & Data Democracy (WGCapD)


The Committee on Earth Observation Satellites' Working Group on Capacity Building and Data Democracy (CEOS WGCapD) continued its series of Digital Elevation Model (DEM) Workshops with the "Higher Resolution SRTM Data & Flood Modelling Workshop" at SANSA Space Operations, South Africa on 23-27 April 2015.

The purpose of this workshop series is to build capacity in utilization of satellite-derived digital elevation data, especially the Shuttle Radar Topography Mission (SRTM) 1-Arc Second data (a.k.a. SRTM 30m or SRTM-2). Additionally, each workshop has a particular application focus. This was the first workshop since the US government's phased global release of the SRTM-30 meter data began in September of 2014.

The workshop was a joint effort amongst the following partners:

- Committee on Earth Observation Satellites (CEOS) WGCapD – primary organizer
- Group on Earth Observations (GEO) - funder
- Instituto Nacional de Pesquisas Espaciais (INPE, Brazil)
- National Aeronautics and Space Administration (NASA, USA)
- National Oceanic and Atmospheric Administration (NOAA, USA)
- Regional Centre for Mapping of Resources for Development (RCMRD)
- Regional Visualization and Monitoring System (SERVIR)
- Secure World Foundation (SWF) - funder
- South African National Space Agency (SANSA, South Africa) - host
- U.N. Office for Outer Space Affairs (UNOOSA) - funder
- U.S. Geological Survey (USGS, USA)

The workshop's application focus was flood modeling. Instruction in two flood models bookended the workshop agenda: TerraHidro, developed by INPE, and CREST, developed by the University of Oklahoma and SERVIR. The final agenda can be found in Appendix A of this report.

Like the previous workshop which had a regional focus on East Africa, the SANSA-hosted workshop also had a regional focus: the Southern Africa region (as defined by the African Union, with Madagascar allowed as an addition due to recent severe flooding). There were 25 workshop participants from the following countries:

- Botswana
- Lesotho
- Madagascar
- South Africa
- Swaziland
- Zimbabwe

There were also invitees from other Southern Africa countries. Support for travel and accommodation was provided to 17 non-South African participants. A detailed list of the participants can be found in Appendix B.

*Participants listening to a lecture.*

On the last day of the workshop, the participants were required to provide feedback by completing an evaluation form. Below is a summary of the feedback, as well as from workshop organizers and presenters. The lessoned learnt from this workshop should be considered to improve the next workshops in the series.

**Strengths:**

1. **Practical**

   Most participants listed "hands on" or "practical" as a strength, suggesting that they appreciated that the lectures went beyond theory, and that the practical components were relevant and will be useful to their jobs.

2. **Focus on Models**

   Instruction in flood modeling was identified by many as a strength of the course. One participant articulated this point by praising a "new tool for saving life." The two major models were given a day and a half of instruction each. Due to the overwhelming response, it's recommended that still more time is allocated to this section in future workshops.

3. **Free Open Data and Software**

   TerraHidro and CREST are both open source models, appropriate for participants from developing countries that generally lack resources to purchase proprietary software.

4. **Informing Participants of Freely Available Data**

   Presenters demonstrated to the participants how to access free and open data from USGS' Earth-Explorer, NASA's LPDAAC and SANSA online data catalogues. In addition, the African coverage of the SRTM 30m DEM was provided to the participants in USB flash drives, along with other resources.

5. **Clear Instruction**

   Both primary instructors were rated high by participants. On a scale of 1 -5, with "1" being "unsatisfactory" and "5" being "excellent", the overall rating for the course was "4.1". The TerraHidro instructor's rating was "4.3", while the CREST instructor was rated "4.2". The course materials rating was "3.9". These outcomes were based on 22 evaluation forms received.

6. **Local Partner**

   It was absolutely necessary to have a local partner/host with the ability to organize on-the-ground support and resources for managing all aspects, and existing relationships in the region. It really would not have been possible without SANSA's support, resources, expertise, and connections. The host should also be a resource for representing what is needed by the end user community in the region.

7. **WGCapD Rep/Facilitator**

   It was beneficial to have a dedicated WGCapD representative on the ground to facilitate the process, present on behalf of the Working Group, and give introductory presentations not covered by the expert presenters.

8. **Technically-trained Participants**

   Part of the success of the workshop was due to the group of technical participants. It enabled a higher level of training and discussion than if we had policy- or management-type participants.

9. **Take Home Materials**

In addition to the SRTM 30m DEM, INPE and RCMRD also contributed to the take home materials given to the participants by providing presentations and software.

10. **Closing Ceremony**

    On the last day of the workshop, the participants were taken on a tour of SANSA Space Operations Centre, not far from the workshop venue. A ceremony of presenting the participants with certificates followed. This was a moment to celebrate not only the participants' completion of the workshop but also to acknowledge the contributions of individuals and organizations that contributed to its success.

**Suggestions for Improvement:**

1. **Stricter screening of students**

   A few participants who lacked GIS skills slowed down the training for the rest. In the future it is recommended that the recruitment criteria better identify candidates which have the prerequisite knowledge of the training to be conducted.

2. **Assistants for instructors**

   While SANSA staff and other workshop facilitators were sometimes available to help the participants who fell behind in the training, the assistant trainers were not always in the room and had difficulty catching up. It's recommended that the course coordinators and any assistants meet before the training to familiarize each other before the course with training materials.

3. **Increase number of days of training**

   This recommendation, while unlikely to be implemented in future workshops, indicates the belief by some participants that there was a lot of material being covered for a short period. Other presentations could possibly be reduced to make more time for the modeling.

4. **Preload software**

   The hydrological models taught by the instructors first had to be installed onto SANSA-sponsored training laptops. While on the one hand, the participants learned some peculiarities about the software that they would not have otherwise, on balance this time would have been better spent on more practical exercises.

5. **Add more exercises**

   For both TerraHidro and CREST, some time that was scheduled for exercises was eaten up by troubleshooting and discussion. The exercises are probably the most valuable sessions since they reinforce what has been learned up until that point and validate their utility to the user.

6. **Individually crafted exercises**

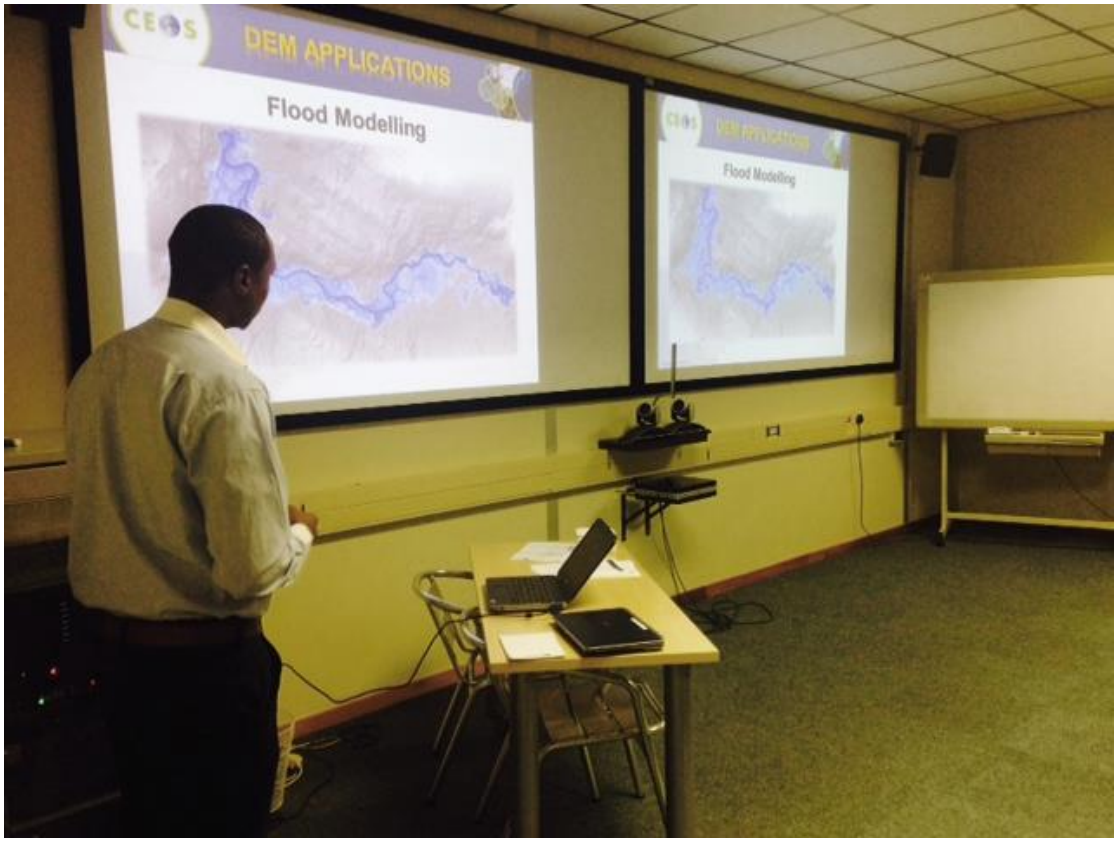
   It was useful to focus on a single region or case study for the hands-on exercises. It provided continuity through the diverse range of training topics and modules. If students are encouraged to bring relevant data of their country with them to the exercise, they could practice an exercise using data that is already familiar and pertinent to them.

7. **Preparation Time**

   The earlier we can prepare for such an activity, the easier it is to manage the event without an inordinate amount of urgent tasks. This applies to invitations, logistics, preparation of materials, etc. While in this case, there was sufficient coordination between presenters to avoid redundancy, ideally, course materials would be handed out at the beginning of the week for participants to be able to refer to as a topic comes up.

**8. Perform online**

Obviously the number of participants was limited by space and cost constraints. Holding a similar course online would allow it to reach a wider audience.




*Mr. Phila Sibandze demonstrating flood inundation*

## Appendix 1: Workshop Agenda

### Day One: Monday, 23 March 2015

| Item # | Time | Activity | Presented By |
|---|---|---|---|
| 0 | 09.30-10.00 | Arrival of Participants and Registration | SANSA |
| 1 | 10.00–10.15 | **Welcoming Remarks** | SANSA – Dr. Jane Olwoch |
| 2 | 10.15–10.45 | **Intro to Digital Elevation Models** | SANSA – Phila Sibandze |
| | 10.45–11.00 | Break | |
| 3 | 11.00–11.30 | **Intro to UN-SPIDER & Importance of DEMs to Disaster Management** | UNOOSA – Lorant Czaran |
| 4 | 11.30–12.00 | **Intro to TerraMA** | INPE – Dr. Laercio Namikawa |
| | 12.00–1.00 | Lunch | |
| 5 | 13.00–14.30 | **TerraHIDRO – Intro / Theoretical Concepts** | INPE – Dr. Laercio Namikawa |
| | 14.30–14.45 | Break | |
| 6 | 14.45–16.15 | **TerraHIDRO – Tools and Usage Examples** | INPE – Dr. Laercio Namikawa |

### Day Two: Tuesday, 24 March 2015

| Item # | Time | Activity | Presented By |
|---|---|---|---|
| 7 | 09.00–10.30 | **TerraHIDRO – Guided Exercises** | INPE – Dr. Laercio Namikawa |
| | 10.30–10.45 | Break | |
| 7 | 10.45–12.00 | **TerraHIDRO – Guided Exercises** | INPE – Dr. Laercio Namikawa |
| | 12.00–13.00 | Lunch | |
| 8 | 13.00–15.30 | **TerraHIDRO – Self-led Exercises** | INPE – Dr. Laercio Namikawa |
| | 14.30–14.45 | Break | |

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|---|---|---|---|
| 8 | 14.45–16.15 | **TerraHIDRO – Self-led Exercise** | INPE – Dr. Laercio Namikawa |

## Day Three: Wednesday, 25 March 2015

| Item # | Time | Activity | Presented By |
|---|---|---|---|
| 9 | 09.00–09.30 | **Intro to CEOS** | NOAA – Patrick O'Brien |
| 10 | 9.30–10.30 | **SRTM Overview** | NOAA – Patrick O'Brien |
| | 10.30–10.45 | Break | |
| 10 | 10.45–12.00 | **SRTM Versions and Access** | USGS – Dr. Eric Wood |
| | 12.00–13.00 | Lunch | |
| 11 | 13.00–14.30 | **GeoSUR – Exercise** | USGS – Dr. Eric Wood |
| | 14.30–14.45 | Break | |
| 12 | 14.45–16.15 | **RCMRD Overview** | RCMRD – Faith Mitheu |

## Day Four: Thursday, 26 March 2015

| Item # | Time | Activity | Presented By |
|---|---|---|---|
| 13 | 09.00– 10.00 | **Intro to CREST Model-Concepts** | RCMRD – Faith Mitheu |
| | | **Application at local/regional/global scale** | SANSA – Phila Sibandze |
| 14 | 10.00–10.30 | **CREST data requirements and sources** | RCMRD – Faith Mitheu |
| | 10.30–10.45 | Break | |
| 15 | 10.45–11.15 | **CREST organization of folders and files** | RCMRD – Faith Mitheu |
| | | **Run model with example basin & preloaded data Hydrographs visualization in Excel** | |

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|---|---|---|---|
| 16 | 11.15–12.15 | **CREST manual calibration** | RCMRD – Faith Mitheu |
| | | **CREST automatic calibration** | |
| | 12.15–13.15 | Lunch | |
| 17 | 13.15–14.30 | **CREST Guided Exercise 1** | RCMRD – Faith Mitheu<br>SANSA – Phila Sibandze |
| | 14.30–14.45 | Break | |
| 18 | 14.45–16.15 | **CREST Guided Exercise 2** | RCMRD – Faith Mitheu<br>SANSA – Phila Sibandze |

## Day Five: Friday, 27 March 2015

| Item # | Time | Activity | Presented By |
|---|---|---|---|
| 19 | 09.00–09.30 | **CREST Self-led exercise 1** | RCMRD – Faith Mitheu<br>SANSA – Phila Sibandze |
| 20 | 09.30–10.15 | **CREST Self-led exercise 2** | RCMRD – Faith Mitheu<br>SANSA – Phila Sibandze |
| | 10.15–10.30 | Break | |
| 21 | 10.30–11.00 | **Use prepared data under self-led exercise 1** | RCMRD – Faith Mitheu<br>SANSA – Phila Sibandze |
| 22 | 11.00– 12.00 | **Web version GFT demonstrations** | RCMRD – Faith Mitheu |
| | 12.00–13.00 | Lunch Break | |
| 22 | 13.00–13.45 | **Continue GFT demonstrations, CREST wrap-up** | RCMRD – Faith Mitheu |
| 23 | 13.45–14.30 | Feedback from Participants | NOAA – Patrick O'Brien |
| 24 | 14.30–14.45 | Workshop Closure and Handing Out Certificates | NOAA – Patrick O'Brien |

## Appendix 2: Workshop Participants

1. Mrs. Mantai CHAPI; Lesotho; Weather Forecaster; Lesotho Meteorological Services
2. Mr. Titus DLAMINI; Swaziland; Hydro-geologist; Department of Water Affairs
3. Mr. Gilbert Kabelo; GABOUTLOELOE; Botswana; Senior Lecturer; Botswana College of Agriculture
4. Mr. Spencer GREEN-THOMPSON; Swaziland; Hydrologist; Department of Water Affairs
5. Mr. Eric Juergen HAASE; German-American working in Namibia; Remote Sensing Lecturer and Trainer; Polytechnic of Namibia
6. Mr. Kudakwashe KAYIRASORA; Zimbabwe; Hydrologist; Ministry of Environment, Water and Climate
7. Mr. Victor MAHLALELA; Swaziland; Disaster Risk Manager; National Disaster Management Agency
8. Mr. Vusi Petros MALINGA; Swaziland; Laboratory Technician; Department of Water Affairs
9. Ms. Basuti MATHANGWANAE; Botswana; Teaching Assistant/Msc student; Botswana International Univ. of Science & Technology
10. Mr. Christoh Lisho MUNDIA; Namibia; GIS and Remote Sensing Lecturer; Polytechnic of Namibia
11. Mr. Gerald MUNDONDWA; Zimbabwe; Hydrologist; Ministry of Environment, Water and Climate
12. Mr. Boitshepo Neo Nape; Botswana; Principal Agricultural Engineer; Ministry of Agriculture, Department of Crop Production
13. Dr. Brilliant PETJA; South Africa; Climate Change Research Manager; Water Research Commission
14. Mr. Molefi PULE; Lesotho; Hydrologist; Department of Water Affairs
15. Mr. Pascal Fetra RAKOTOMANDRINDRA; Madagascar; Geomatician; National Bureau of Risk and Disaster Management
16. Mr. Daulphin RAZAFIPAHATELO; Madagascar; Student Searcher; University of Antananarivo
17. Mr. George THABENG; Botswana; Head of Hydrology and Water Resources Division; Department of Water Affairs
18. Mr. Guy G. YUYI; Botswana; Environmental Technician; Botswana College of Agriculture
19. Mr. Phila SIBANDZE; South Africa; Remote Sensing Researcher; SANSA
20. Mr. Mahlatse KGANYAGO; Remote Sensing Intern; SANSA
21. Mr. Dechlan PILLAY; South Africa; Senior Manager; National Disaster Management Centre
22. Mr. Cai XUELIANG; South Africa; Water Resources Engineer; International Water Management Institute
23. Ms. Nosiseko Mashiyi; South Africa; Remote Sensing Scientist; SANSA
24. Ms. Thando Oliphant; South Africa; Remote Sensing Scientist; SANSA

*Dr. Jane Olwoch, director of SANSA Earth Observations, welcoming participants*