



Summary report of THE COSPAR CAPACITY BUILDING WORKSHOP AT MEKELLE UNIVERSITY IN ETHIOPIA

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Introduction

The workshop was organized by Mekelle University in collaboration with COSPAR, SCOSTEP, ISWI to introduce a system that can help to understand space and ground based data to explore and expand research practice on interplanetary shocks.

The workshop objectives were:

- Encourage the scientific use of space data by scientists in developing countries
- Provide a highly practical training in the use of space data from current missions
- Space-based coronagraph observations (SOHO, STEREO, SDO, Wind) and radio spectral observations from space (Wind/WAVES, STEREO/WAVES) and ground (RSTN, CALLISTO) to study shocks driven by coronal mass ejections.

Workshop in Mekelle, Ethiopia consisted of trainees from Ethiopia (15), Egypt, India, Kenya, Nigeria, Rwanda, Tunisia, Srilanka, Nepal (17) and Lecturers (11): Ethiopia, USA, Greece, India, Italy, Switzerland total of 43 participants

Venue and facilities:

The workshop was conducted at Axum Hotel where students and lecturers were settled for the two weeks workshop time.



Workshop Venue (Axum Hotel)

The workshop was conducted from May 21-June 2/2018. There was a strong support from Mekelle University management. It was opened by the President of the University Prof. Kindeya G/hiwot



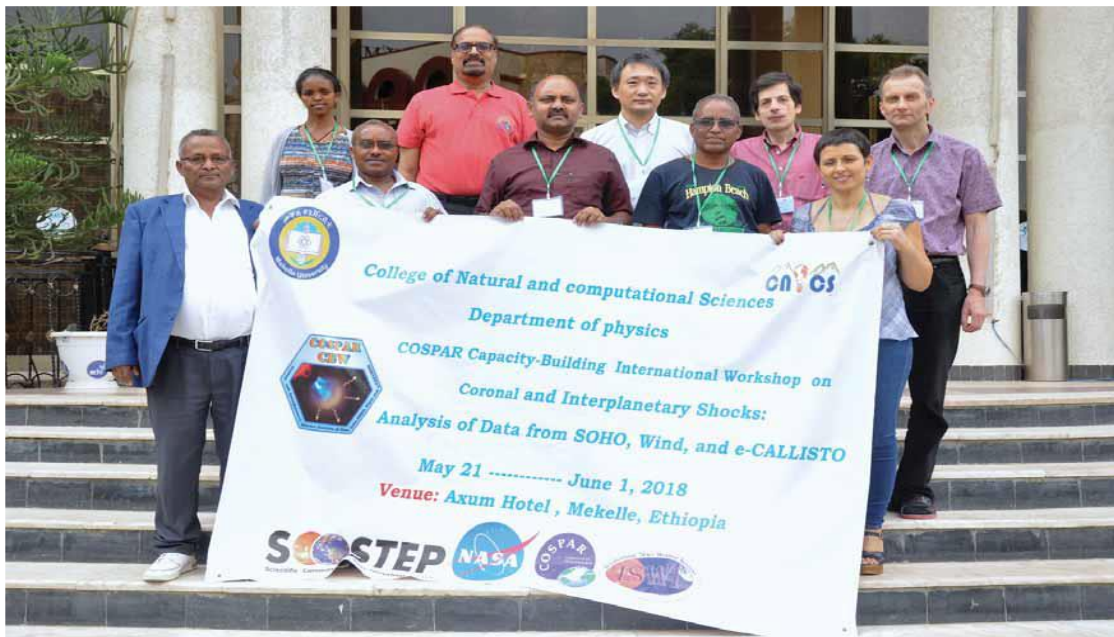
Participants of the workshop at the opening ceremony .



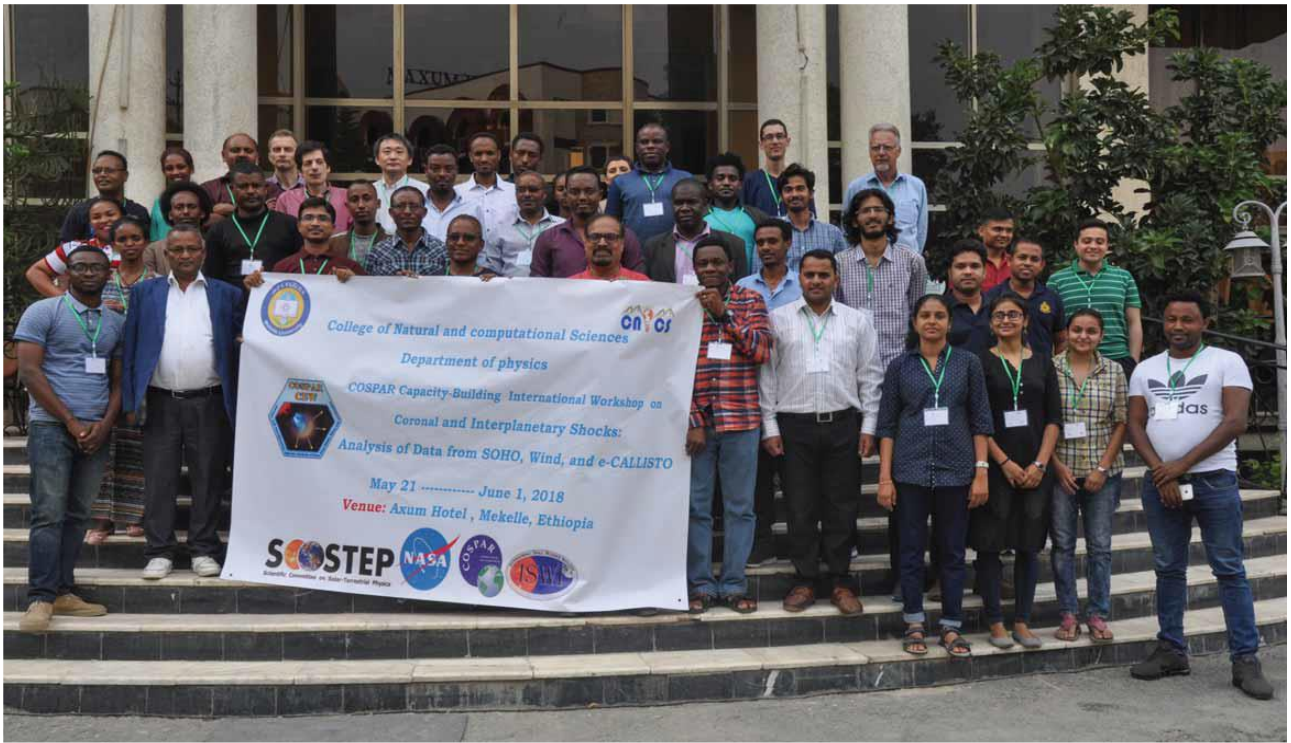
Welcoming speech by Dr. Habtu Alemayehu, Dean of Collage of natural and Computational Sciences



Welcoming speech by President MU, Prof. Kindeya G/hiwot



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11-lecturers



Group photo of all participants

Topics Addressed during the workshop

The major topics adressed

- Python software
- Plasma Physics
- Sun-Earth connection
- Solar Physics
- CMEs and Shocks
- Interplanetary physics
- Space Weather
- Radio telescopes
- Data Analysis

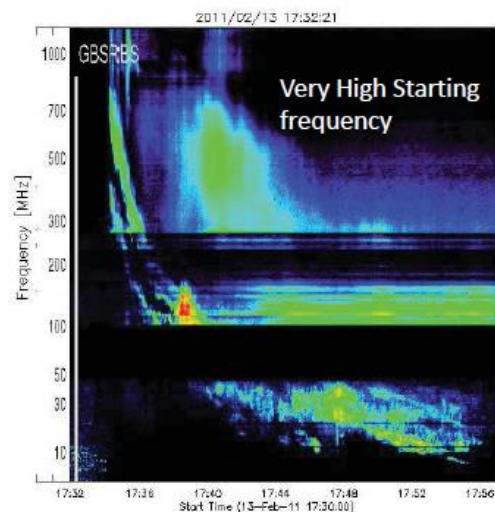
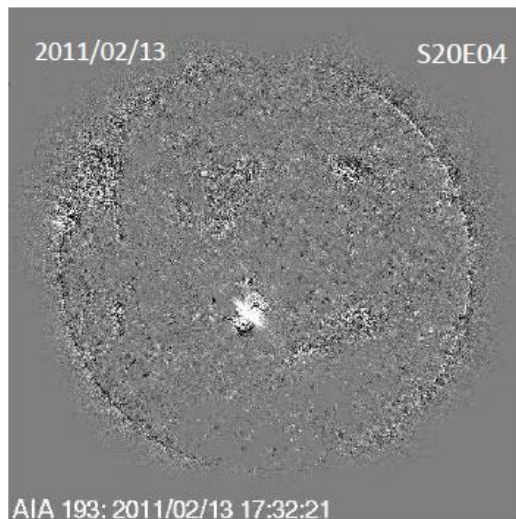
The workshop was organized as follows:

During the first week the workshop topic was introduced by providing background lectures. The detailed program is conducted as in the Schedule below.

Time	Monday May 21	Tuesday May 22	Wednesday May 23	Thursday May 24	Friday May 25	Saturday May 26	Sunday May 27
830-1030	Inauguration Gopalswamy 1,2	Nindos 3,4,5	Kathiravan 1,2,3	Makela 1,2,3	D'Amicis 3,4,5	Gopalswamy 3,4,Tsega	Field Trip
1030-11	Break						
11-1230	Monstein 1,2	G/Tsadkan 4,5	Gopalswamy 3,4	D'Amicis 1,2	Makela 4,5	Yashiro 1,2	
1230-130	Lunch						
130-330	G/Tsadkan 1,2,3	Monstein 3,4,5	Kathiravan T	Monstein T	D'Amicis T	Abraha, Kassa, H/selassie	
330 -4	Break						
4-6	Nindos 1,2,T	Nindos T	Monstein T	Gopalswamy T	Makela T	Yashiro & Gopalswamy Workshop events	

Wave Diameter Method:

The shock is hemispherical around the CME, so the shock height above the surface is half of wave diameter



AIA wave radius @ type II onset = $0.14 R_s$ = Shock height in EUVI
 $400 \text{ MHz} \rightarrow n_p = 1.98 \times 10^9 \text{ cm}^{-3}$

Workshop examples

The second Week

2nd Week: Data Analysis

6 groups formed
 Each group had a lecturer
 Each group analyzed 2 events (one simple and one complex)

	Monday May 28	Tuesday May 29	Wednesday May 30	Thursday May 31	Friday June 1
0	Analysis groups/event assignment	Reports	Reports	Reports	Final Reports
	Break				
	Event analysis	Event analysis	Event analysis	Event analysis	Closing
0	Lunch				
	Event analysis	Event analysis	Event analysis	Event analysis	Departures
	Break				
	Event analysis	Event analysis	Event analysis	Event analysis	

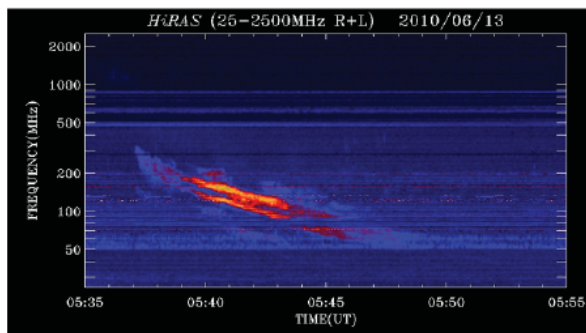


EVENT ID: 20100613_0538
 Tentative Number: 004 (could be changed due to newly identified type IIs)

[NOAA-Events-List](#)

```
#2010/06/13 05:38
4450 0530 0539 0544 G14 5 XRA 1-8A M1.0 4.2E-03 1079
4450 0535 0535 0540 LEA 3 FLA S25W84 SF 1079
4450 0537 0537 0538 LEA G FBR 245 180 1079
4450 + 0538 /// 0552 SVI C RSP 055-180 II/1 621 1079
```

S25W88 band-splitting, no DH, CAURI_59,MRT_59,OOTV_59 59,SSRT_59



[SDO A094+GOESX](#) [SDO A193RDF+GOESX](#) [SDO A193RDF+STA195RDF](#) [SDO A193RDF+STB195RDF](#)
[SDO A193RDF+LASC2RDF](#) [LASC2RDF+LASC3RDF](#) [LASC2RDF+STA-COR1RD](#) [LASC2RDF+STB-COR1RD](#)
[LASC2RDF+LASC3RDF](#) [STA-COR1RD+COR2RD](#) [STB-COR1RD+COR2RD](#) [LASC2RDF+Wind/WAVES](#) [STA-COR2RD+SWAVES](#) [STB-COR2RD+SWAVES](#)

[All CDAW Movie](#)

Data: Type II Radio Bursts

- Measure drift rates from the dynamic spectra
- Compute shock speed evolution using various density models
- Compare speeds from white-light and EUV images of coronal mass ejections

All data on local server – to avoid internet issues
 The data are now hosted at NASA/GSFC CDAW Data Center (cdaw.gsfc.nasa.gov)

Proposed Budget for the workshop.

The budget source of the workshop was from the following

1. COSPAR 25000 EUROS = 775000 Birr
2. ISWI 3000 = 81000 Birr
3. Mekelle University = it will cover all the remaining expenses

Budget expenditure in the workshop

1. Living expenses paid to Axum Hotel= 675,087.00 Birr
2. Airfare of international students and lecturers=695,478.00 Birr
3. Banquets and refreshments = 185,000.00 Birr
4. Banners, note books = 30,000 Birr

Total= 1585565.00

N.B: 1. We did not include the funds from NASA and SCOSTEP which was Used for transportation of USA Lecturers.

2. Mekelle University has Covered Birr 729,565.00

Banquet included Traditional Habesha Show



Some Comments from the Participants

- “This is really a major part of true intellectual culture of modern times”
- “Everything was fine in the hotel except network connectivity.”
- “Uploading the lectures on workshop website, well before the workshop was helpful.”
- “ I have learned a lot during the project by taking measurement from the observations and analysing them to understand the CMEs I worked on.”
- “This is by far the most beneficial training/workshop in regards to the relevance to my field of study and adequate time to practice with what is learnt. The interactions were invaluable. The software were relevant.”
- “This workshop helped me a lot ... I have no words to expresses my happinessBut I want to recommend to continue this workshop every year.”

Based on the comments given from the participants and our observation as a University the workshop was very much successful and achieved its goals.