

# Panel Session 4: Toward Improved Space Weather Services and Preparedness

Global Capacity Building by ISWI, COSPAR, and SCOSTEP

Nat Gopalswamy

NASA Goddard Space Flight Center, Greenbelt, MD



- Collaboration between developing and developed countries
- SWx Instrument deployment
- Space Science Schools
- ISWI workshops: Science with ISWI instrument data + Space data
- Outreach activities
- Part of UN Space Weather Agenda



- Capacity building workshops
- Initially for all astronomy
- Now solar and space weather workshops
- SWx Roadmap
- Biennial meetings
- Interdisciplinary Body of ICSU
- UN Observer



- Capacity building activities
- Space Science Schools
- Solar-terrestrial Research: Climate and weather
- Targeted 4-yr science programs
- Annual Symposia
- Quadrennial meetings
- Interdisciplinary Body of ICSU
- UN Observer

Supported by Member Countries. Prominently: USA & Japan

# ISWI/SCOSTEP Space Science Schools: Sun to Earth Topics

Science Teacher Workshops



International Heliophysical Year Schools (2007 – 2011): Brazil, China, Egypt  
India, Slovakia, Nigeria  
Indonesia (Sep 2012); Kenya (October 2013), Peru (2014), India (Nov 2016)  
Azerbaijan (October 2018)  
50-80 graduate students in each school: several hundred students trained

Public Lectures by ISWI/SCOSTEP Lecturers

# The United Nations/United States of America Workshop on the International Space Weather Initiative:

## The Decade after the International Heliophysical Year 2007

### 31 July – 4 August, 2017 Boston College, Boston, MA

- Flagship meeting for UNISPACE+50
- Keynote talks and panels discussion on: Space Weather Policy Issues
- Economic Impact & Global response
- Science workshop: talks & posters
- ISWI instrument collaboration



Previous UN/ISWI Workshops in: Bulgaria, Ethiopia, India, Japan, Korea, Nigeria, Ecuador, Zambia





Ken Hodgkins  
US State Dept



David Kendall  
UNCOPUOS

Space Weather:  
Policy & Economic  
Impact  
UNISPACE+50  
ISWI Science

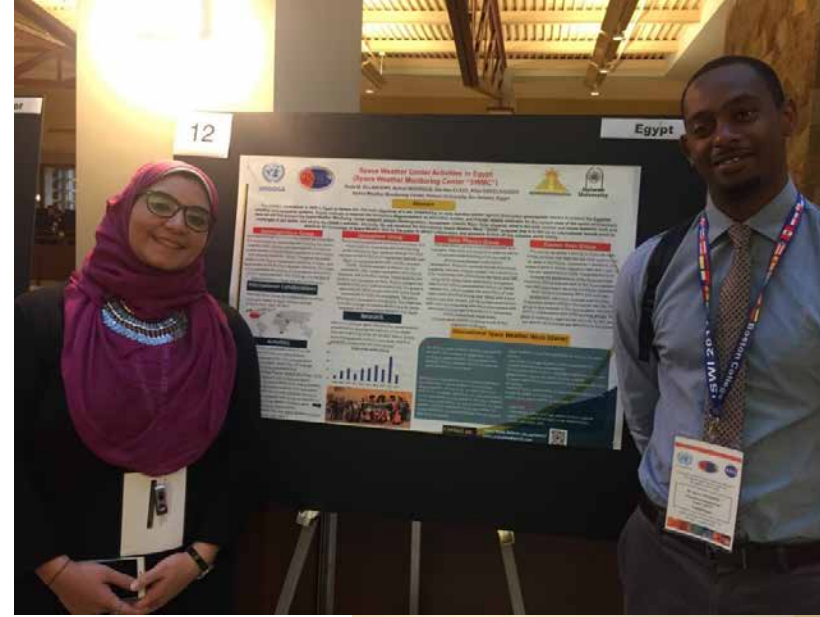
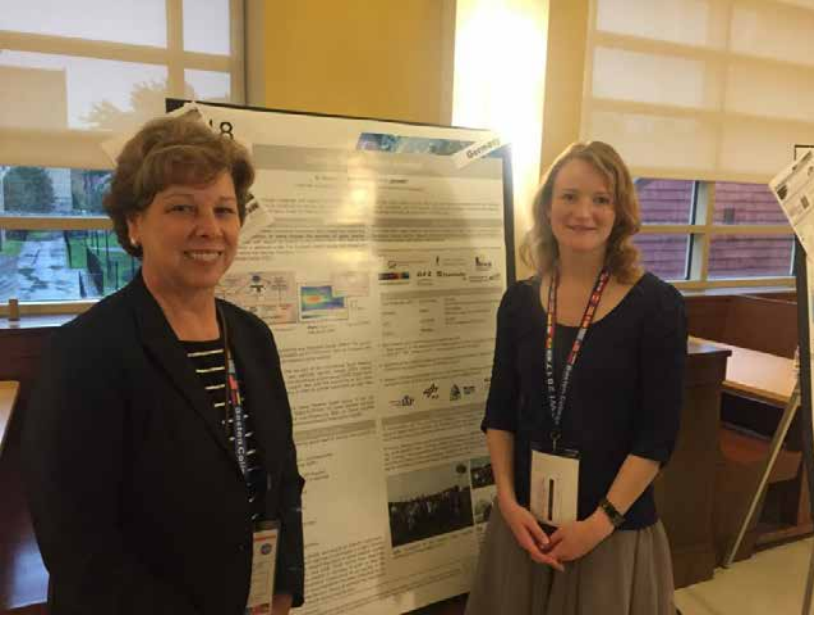
Jul 31-Aug 4 2018



Thomas CHILES, BC



Simonetta Di Pippo  
UNOOSA



Science Sessions:  
Posters & Talks

100-150 participants in UN/ISWI workshops  
Primary sponsors: UNOOSA & ISWI  
Local support from the host  
Additional sponsors that vary from place to place  
Publication in refereed journals based on science presentations



The United Nations/United States of America Workshop on ISWI  
Participants



# THE COSPAR CAPACITY BUILDING WORKSHOP AT MEKELLE UNIVERSITY IN ETHIOPIA

May 21 – June 1, 2018 Mekelle, Tigray, Ethiopia

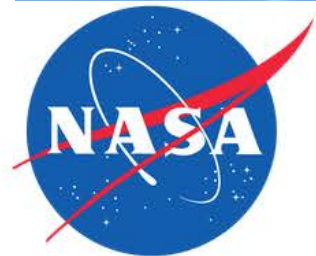
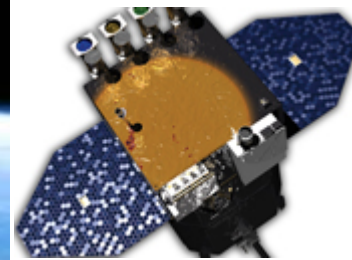
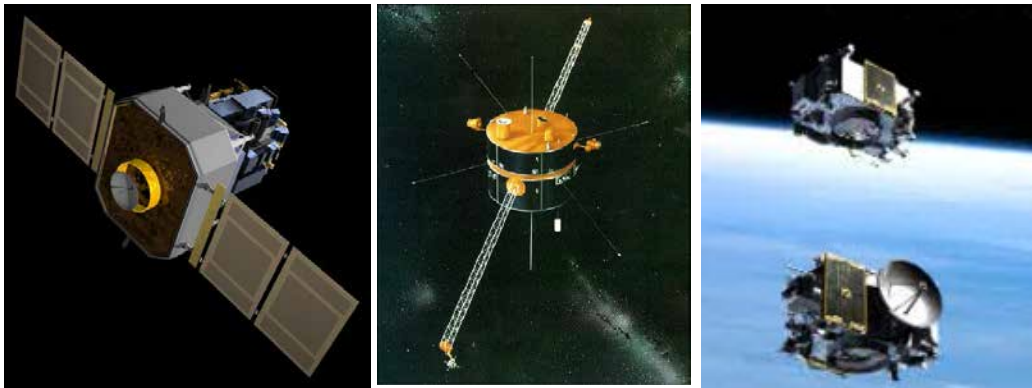
<http://e-callisto.org/cospar2018/COSPAR2018workshopEthiopia.html>

## Objectives:

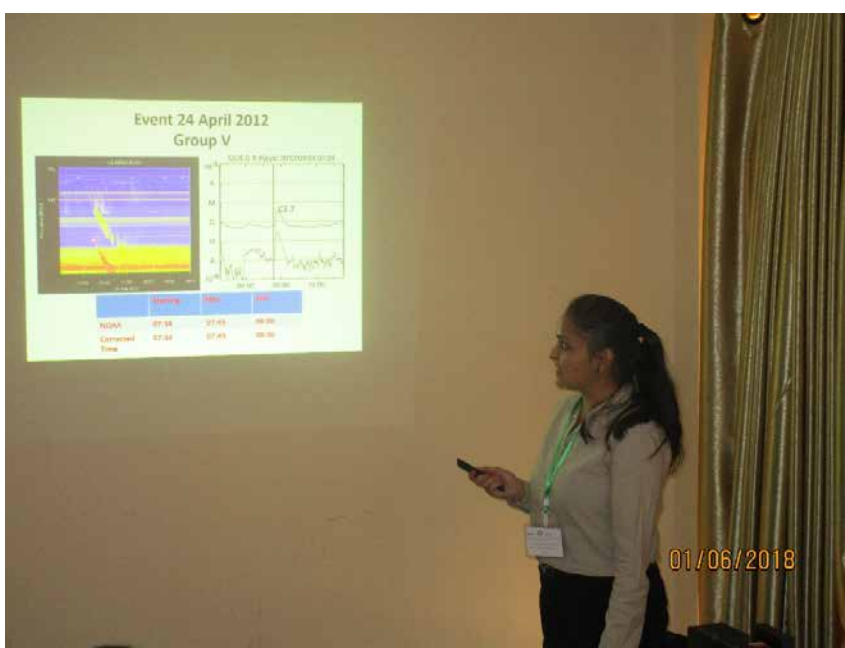
- Encourage the scientific use of space data by scientists in developing countries
- Provide a highly practical training in the use of space data from current missions

## Details:

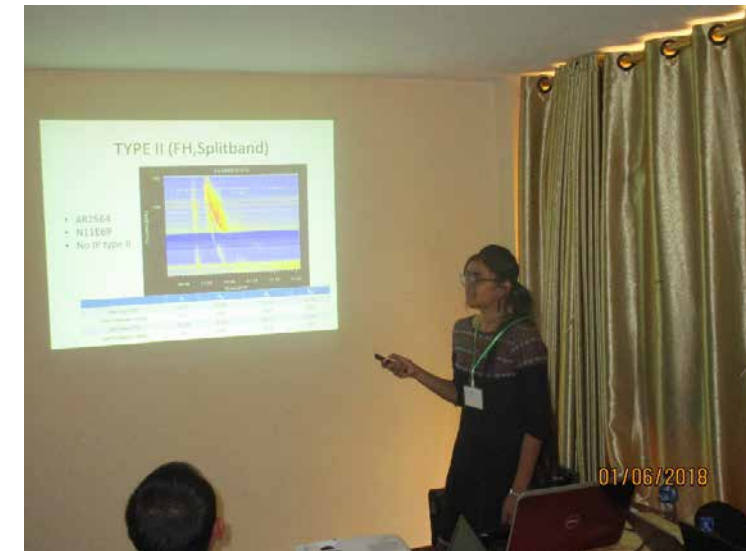
- Coronal mass ejections and shocks: sources of extreme space weather
- Data from many space missions + ground-based instruments
- First week of lectures; second week of data analysis by six groups (with an embedded lecturer in each group)
- Daily progress reports and final presentations; continued collaboration post-workshop







Final presentations  
made by students after  
daily progress reports



- Hands-on experience
- Training in python
- Web-based tools
- Analysis & interpretation
- Research report
- ISWI instrument donated to Ethiopia
- USA, Japan, Germany, France, Armenia, and Brazil provide SWx instruments
- Currently 18 networks with >1000 instruments in >100 countries
- Important ISWI capacity building activity



23/02/2017

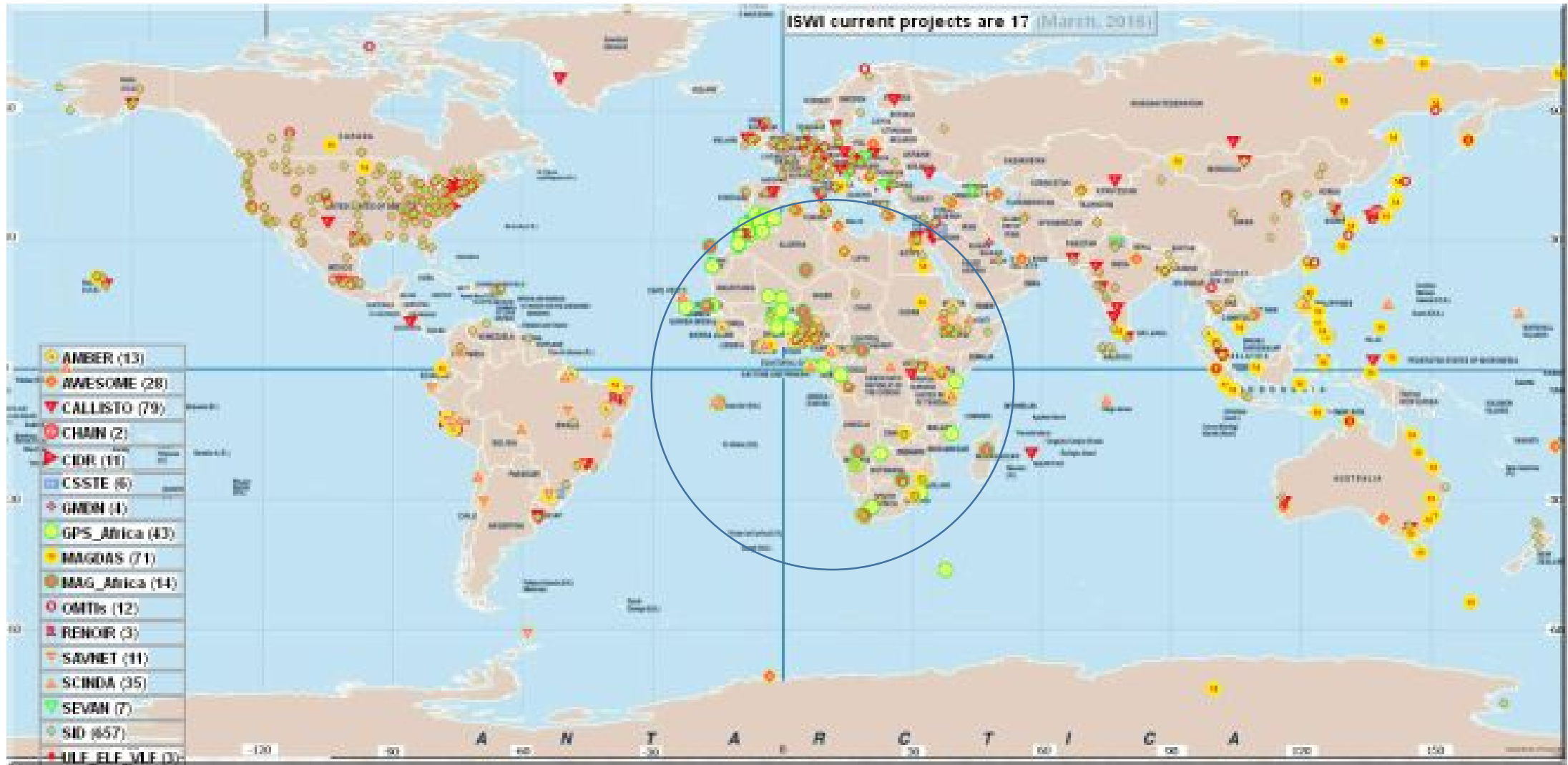
[iswi-secretariat.org](http://iswi-secretariat.org)

## SCOSTEP/ISWI scientists interact with high school students



 <p>ADEBESIN, Babatunde Olufemi, Landmark Univ., Nigeria (NASA-GSFC)</p>	 <p>LEMINH, Tan, Tay Nguyen Univ., Vietnam (CIRC/ISEE, Nagoya Univ.)</p>	 <p>OMONDI, George Erick, Maseno Univ., Kenya (SANSa)</p>	 <p>OWOLABI, Oluwafisayo, University of Lagos, Nigeria (SANSa)</p>	 <p>SELVAKUMARAN, R., Indian Inst. Geomagnet., India (NASA - GSFC)</p>	 <p>THOMAS, Neethal, Indian Inst. Geomagnet., India (CIRC/ISEE, Nagoya)</p>
 <p>SUMOD, S.G., Mahatma Gandhi University, India (ISEE, Nagoya Univ.)</p>	 <p>SASIKUMAR RAJA, K., Indian Inst. of Science Education and Research, India (NAOC, China)</p>	 <p>GOKANI, Sneha, Indian Inst. Geomagnetism, India (SANSa)</p>	 <p>BOLAGI, Olawale Segun, Univ. of Lagos, Nigeria (Univ. of Science &amp; Technology, China)</p>	<p>SCOSTEP Visiting Scholars:2015-2018 2017: 20 PhD students trained in Advanced Labs .</p>	

A total of 1045 instruments located in 112 countries



# Summary

- ISWI, COSPAR, and SCOSTEP are international scientific organizations heavily involved in space weather capacity building activities
- There is close collaboration between these organizations to exploit the synergy
- The activities provide all aspects of the Sun-Earth connected system with prominent focus on SWx: From the interior of the Sun to the interior of Earth
- Hundreds of PhD students and young scientists have been trained in space weather and imparted with the skills needed to do research in space weather science
- Participation by other organizations are welcome