School Report

Smt. Kasturbai Walchand College of Science & Arts, Rajnemi Campus, Sangli, Maharashtra 416416, India

http://www.iiap.res.in/meet/school_meet/index.php

Prepared by: Nat Gopalswamy

ORGANIZING INSTITUTIONS AND SPONSORS

Aim of the School

- The SCOSTEP/ISWI International School on Space Science held in Sangli, India, has been one of the recent schools organized jointly by the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) and the International Space Weather Initiative (ISWI).
- The school was designed to be an excellent learning and enrichment opportunity for graduate students. The target audience was students who are pursuing PhD in solar terrestrial physics and space science.
- Some masters students who have already some exposures in solar/space physics were also included.
- The students received detailed exposure to topics ranging from the solar interior and atmosphere to Earth's magnetosphere, ionosphere, and atmosphere including phenomena of various time scales in the Sun-Earth connected space.

Organization

- Science content: School Directors
- Venue, accommodation, meals, transportation: Smt. Kasturbai Walchand College of Science & Arts (Local Organizing Committee)
- Web site: Indian Institute of Astrophysics, Bangalore
- International Travel: Boston College (ISWI), ISEE – Japan, Smt. Kasturbai Walchand College of Science & Arts

Sponsors

cientific Committee on Solar-Terrestrial sics (SCOSTEP)

nternational Space Whether Initiative (ISWI)

ndian Space Organization (ISRO)

ndo-US Science and Technology Forum SSTF)

ITI Aayog, Govt. of India

cience and Engineering Research Board RB), DST, Govt. of India

ndian Institute of Geomagnetism (IIG)

ndian National Science Academy (INSA)

9. Committee on Space Research (COSPAR)

10. NASA

11. Center for International Collaborative Research (CICR), Institute for Space-Earth Environmental Research (ISEE), Nagoya University, Japan

12. Japan Society for the Promotion of Science (JSPS) core-to-core program for Asia/Africa

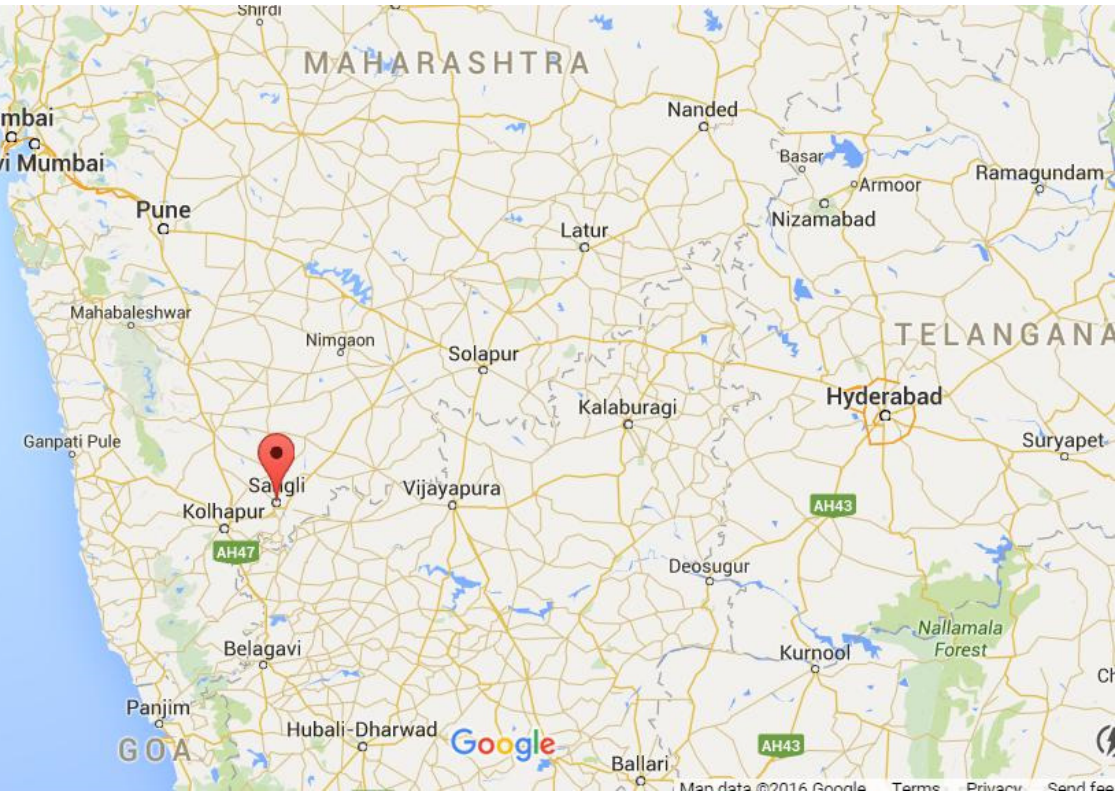
13. Japan and Project for Solar-Terrestrial Environment Prediction, Japan.

14. Shivaji University, Kolhapur, India

15. Veetrag Computers, Sangli, India

16. Indian Institute of Astrophysics (IIA)

The School venue was a remote region brimming with sugar cane, turmeric, and thirst for science…



School Directors

Dr. Nat Gopalswamy (NASA/GSFC, USA)

Dr. P. K. Manoharan (Radio Astronomy Center, Ooty, India)

Dr. Dipankar Banerjee (Indian Institute of Astrophysics, Bengauru, India)

Dr. Dadaso Shetti (Smt. Kasturbai Walchand College, Sangli, India)

Participation

- 28 lectures by 23 Professors from USA, Japan, India, and Norway
- ISWI Instruments workshop conducted by 8 scientists from USA, India, Japan, and Switzerland
- There were 120 applications. 74 students were selected. Participants were from China, Egypt, Ethiopia, India, Indonesia, Ivory Coast, Kenya, Korea, Nigeria, Philippines, Rwanda, Thailand, Uganda, and Vietnam

Decorative art by the local organizers using color powders (Rangoli)

School Lectures

Sun in the Universe: M. Guhathakurta, NASA/HQ, USA

Magnetohydrodynamics: Mark Miesch, High Altitude Observatory, USA

Numerical Simulations: Mark Miesch, High Altitude Observatory, USA

Software tools: Python – Mihael Kirk, NASA/GSFC, USA

Basic Plasma Physics – Nat Gopalswamy, NASA/GSFC, USA

Solar Interior: S. P. Rajaguru, IIA Bangalore, India

Solar Dynamo : Mark Miesch, High Altitude Observatory, USA

Solar Atmosphere: Dipankar Banerjee IIA, Bangalore, India

Magnetic Reconnection : Kazunari Shibata, Kyoto University Japan

Solar Wind Observations: P. K. Manoharan, NCRA/TIFR, Ooty, India

Solar Wind Theory: T. Suzuki, Tokyo University, Japan

Sun and Climate : R. Ramesh, Physical Research Laboratory, India

Solar Eruptions : Nat Gopalswamy, NASA/GSFC, USA

Solar Energetic Particles: Pertti Mäkelä. NASA/GSFC, USA

- Radio Physics of the Sun : C. Kathiravan IIA Bangalore, India
- Magnetic Flux ropes : Vemareddy Panditi, IIA, Bangalore, India
- CME Stereoscopy : Nandita Srivastava, PRL/Udaipur, India
- Helio Data/HEK : Neal Hurlburt, Lockheed Martin, USA
- Magnetospheric Physics: Nikolai Ostgaard, University of Bergen, No
- Magnetosphere-solar wind interaction: Nikolai Ostgaard, Norway
- Ionospheric Physics : Kazuo Shiokawa, Nagoya University, Japan
- Magnetosphere-Ionosphere Coupling : A. Yoshikawa, Kyushu U., Ja
- Equatorial Aeronomy : A. K. Patra, NARL, Gadanki, India
- Atmospheric Physics: S. Gurubaran, IIG, Mumbai, India
- Space Weather : Keith Groves, Boston College, USA
- Remote-sensing Instrumentation : Sankar Subramanian, ISRO, India
- In-situ instrumentation: S. Kanekal, NASA/GSFC, USA
- Cosmic Rays - Pertti Mäkelä, NASA/GSFC, USA

SCOSTEP/ISWI School 2016

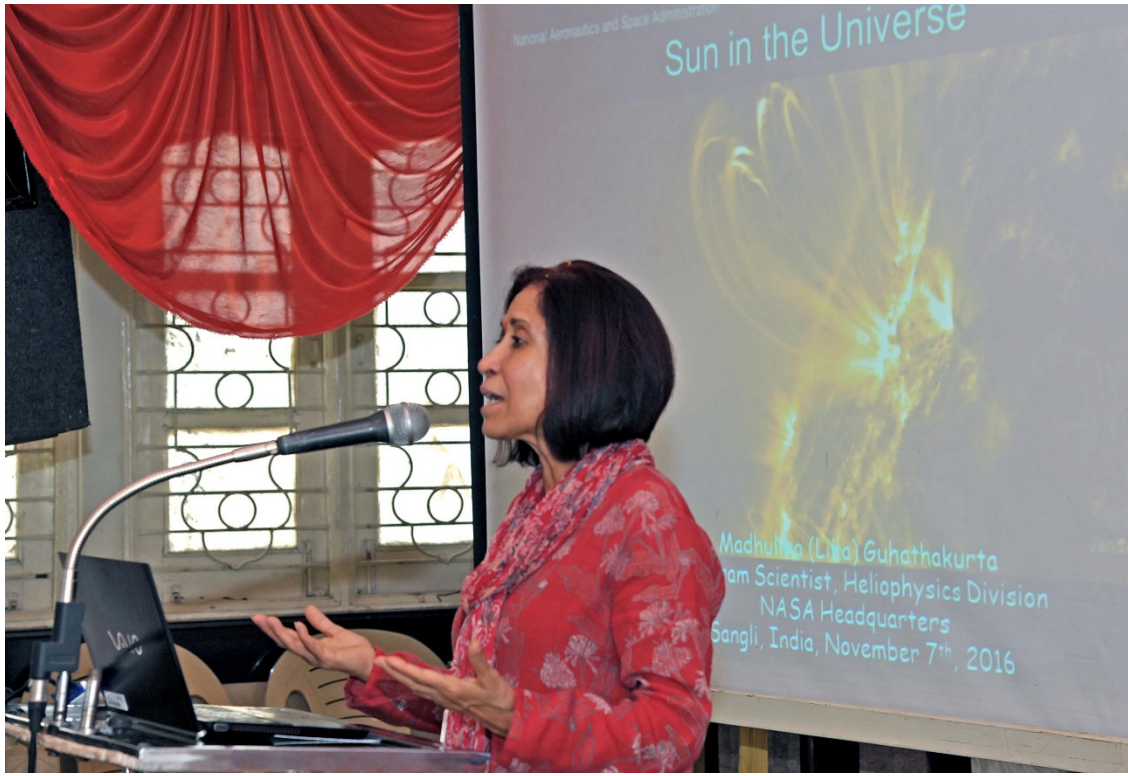
74 students
23 Professors
LOC
Officials from Latte Educatior
Society that runs the host institution

Traditional Welcome

Let the Light of Knowledge Spread…

Lamp lighting ceremony: Professor Wadmare, Professor Manoharan, Mr. Suhas Patil, Dr. Gopalswamy, Dr. Guhathakurta, Mr. Sakale, Mr. Suresh Patil, Mr. Kodag, Dr. Miesch, and Dr. Shetti

Inaugural lecture on
“ The Sun in the Universe”

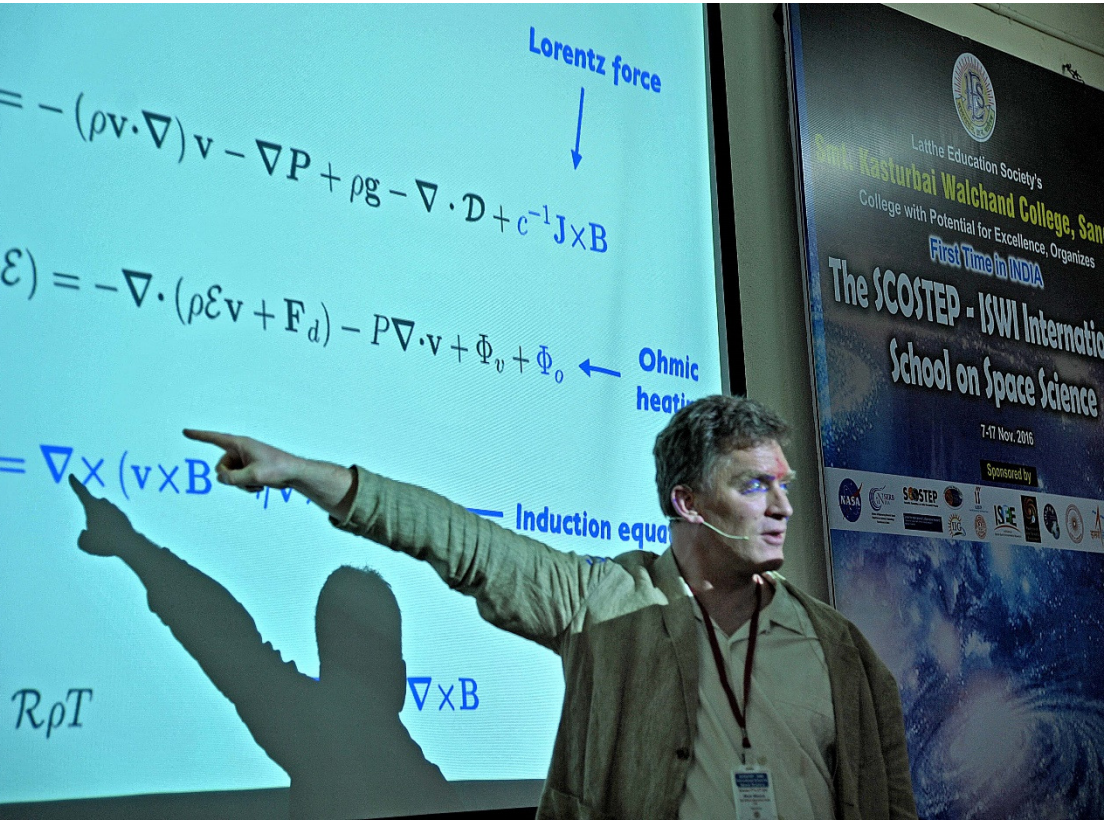


Interactive Tutorial on Python – the free Software for Data Analysis

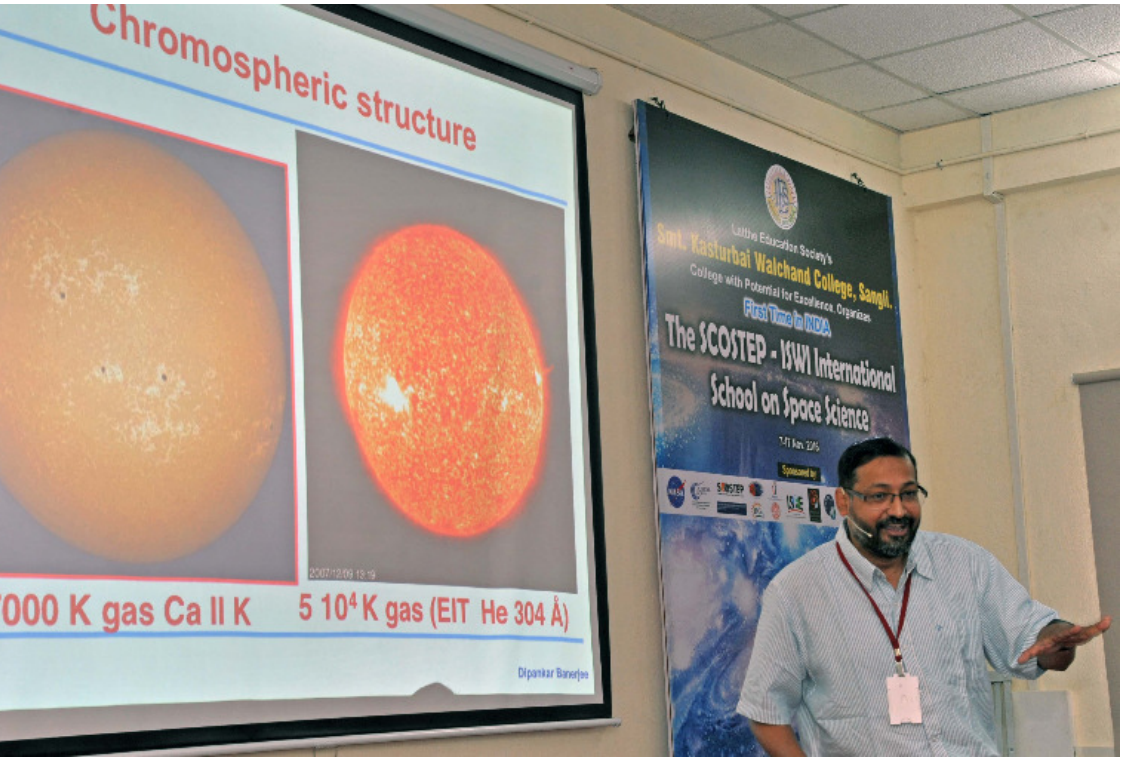
Solar Interior and Oscillations

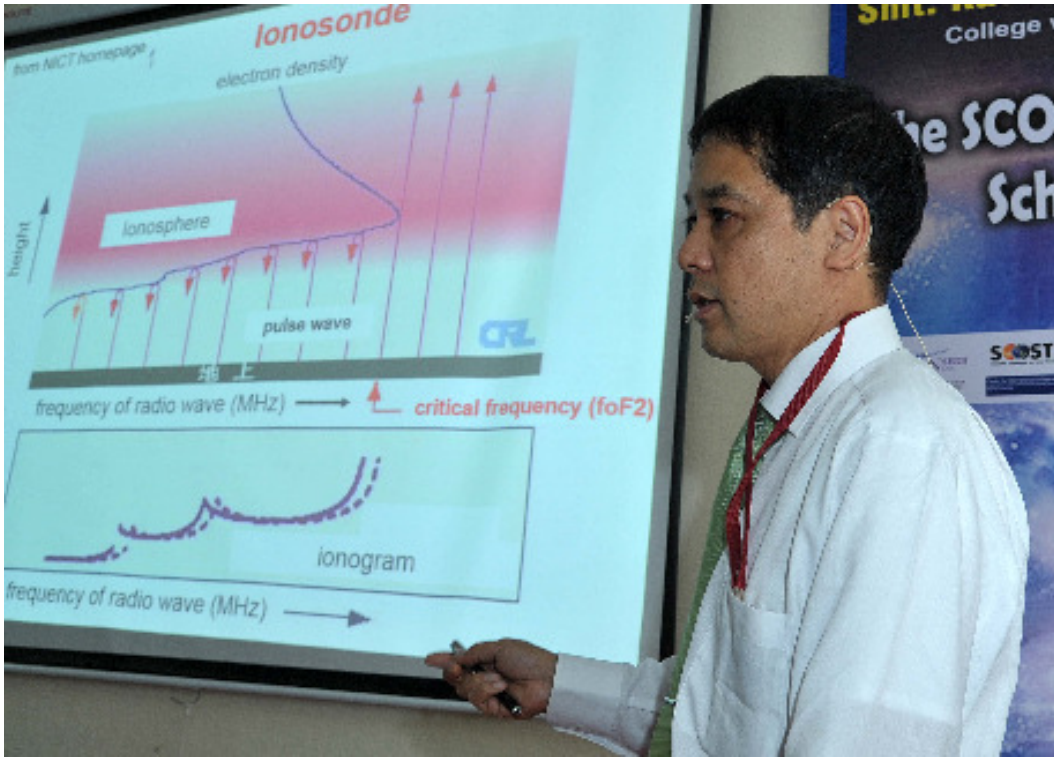
e scientific sessions started with the first lecture by P. Rajaguru on the interior of the Sun – how the energy is genera
d transported to the surface

Questions on Solar Dynamo

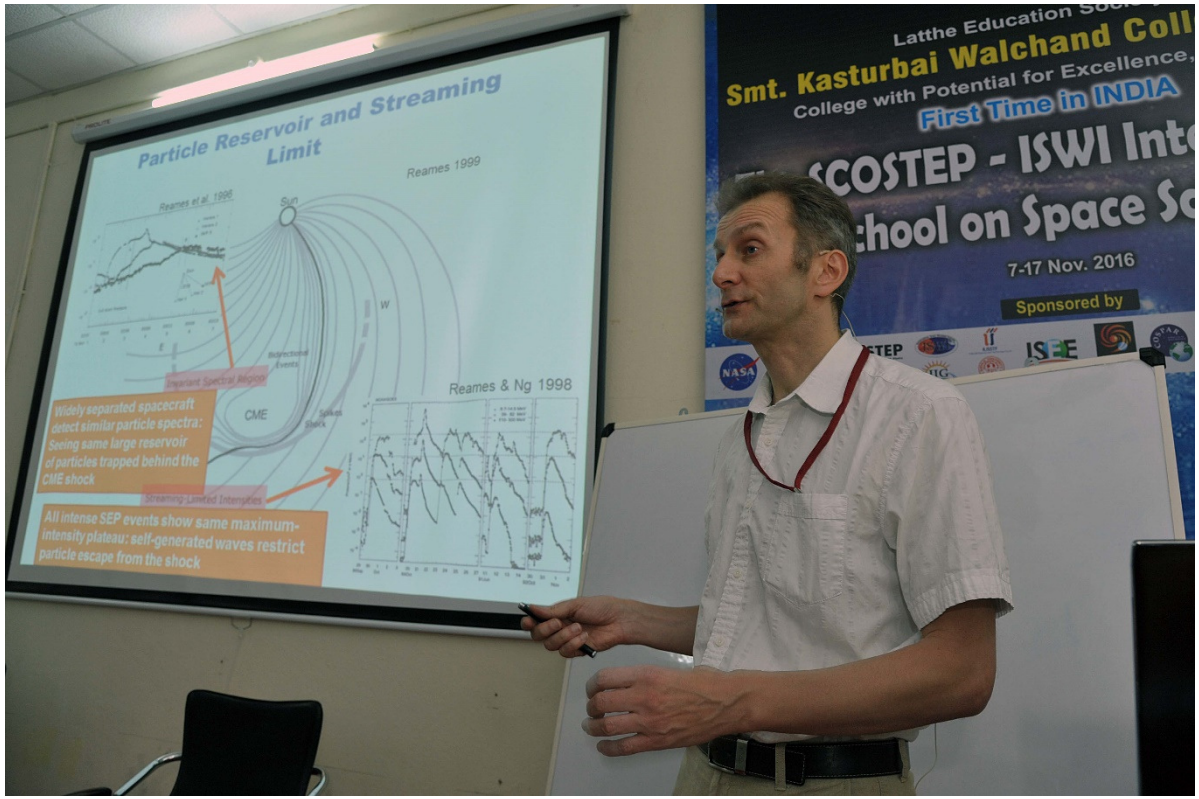


Chromosphere and Ionosphere





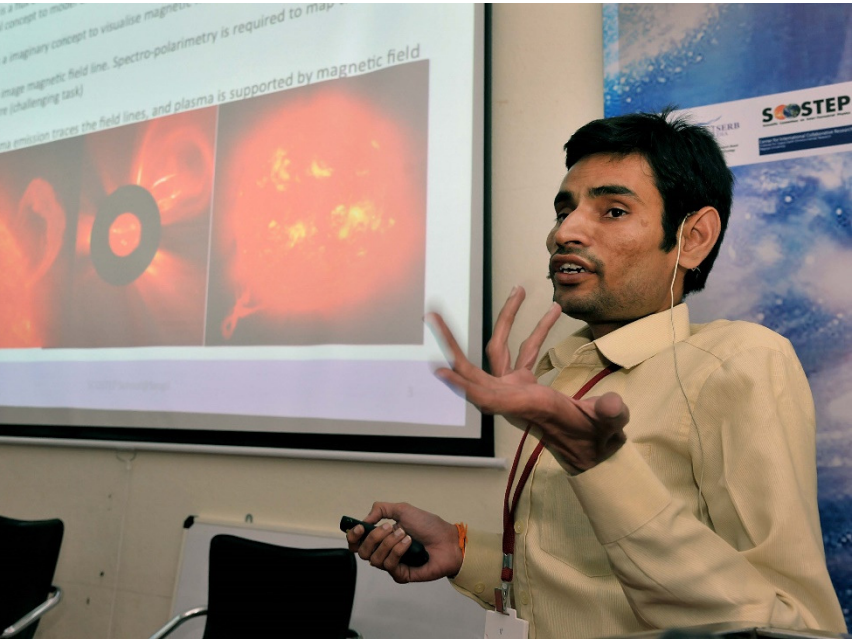
ormal chat among lecturers

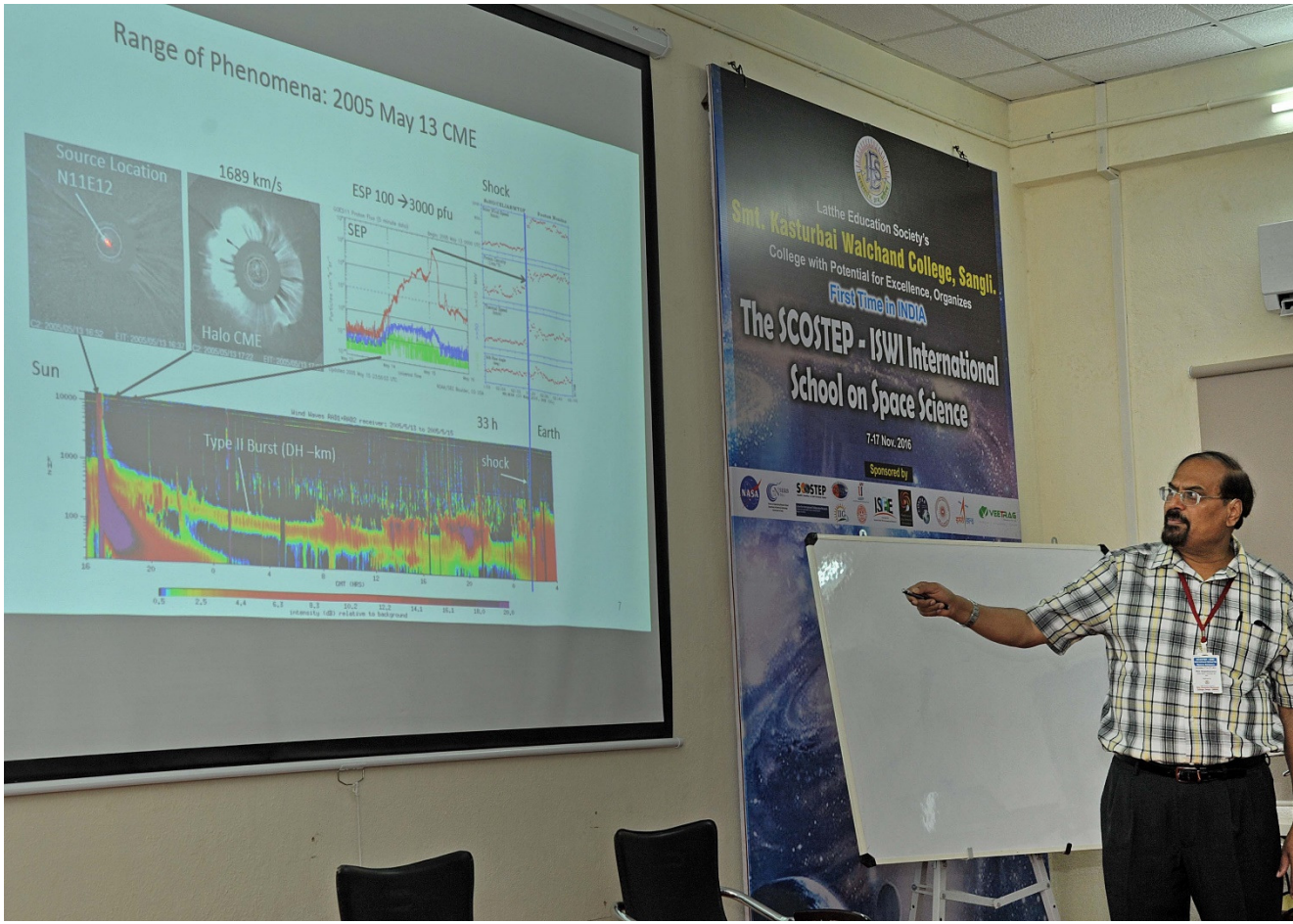


Pertti Makela's lecture on solar energetic particles

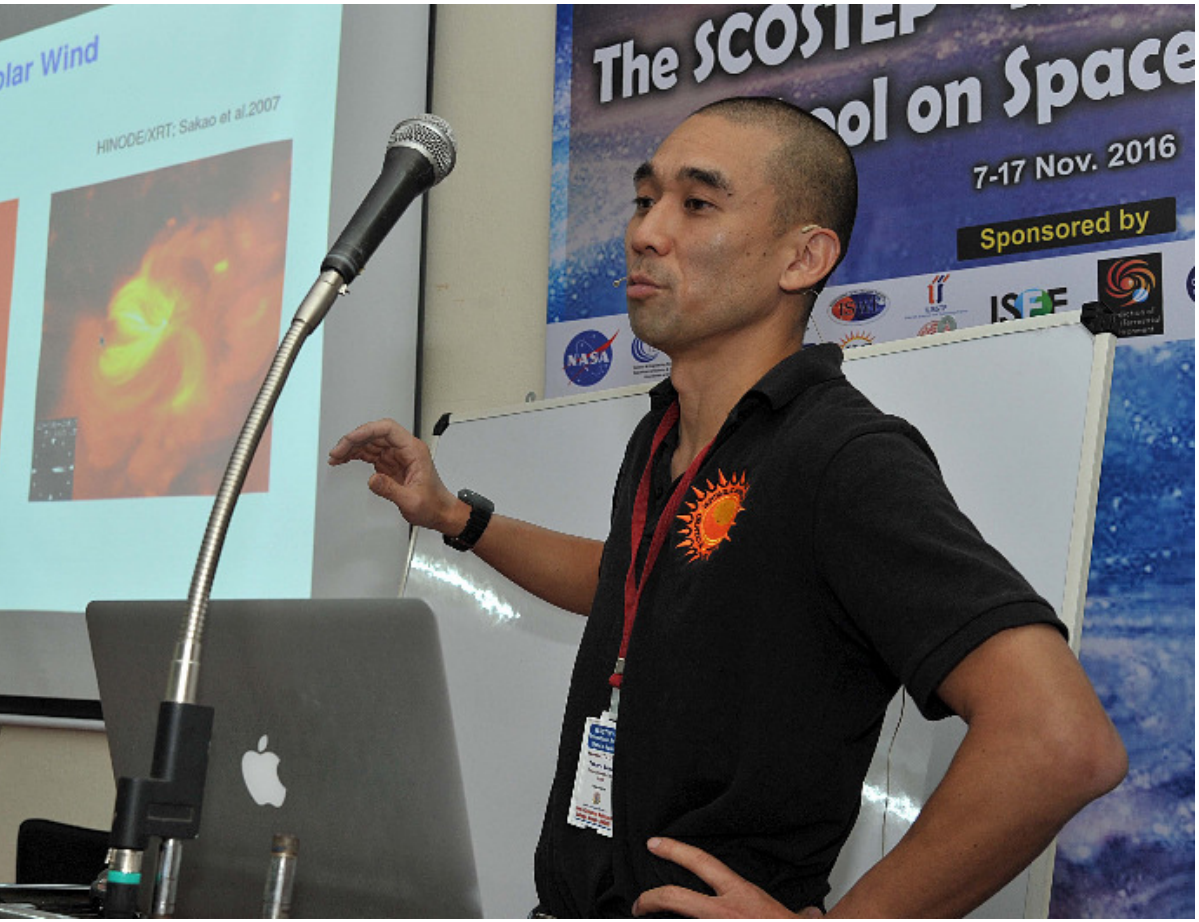
CMEs!


Sponsor
NASA
ISEE


SOSTEP


Range of Phenomena: 2005 May 13 CME
Source Location
N11E12
1689 km/s
Halo CME
ESP 100 →3000 pfu
SEP
Shock
Sun
33 h
Earth
Type II Burst (DH –km)
shock
Lattha Education Society's
Smt. Kasturbai Walchand College, Sangli.
College with Potential for Excellence, Organizes
First Time in INDIA
The SCOSTEP - ISWI International School on Space Science
7-17 Nov. 2016
Sponsored by

Solar Wind


olar Wind
HINODE/XRT: Sakao et al.2007
The SCOSTEP
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NASA


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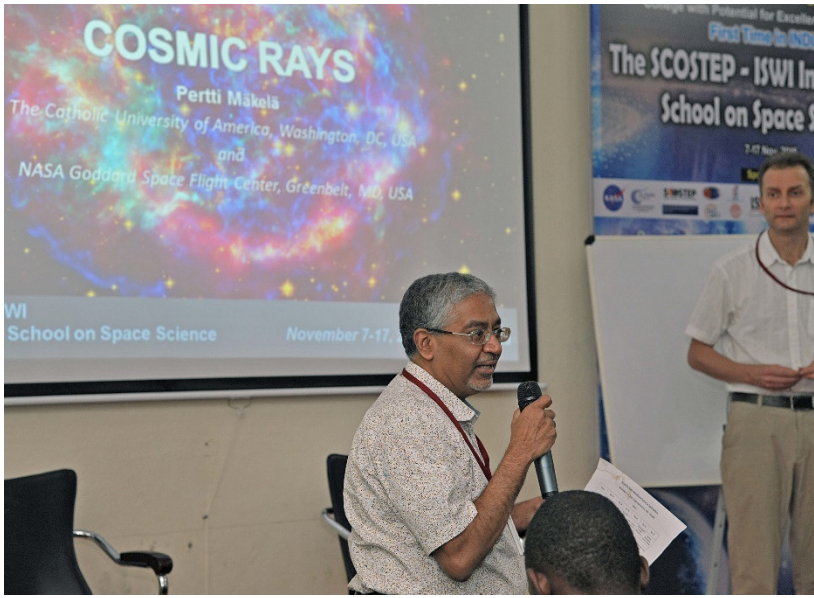
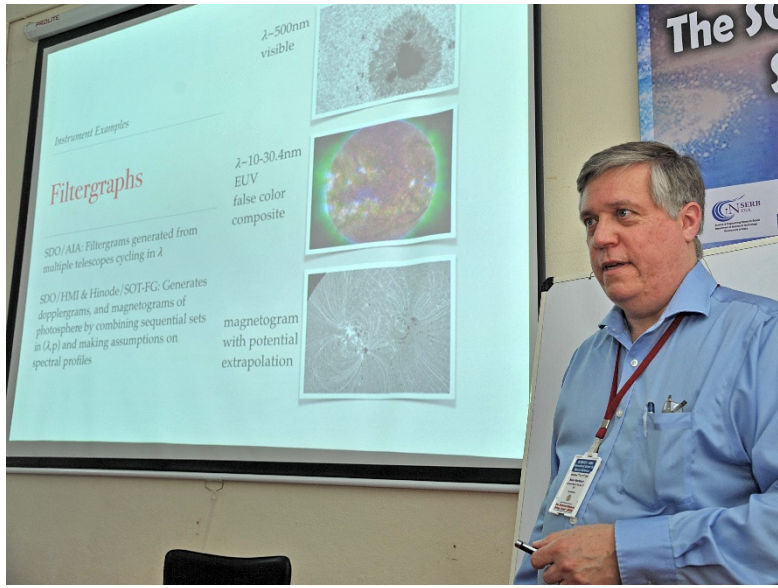
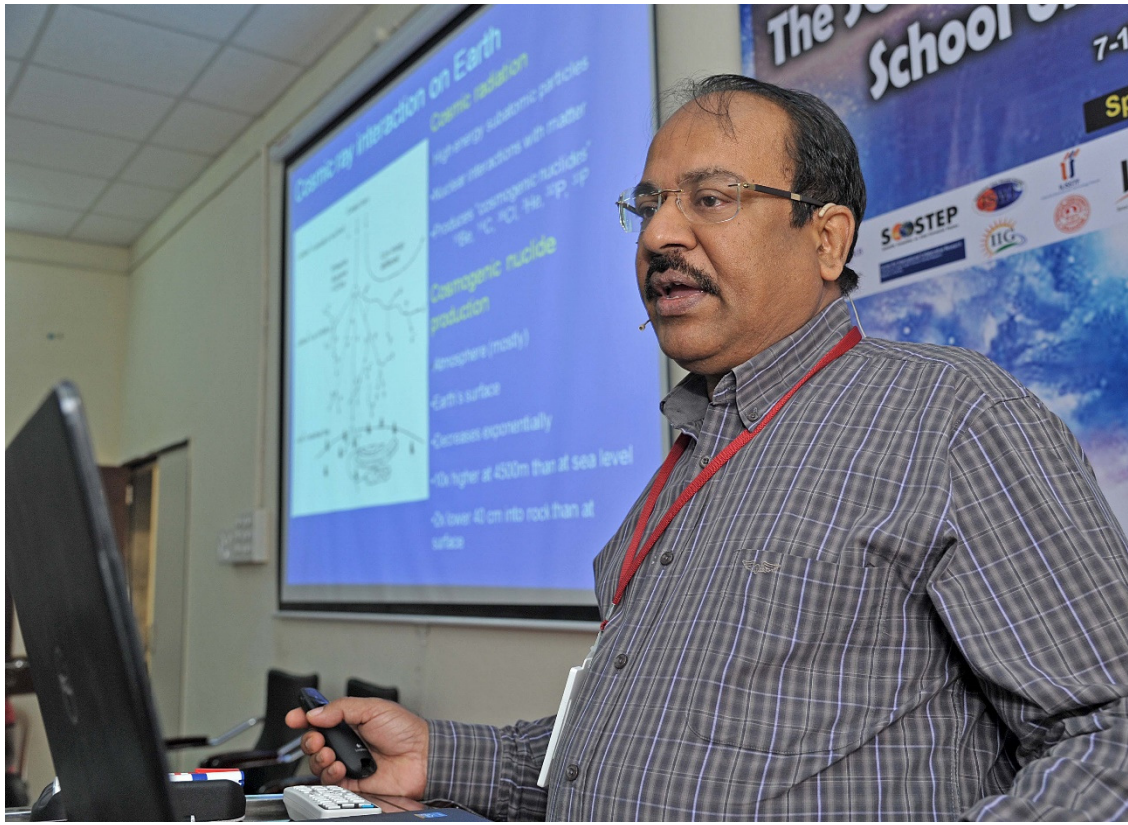
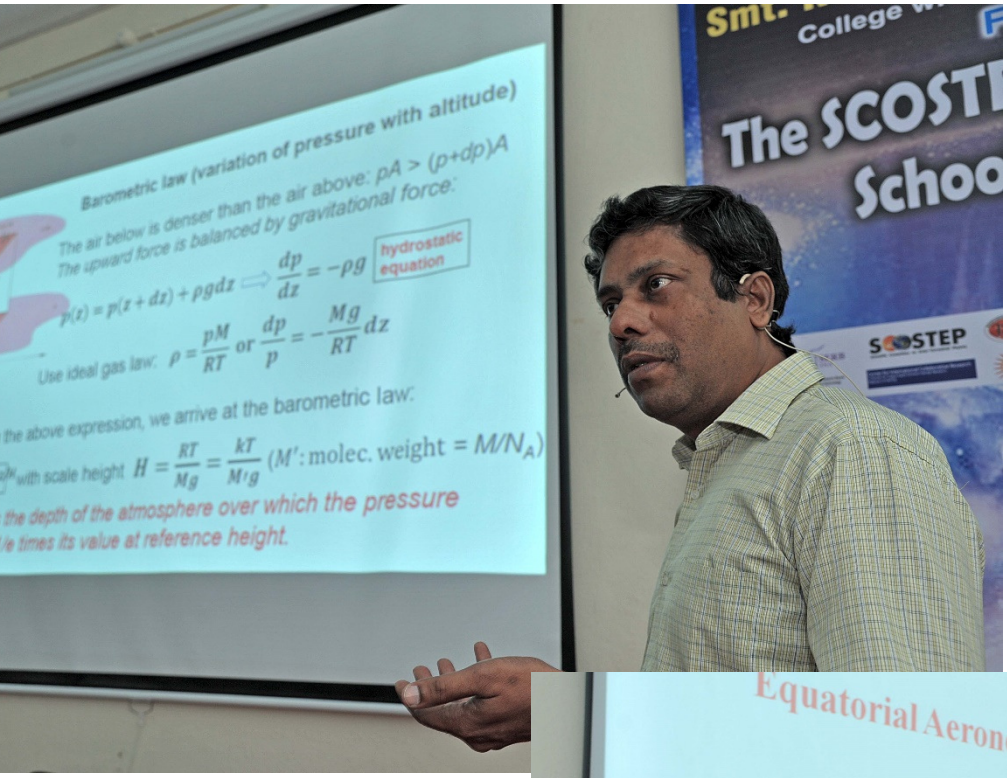

COSMIC RAYS
Pertti Mäkelä
The Catholic University of America, Washington, DC, USA
and
NASA Goddard Space Flight Center, Greenbelt, MD, USA
School on Space Science


Instrument Examples
Filtergraphs
λ~500nm
visible
λ~10-30.4nm
EUV
false color
composite
SDO/AIA: Filtergrams generated from multiple telescopes cycling in λ
SDO/HMI & Hinode/SOT-FG: Generates dopplergrams, and magnetograms of photosphere by combining sequential sets in (λ,p) and making assumptions on spectral profiles
magnetogram
with potential
extrapolation

A. Yoshikawa on the magnetosphere



Dr. R. Ramesh explains Sun-Earth Climate connection


Barometric law (variation of pressure with altitude)
The air below is denser than the air above: pA > (p+dp)A
The upward force is balanced by gravitational force:
hydrostatic equation
Use ideal gas law:
the above expression, we arrive at the barometric law:
with scale height
the depth of the atmosphere over which the pressure
le times its value at reference height.
SCOSTEP


Interplanetary space
Sun
Magnetosphere
Earth
Solar wind:
Plasma= electrons and ions
Frozen-in concept: No collision: magnetic field is´frozen´ in the plasma
interplanetary medium
Earth's magnetosphere – a shield
4
NASA


Equatorial Aeronomy
A K Patra
Research Laboratory, Gadanki
Smt. Kasturbai Walchand College, Sangli.
The SCOSTEP - ISWI International
School on Space Science

ISWI Instrument Workshop (Nov 14, 2016)

- CALLISTO – C. Monstein
- SCINDA – K. Groves
- AWESOME – R. Singh
- GPS Receivers – G. Seemala
- MAGDAS – A. Yoshikawa
- OMTI – K. Shiokawa
- AMBER – E. Yizengaw
- CHAIN – K. Shibata

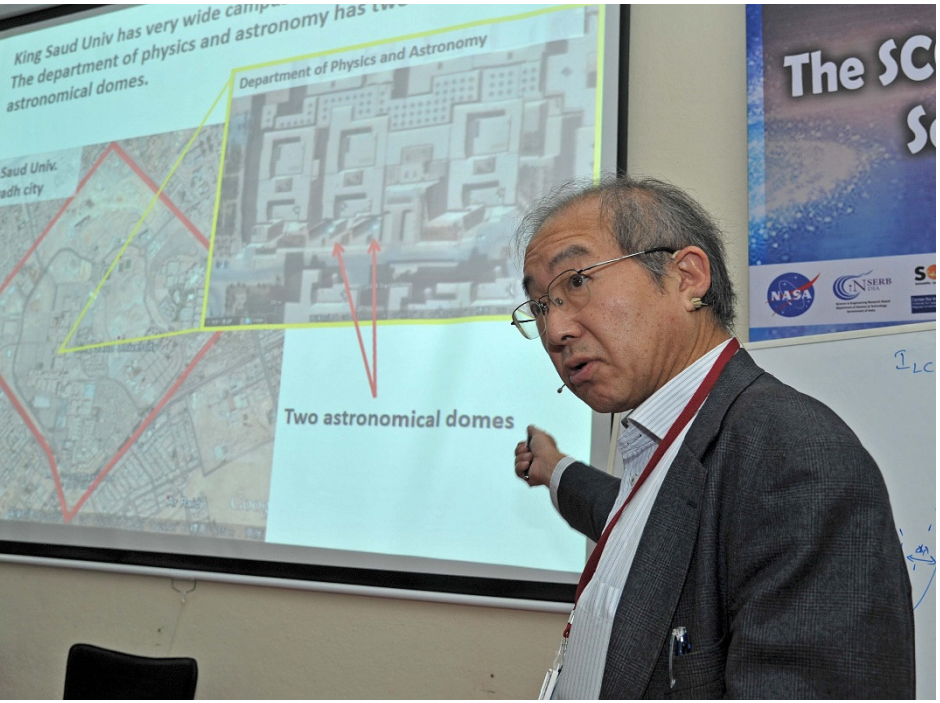
C. Kathiravan & I. Barve demonstrated the working of a two-element radio interferometer during the Instrument workshop

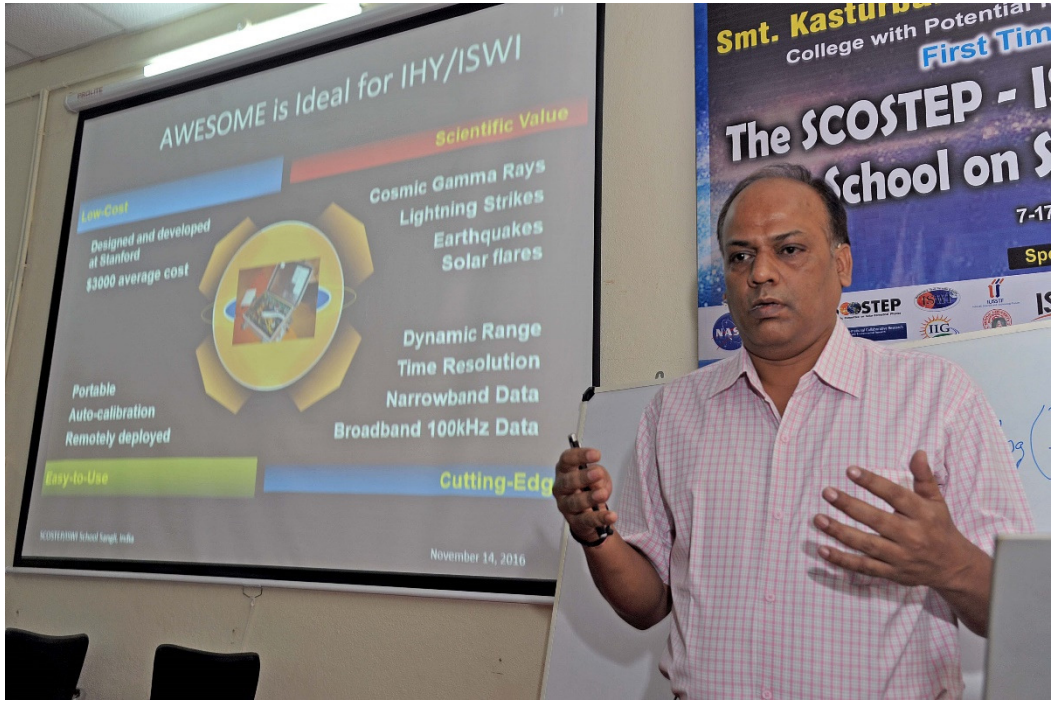
Instrument workshop

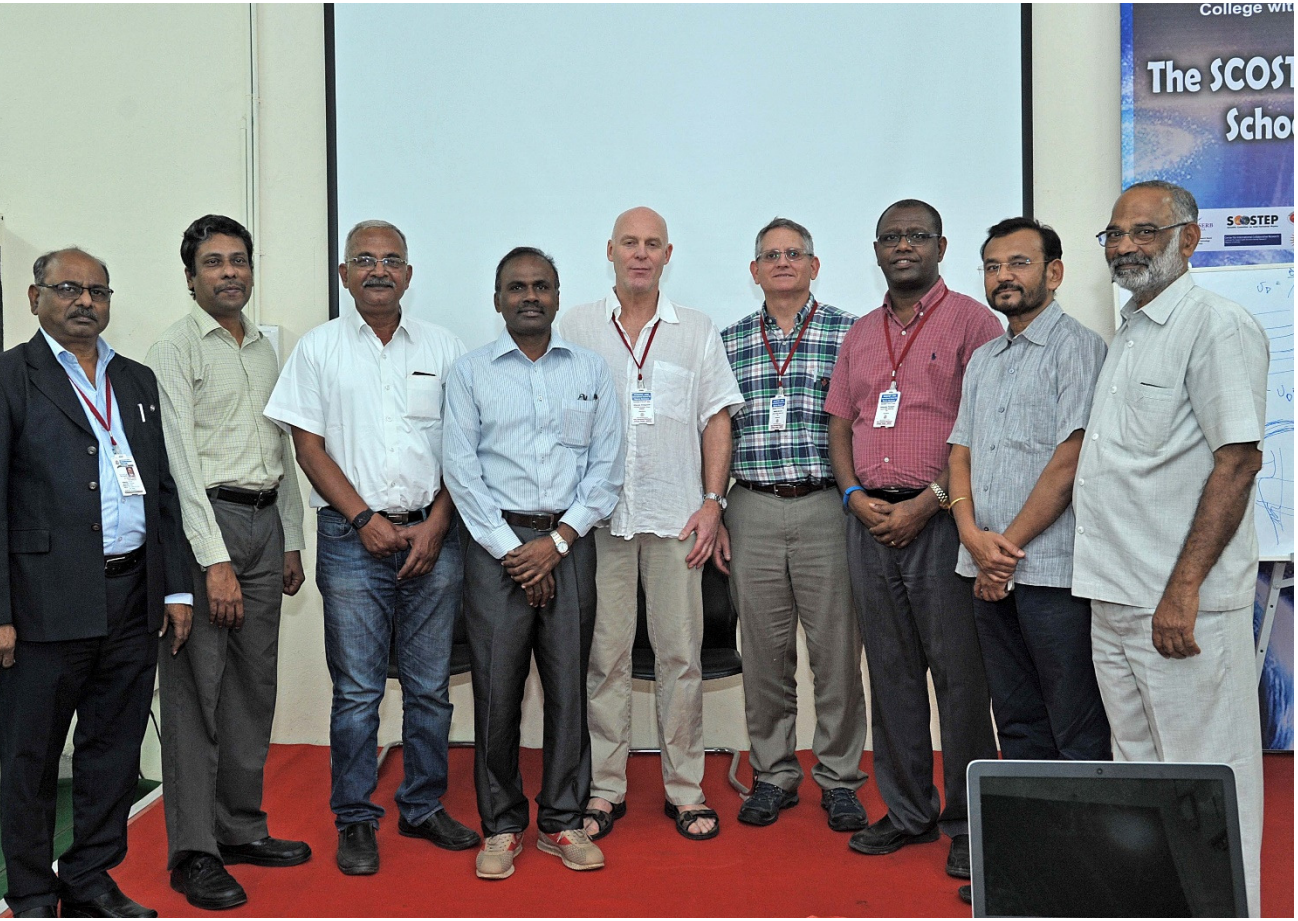
truments to observe space weather from ground were deployed and demonstrated during the school

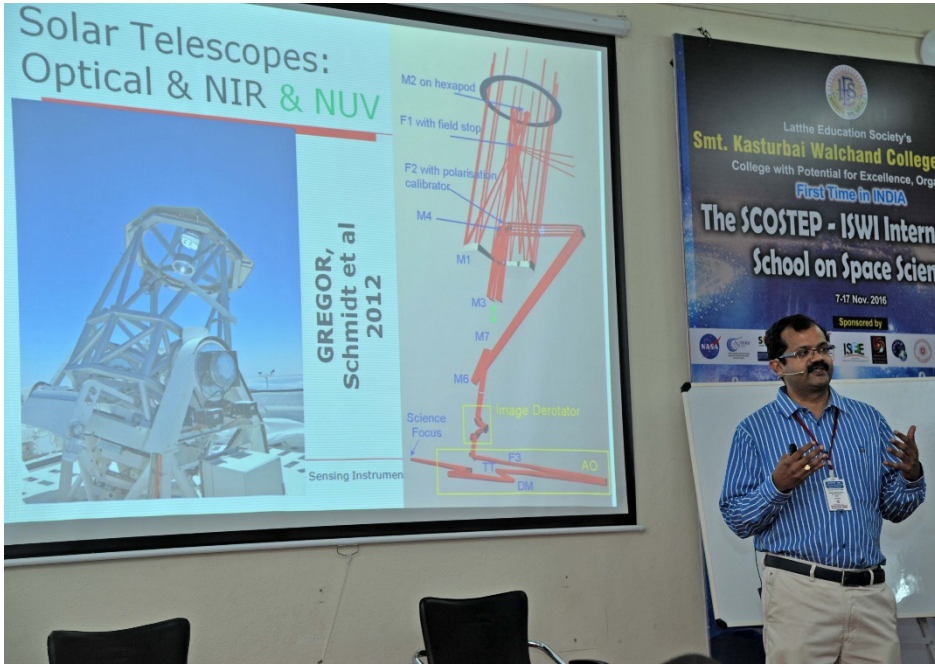

Evolution of GPS Receivers
from 10 Kg to 100 g, 100 watts to 1 watt, $ 100k to $ 100
Early 1980s
2005
13
The SCOSTEP
School on


Outline
From C. Mitchell, Univ of Ba
Motivation: Impacts on Space-based RF Systems
SCINDA Sensors and Model
Considerations for installing SCINDA
Lessons Learned by an Instrument Provider
Summary
Equatorial scintillation
encompassing many
Sch


King Saud Univ has very wide
The department of physics and astronomy has
astronomical domes.
Department of Physics and Astronomy
Saud Univ.
adh city
Two astronomical domes
The SC


AWESOME is Ideal for IHY/ISWI
Scientific Value
Low-Cost
Designed and developed at Stanford
$3000 average cost
Cosmic Gamma Rays
Lightning Strikes
Earthquakes
Solar flares
Dynamic Range
Time Resolution
Narrowband Data
Broadband 100kHz Data
Portable
Auto-calibration
Remotely deployed
Easy-to-Use
Cutting-Edg
November 14, 2016
College with Potential
First Tim
The SCOSTEP - I
School on S
7-17


SCOSTEP


Solar Telescopes:
Optical & NIR & NUV
GREGOR,
Schmidt et al
2012
M2 on hexapod
F1 with field stop
F2 with polarisation calibrator
M4
M1
M3
M7
M6
Image Derotator
Science Focus
F3
TT
AO
DM
Sensing Instrumen
Latthe Education Society's
Smt. Kasturbai Walchand College
College with Potential for Excellence, Orga
First Time in INDIA
The SCOSTEP - ISWI Intern
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Instrument workshop: CALLISTO

nna installed in the premises of the host college

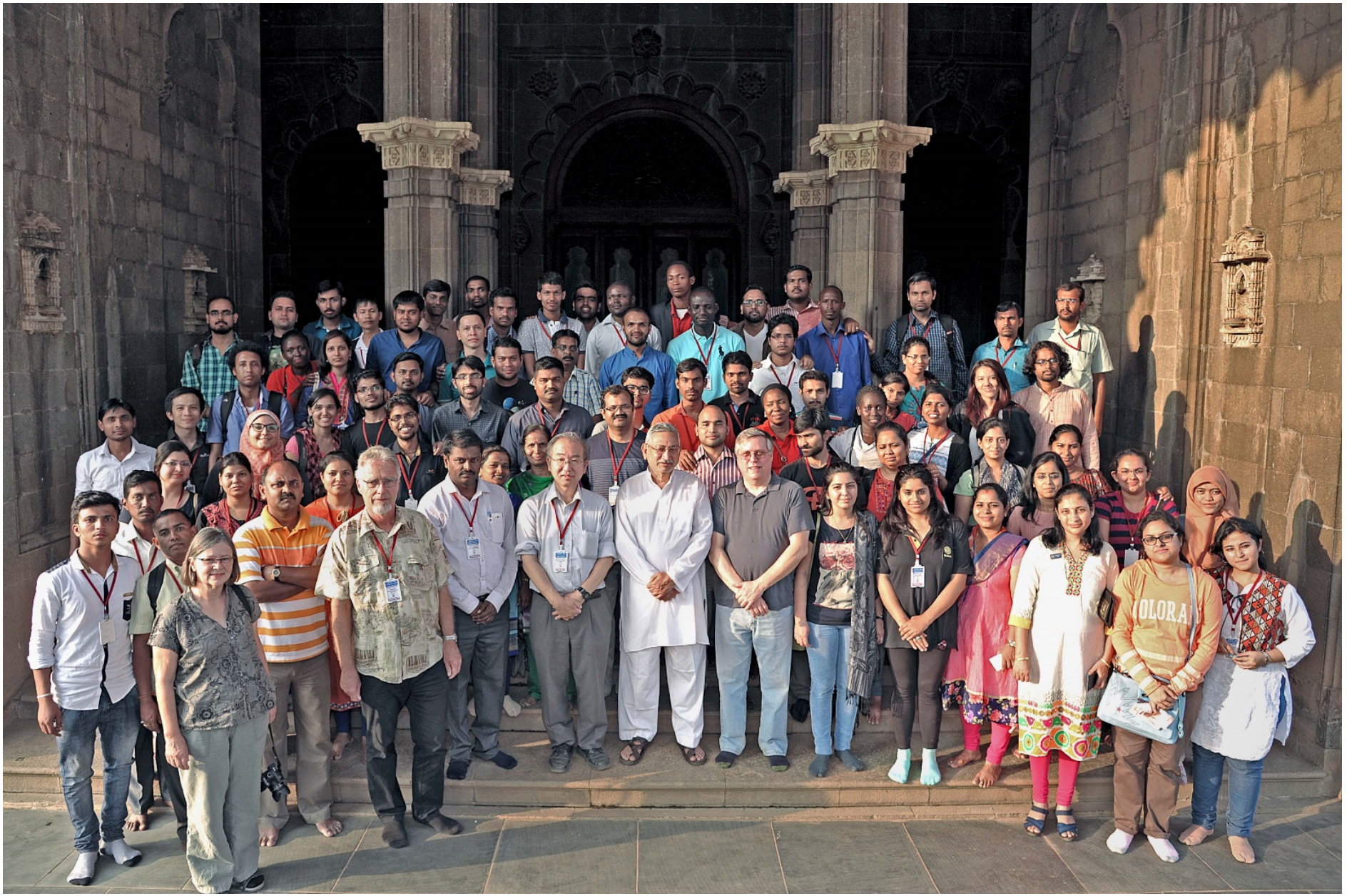
C. Monstein (PI) and D. Shetti (host) in the CALLISTO Contro

Cultural Program on the evening of Nov 16

by a Sangli dance professional

and by a school participant

A percussion battle…



During the field trip on Nov 13, 2016, the school participants were greeted by the Maharaja of Kolhapur, H. H. Shahu II Chhatrapati (center in white)

Members of the LOC

Thanks to the LOC chair during the valedictory function

Participants Providing Feedback

Outreach Activities

- M. Guhathakurta, M. Kirk, M. Miesch, and S. Kanekal interacted with high school students from A. B. Patil High School on November 10, 2016
- N. Gopalswamy, K. Groves, P. K. Manoharan, and N. Ostgaard participated in a question-answer session with about 100 science students from local high schools

Feedback

- Every lecture was very informative and the exercises gave a practical feel to the subject … Sayani Ghosh
- International school on space science is one of the best schools I ever attended. Lectures covered almost all area of space science, that I could feel that a gradual progress in the lectures. The exercise session gave me the real happiness to be a researcher and work together in a group. … Ashna VM
- It was a experience of a lifetime attending a school for the first time. It gave me lots of new friends in my field from India as well as all over the world. … Subir Mandal