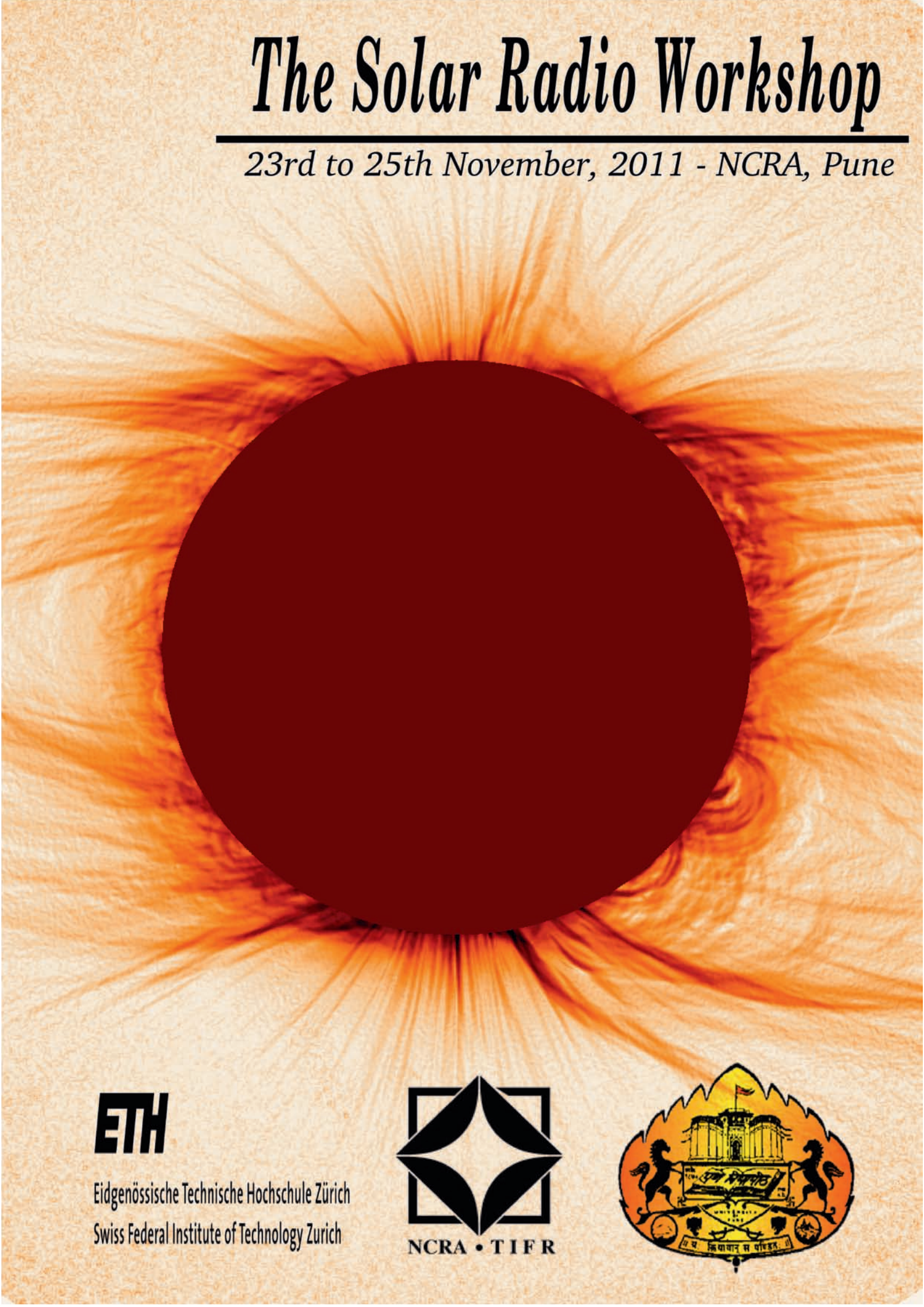
The Solar Radio Workshop

23rd to 25th November, 2011 - NCRA, Pune



ETH

Eidgenössische Technische Hochschule Zürich

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NCRA • TIFR


23rd November, 2011

10:10 - 10 :35
P.K.Manoharan
National Centre for Radio Astrophysics

Radio observations, combined with the groundbased optical observations and spacebased data can provide a crossreferenced analysis of solar phenomena and eruptive events and make a powerful technique to study energy release and electron acceleration processes in solar flares and coronal mass ejections (CMEs). This talk will review the current understanding of the entire solar atmosphere – from the photosphere to the corona, and out into the solar wind. We discuss some of the open questions that remain to be answered in order to make significant progress in understanding the chain of events starting at the Sun that lead to severe space weather impacts at near-Earth space.

10:35 - 11:00
S.Ananthakrishnan
University of Pune

Sun has been extensively studied across the entire electromagnetic spectrum. In this talk, we will introduce you to this exciting world of solar research and briefly touch upon instruments (like telescopes, satellites, antenna dishes, etc.) which have been used for the study of the Sun at various wavelengths. These will include both ground based and space based instruments. Being a radio workshop, our emphasis will be on radio instruments.

11:00 - 11:20
Tea Break

11:20 - 12:00
Christian Monstein
ETH Zurich
CALLISTO and the e-CALLISTO network

The solar radio spectrometer, Callisto and the network e-Callisto, is presented. It is a frequency-agile receiver based on commercially available consumer electronics. Its major characteristic is the low price for hardware and software, and the short assembly time, two or more orders of magnitude below existing spectrometers. The instrument is sensitive at the physical limit and extremely robust and stable. The total bandwidth is 45 MHz up to 870 MHz, and the radiometric width of individual channels is 300 kHz. A total of up to 800 measurements can be made per second with 1 msec integration time. The output of the spectrometer is stored in FIT-files, one per 15 minutes of observation. The spectrometer is well suited for solar low-frequency radio observations pertinent for space weather research or radio monitoring. 55 instruments of the type were constructed until now and put into operation at more than 20 sites, distributed over the whole planet. Several copies of Callisto are intended to put into operation in view of IHY and ISWI. Antenna setup and first results in the 45 – 870 MHz range are presented. Some of them were already recorded in a preliminary setup during the time of high solar activity in October and November 2003.
Preliminary results of recent base band measurements made at different stations

will be presented and discussed.

12:00 - 12:25
R. Ramesh
Indian Institute of Astrophysics
Solar Radio Physics from the IIA Gauribidanur Radio-Heliograph

The Indian Institute of Astrophysics operates a low frequency radioheliograph (30-120 MHz) at the Gauribidanur observatory near Bangalore since 1997. The instrument is dedicated for observations of the solar corona. Recently a radio spectrograph, and an interference radio polarimeter has also been commissioned in the above frequency range to get respectively the dynamic spectrum of the radio emission associated with the transient disturbances on the Sun, and information on the associated magnetic field. I will discuss the features of the above instruments and how the results obtained till date have been useful in our understanding of the solar corona.

12:25 - 12:50
Hari Om Vats
Physical Research Laboratory
Estimation of solar rotation

This talk will provide an overview of the methods to estimate solar rotation. The presentation will briefly review three schemes for solar rotation and their relative merits and difficulties. Some of our recent results by flux modulation method would be discussed.


24th November, 2011

9:30 - 10:10
Nat Gopalaswamy
NASA Goddard Space Flight Center
Recent Results on Solar Eruptions

Solar eruptions can seriously affect Earth's space environment and serve as a tool to understand the physical processes in the solar atmosphere and interplanetary plasma. Since the early 1990s, there have been enormous progress in the study of solar eruptions owing to the availability of data from space and ground based instruments and scientific programs run by government agencies. Of particular importance are solar flares and coronal mass ejections (CMEs), which directly contribute to adverse space weather. Energetic particles accelerated by CMEs and enhanced electromagnetic emission from flares can suddenly change the ionization level in the ionosphere, leading to a number of problems in radio communication and navigation. CMEs arriving at Earth's magnetosphere can produce large geomagnetic storms that lead to a multitude of disturbances in geospace. Solar radio bursts are closely associated with solar eruptions, and hence provide instantaneous information on eruptions. Of particular interest are type II and type IV radio bursts, which are closely related to CMEs. Type II bursts are produced by CME-driven shocks, while the type IV bursts are produced by nonthermal electrons accelerated at the flare reconnection region. In this talk I present some of the recent results obtained by combining space and ground based observations at different wavelengths.

10:10 - 10:35
Prasad Subramanian
IISER
The turbulent solar wind: a brief overview, with emphasis on radio wavelengths

The solar wind, whose existence was predicted by Parker before its discovery remains an enigma to this day. It holds clues to several fundamental issues in physics: the nature of transport processes and disspation in collisionless plasmas, the spectrum of turbulence in nearly incompressible media, and many others. Since we are immersed in the solar wind, transients in the solar wind are also of great practical importance to us. We will briefly review salient features of the solar wind and present interpretations and conclusions that have been arrived at primarily via observations at radio wavelengths.

10:35 - 11:00
Ashok Ambastha
Physical Research Laboratories
Solar physics in Optical Wavelengths

The outer layers of solar atmosphere, from the photosphere to the outermost Corona, reveal spatially highly structured and temporally variable and active faces of the Sun at all scales. A wide variety of dynamic features can be observed even during the relatively quiet phases of the Sun in optical wavelengths using modest aperture solar telescopes. Sun's magnetic field, combined with differential solar rotation, is the key factor governing these structures and to bring variability

and solar activity at widely ranging temporal and spatial scales. Although driven by the physical processes operating in the interior of the Sun, much of the most fascinating energetic, explosive phenomena occur in the optically observable outer layers as a result of the complex interplay of magnetic and velocity fields of solar plasma. Therefore, magnetic and velocity measurements at high spatial and temporal resolution are essential ingredients for understanding processes of energy storage and release in the form of catastrophic events, such as, solar flares and coronal mass ejections (CMEs). These phenomena occur in time-scales ranging from a few seconds to several hours. At longer scales, the most notable is the solar activity cycle of 11 years, or magnetic cycle of 22 years. In this talk, we will discuss the techniques employed in these measurements at the optically visible solar photosphere and to some extent, the chromosphere. We shall present an account of the importance of magnetic and velocity field measurements, and the recent observational and theoretical developments in related areas of solar physics.

11:00 - 11:30
Tea Break

11:30 - 11:55
P.Janardhan
Physical Research Laboratory
A brief overview of solar magnetic fields and the unusual solar cycle 23

Detailed studies of solar magnetic features is an important area of research not only for its intrinsic interest, but also because solar magnetic fields have a profound and far-reaching influence on the Earth’s near-space environment. With society’s increased dependence on space-based technology, much of which is at risk due to solar activity that waxes and wanes with the sunspot cycle, it is imperative that we understand the solar magnetic cycle and its effects on the near-space environment. In addition, due to the reported anthropogenic influence on climate change that has occurred in recent times, it is becoming increasingly important to distinguish and delineate the degree to which the solar cycle can affect terrestrial climate. In this talk I will give a brief overview about the origin of solar magnetic fields and touch upon some recent findings of a steep and unusual decline in solar magnetic fields at the end of solar cycle 23.

11:55 - 12:20
Alejandro Lara
Solar Radio Observatory, Mexico
The Solar Radio Observatory at Mexico

The Solar Radio Observatory in Mexico City have 7 projects in different status, from the initial design up to fully operating telescopes. Most of these are comparatively low cost projects which can be easily developed.
We present the projects, their status and the solar physics problems that may be addressed with these telescopes.


25th November, 2011

9:30 - 9:55
Wahab Uddin
ARIES
Multi-wavelength Study of Solar Flares

Solar flares are one of the most energetic and dynamic phenomena in the solar atmosphere. Here in the present talk we would like to describe the origin and evolution of solar flares in different wavelengths. Flares generally occur in the complex active regions in which magnetic field gradient and shearing are very high. The large amount of free magnetic energy stored in the highly sheared magnetic field released during solar flares due to magnetic reconnection. Major flares are generally associated with many dynamic phenomena i.e. filament/prominences eruptions, coronal mass ejections (CMEs), strong radio bursts, particle accelerations and geomagnetic storms.
Here we also present the ground based H-alpha observations of solar flares observed at ARIES and space based observation in different wavelengths to understand the energy build up and energy release processes.

9:55 - 10:20
Bhuwan Joshi
Physical Research Laboratory
Solar flares: A multi-wavelength perspective

Solar flares are characterized by the sudden release of excess energy stored in the magnetic fields of solar corona. The modern multi-wavelength observations have immensely improved our understanding of the various physical processes occurring in different atmospheric layers of the Sun during a solar flare. The standard flare model has been successful in broadly recognizing these physical processes as the consequence of large-scale magnetic reconnection in the corona.
The objective of the present talk is to summarize the multi-wavelength observations of solar flares taken from various ground based and space borne instruments. We will particularly highlight the new results on the emission from the flaring coronal loops. We will further compare these new observations with present theoretical interpretations in order to discuss the scopes and challenges for future investigations.

10:20 - 10:45
Janaka Adassuriya
Arthur C Clarke Institute
Determination of the Solar Radius based on the Annular Solar Eclipse of 15 January 2010

A determination of the solar radius was made based on the observations of Baily’s beads carried out on the southern limit of the annular solar eclipse on 15 January, 2010 from Sri Lanka. A positive correction of $\Delta R=0.260.18$ arcsec was found with respect to the standard solar radius, R, of 959.63 arcsec. The values of ΔR from the past observations were analyzed with the phase of the solar activity and found that the magnitude of ΔR is maximum at low active phases while it was minimum at high active phases.

11:00 - 11:30
Tea Break

11:30 - 11:55
Durgesh Tripathi
IUCAA
EUV spectroscopy of solar transition region and corona

Since its discovery in the 1940s, the problem of solar coronal heating has been one of the most intensively studied problems in solar physics. However, the answer to this problem remains elusive. Magnetically dominated solar plasma consists of a variety of structures, such as active regions, coronal loops, X-ray bright points and coronal holes etc. The physics of all kind of coronal structures, therefore, holds the key to understanding coronal heating and the flow of mass and energy in the region. Despite extensive work on the development of theoretical modelling, the energy source, structure maintenance and mass balance in the coronal loops are not yet fully understood. The ultimate solution of this problem requires precise measurements of physical plasma parameters such as flows, electron temperature, density and filling factors in spatially resolved coronal structures. In this talk, I would discuss some of the techniques to measure basic plasma parameters using EVU spectroscopy and discuss the challenges. I will also show some of the results obtained using the EUV Imaging Spectrometer aboard Hinode spacecraft.

11:55 - 12:20
Rajmal Jain
Physical Research Laboratory
X-ray and Radio Emission from Solar Explosions

I begin with the introduction to solar explosions viz. flares and CMEs and their emission on the electromagnetic spectrum. Active region and flare classification schemes are presented. I also briefly describe the radiation mechanisms. I present observations of flares/ CMEs to demonstrate the emission arriving at different wavelengths. In this context I demonstrate the observations from space borne and ground-based instruments to describe the X-ray and radio wave band emission from the solar flares and CMEs, and their phenomenology and properties. I briefly describe the India’s first space borne solar astronomy experiment “Solar X-ray Spectrometer (SOXS)”: instrument, observations and analysis techniques. I discuss specifically the X-ray and radio emission from a few flares and CMEs observed by SOXS. Talk will be concluded with the important questions to be addressed in future.