Second Remote Sensing of the Inner Heliosphere Workshop

Report of Contributions

https://indico.cern.ch/e/126297

Contribution ID: **1** Type: **not specified**

Workshop Opening

A brief introduction to Aberystwyth and to the workshop.

Primary author: Dr BISI, Mario M. (Center for Astrophysics and Space Sciences, University of California, San Diego, 9500 Gilman Drive #0424, La Jolla, CA 92093-0424 USA / Institute of Mathematics and Physics, Aberystwyth University, Penglais Campus, Aberystwyth, Ceredigion, SY23 3BZ, Wales, UK)

Presenter: Dr BISI, Mario M. (Center for Astrophysics and Space Sciences, University of California, San Diego, 9500 Gilman Drive #0424, La Jolla, CA 92093-0424 USA / Institute of Mathematics and Physics, Aberystwyth University, Penglais Campus, Aberystwyth, Ceredigion, SY23 3BZ, Wales, UK)

Contribution ID: **2** Type: **not specified**

IPS and 3-D Tomographic Reconstructions

General contributions throughout the workshop as and when necessary including brief updates on the UCSD tomography routines, use of EISCAT/ESR/MERLIN/LOFAR for observations of IPS, future aspirations for obersations of IPS, and other relevant topics of discussion.

Primary author: Dr BISI, Mario M. (Center for Astrophysics and Space Sciences, University of California, San Diego, 9500 Gilman Drive #0424, La Jolla, CA 92093-0424 USA / Institute of Mathematics and Physics, Aberystwyth University, Penglais Campus, Aberystwyth, Ceredigion, SY23 3BZ, Wales, UK)

Presenter: Dr BISI, Mario M. (Center for Astrophysics and Space Sciences, University of California, San Diego, 9500 Gilman Drive #0424, La Jolla, CA 92093-0424 USA / Institute of Mathematics and Physics, Aberystwyth University, Penglais Campus, Aberystwyth, Ceredigion, SY23 3BZ, Wales, UK)

Contribution ID: **5** Type: **not specified**

Interplanetary Scintillation Measurements with LOFAR: Progress so far

The LOw Frequency ARray (LOFAR) is a new array of radio telescopes centred on the Netherlands with additional stations across Europe. Designed to operate at frequencies from 10 to 250MHz, it is one of a new generation of "software telescopes". Currently, it is in the latter stages of the commissioning phase and a wide variety of scientific experiments are in testing mode. Measurement of interplanetary scintillation (IPS) with this system should be a relatively straightforward mode to implement, but challenges are posed by the rate of data collected and the radio environment in which LOFAR sits. This paper will give a brief overview of the LOFAR and describe the current stage of development of the IPS mode of operation.

Primary author: Dr FALLOWS, Richard (Aberystwyth University)

Presenter: Dr FALLOWS, Richard (Aberystwyth University)

Contribution ID: **6** Type: **not specified**

IPS as a space weather tool: lessons-learned and thoughts for the future

Interplanetary scintillation (IPS) is one of several techniques that can track density structures propagating out from the Sun. Thus it is potentially an important space weather activity that can help to predict the onset of geomagnetic storms. That potential was recognized over twenty years ago, when a joint UK-US project sought to use the Cambridge IPS array to develop an operational system for space weather. However, the results of that project proved disappointing. This paper will (a) review the limitations that made those results so disappointing, (b) demonstrate there are many ways in which they could be overcome in a future IPS system, and (c) argue that it is timely to re-visit the use of IPS as an operational tool for space weather monitoring. The overall aim to promote discussion on how IPS should fit into the growing toolset for tracking CMEs and other solar ejecta. That tracking is one of the most critical contemporary challenges in the development of space weather service.

Primary author: Prof. HAPGOOD, Mike (RAL Space)

Presenter: Prof. HAPGOOD, Mike (RAL Space)

Contribution ID: **7** Type: **not specified**

Tracking heliospheric transients –paths towards space weather services

This paper will explore at a conceptual level how the tracking of heliospheric transients (coronal mass ejections and co-rotating interaction regions) can lead to novel space weather services that can mitigate impacts on power grids, satellite navigation and timing systems, HF radio communications and spacecraft. The aim is to go beyond the usual bland statements about space weather impacts from heliospheric research –and look at the complex chain of physics that links the solar wind to space weather environments in Earth's radiation belts, plasmasphere, ionosphere, atmosphere, oceans and lithosphere. An awareness of this chain is critical to the practical exploitation of our growing ability to track heliospheric transients and can help us identify critical issues for future work. The paper will show that two kinds of alerts are feasible in the short- and medium-term: (a) Amber alerts –linked to the predicted time of arrival of a transient at Earth and raising awareness that the risk level is increased, but not yielding details specific to particular applications; and (b) Indices –predictions of key solar-terrestrial indices, providing statistical estimates of future risk levels linked to space weather environmental parameters that are directly relevant to particular applications. We will also show that more sophisticated services will be possible in the long-term, but these are dependent on advances in space weather modeling.

Primary author: Prof. HAPGOOD, Mike (RAL Space)

Presenter: Prof. HAPGOOD, Mike (RAL Space)

Contribution ID: **8** Type: **not specified**

The events of 1-4 August 2010: An overview

August 2010 saw the first major activity of the new cycle. SDO observations of a complex series of events over an extended region of the solar atmosphere heralded the onset of a uniquely complete dataset of observations from many spacecraft, tracing multiple CME events from Sun to Earth and recording the impacts at the Earth. Central to this were the STEREO observations from out of the Sun-Earth line. An international collaboration has held two workshops to coordinate the analysis of these events and the first papers are being produced as we exploit this unprecedented dataset. Here, we provide an overview of the analysis and results of this activity.

Primary author: Prof. HARRISON, Richard (RAL)

Presenter: Prof. HARRISON, Richard (RAL)

Contribution ID: **9** Type: **not specified**

UCSD Time-Dependent Tomographic Forecasting with White Light and Interplanetary Scintillation Observations

The University of California, San Diego (UCSD) time-dependent tomography program has been used successfully since the beginning of the year 2000 to remotely sense and forecast interplanetary scintillation (IPS) observations of coronal mass ejections. More recently this program has been adapted to provide forecasts of heliospheric density using Thomson-scattered data from the Solar Mass Ejection Imager (SMEI). Here we describe the current state of the IPS and SMEI real-time data pipelines. We describe the speed improvements for obtaining the nearly 10,000 lines of sight per SMEI orbit and the improved accuracy of the remote-sensing fit with the inclusion of space-borne in-situ density and velocity measurements.

Primary author: CLOVER, John (CASS/UCSD)

Co-authors: Dr BUFFINGTON, Andrew (CASS/UCSD); Dr JACKSON, Bernard (CASS/UCSD); LINFORD, John (CASS/UCSD); Dr HICK, P. Paul (UC San Diego)

Presenter: CLOVER, John (CASS/UCSD)

Contribution ID: **10** Type: **not specified**

Variation of Global Solar Wind Structure Observed with STELab-IPS

Interplanetary scintillation (IPS) is a phenomenon that is unique and allows one to measure solar wind velocities over a wide spatial range of interplanetary space where in-situ measurements are impossible or difficult. We have been observing the solar wind velocity structure using a multi-station IPS facility (327 MHz) at Solar-Terrestrial Environment Laboratory in Japan (STELab-IPS) since early 1980's. The IPS pattern contains the information of solar wind velocities and density fluctuations passing across a line-of-sight from an observer to a radio source. We determine solar wind velocity structures by employing computer assisted tomography (CAT) to reduce the line-of-sight integration effect which degrades the determination accuracy of the solar wind structure.
In this presentation we focus on the variation of global solar wind structure from 1985 to 2009. The STELab-IPS clearly detects variations of bimodal structure, N-S asymmetry, and differences between solar cycles. We compare the solar wind structure and in situ measurements (WIND, ACE and Ulysses) to check the reliability of our observations. Furthermore solar wind velocity maps are converted to density, massloss and dynamic pressure maps by using relationship between solar wind velocity and density obtained by fitting solar wind data of NSSDC OMNI web database. We also discuss long-term trend of heliosphere expected from our IPS observations.

Primary author: Dr FUJIKI, Kenichi (STELab., Nagoya Univ.)

Co-authors: Prof. KOJIMA, Masayoshi (STELab., Nagoya Univ.); Prof. TOKUMARU, Munetoshi (STELab., Nagoya Univ.)

Presenter: Dr FUJIKI, Kenichi (STELab., Nagoya Univ.)

Contribution ID: **11** Type: **not specified**

IBEX remote sensing of the heliospheric interface and beyond and multi-technique remote-sensing observations of solar wind

In the first portion of the talk, given on behalf of the IBEX Science Team, we will present observations of Energetic Neutral Atoms from the heliospheric interface region and beyond performed by the Interstellar Boundary Explorer (IBEX) spacecraft. In addition to the expected signal from the heliospheric interface, IBEX discovered an arc-like, persistent Ribbon of enhanced ENA emissiona in all energy bands of the IBEX Hi and overlapping bands of the IBEX-Lo detectors. This discovery was followed by a handful of hypotheses on the origin of the Ribbon, none of which has finally been widely accepted.

IBEX observations of the remote regions of the heliosphere can only be interpreted and understood when modifications of the ENA signal underway from the origin to the detector that must be occurring within the supersonic solar wind are undertstood and taken into account. To that end, we used remote sensing observations of the heliospheric Lyman-alpha glow from SWAN/SOHO, remote-sensing IPS observations of solar wind speed from STELAB, and in-situ observations of solar wind from Wind, ACE, and Ulysses as well as 1 AU observations of solar EUV radiation to reproduce the evolution of solar wind density and velocity in time and heliolatitude for the 2 past solar cycles. This will be presented in the second portion of the talk.

Primary authors: Ms SOKÓŁ, Justyna M. (Space Research Centre PAS); Dr BZOWSKI, Maciej (Space Research Centre PAS)

Co-authors: Dr MCCOMAS, David J. (SouthwestResearch Institute); Dr QUEMERAIS, Eric (LATMOS/IPSL); Dr BOCHSLER, Peter (Bern Ubiversity); Dr LALLEMENT, Rosine (LATMOS/IPSL); Dr FERRON, Stephane (LATMOS/IPSL)

Presenters: Ms SOKÓŁ, Justyna M. (Space Research Centre PAS); Dr BZOWSKI, Maciej (Space Research Centre PAS)

Contribution ID: **12** Type: **not specified**

A Self-Similar Expansion Model for use in Solar Transient Propagation Studies

Since the launch of the STEREO spacecraft, a plethora of techniques have been developed to investigate the three-dimensional kinematics of solar transients, such as Coronal Mass Ejections (CMEs), from their signatures in imaging observations. These techniques, which range from the highly complex and computationally intensive forward modelling method to methods based on simple curve fitting, all have their inherent advantages and drawbacks. Much use, both for the analysis of single and dual spacecraft observations, has been made of the so-called fixed phi (FP) and harmonic mean (HM) models of solar transient geometry, which consider the transient to be a radially-propagating point source and a radially-expanding sphere anchored at Sun-centre, respectively. Initially, we compare the velocity and propagation direction results derived from the use of these two models in the analysis of a large set of single spacecraft solar transient observations from the STEREO/Heliospheric Imager (HI) instruments. As these two models clearly constitute extreme descriptions of solar transients in terms of their line-of-sight extent, we define a model with a more generalised geometry (based on self similar expansion, SSE) for which the FP and HM models form the limiting cases. In addition to providing estimates of transient propagation direction and velocity from the HI observations, this model potentially enables us to estimate the transient extent in the plane perpendicular to the viewing plane. Using Monte-Carlo simulations we endeavour to identify the regimes over which use of this model could be expected to provide reliable results.

Primary author: DAVIES, Jackie (RAL Space)

Co-authors: DAVIS, Chris (RAL Space & University of Reading, UK); PERRY, Chris (RAL Space, UK); MOESTL, Christian (University of Graz & Austrian Academy of Sciences, Austria); TEMMER, Manuela (University of Graz & Austrian Academy of Sciences, Austria); HARRISON, Richard (RAL Space, UK); CROTHERS, Steve (RAL Space,UK); ROLLETT, Tanya (University of Graz & Austrian Academy of Sciences, Austria)

Presenter: DAVIES, Jackie (RAL Space)

Contribution ID: **13** Type: **not specified**

MEXART observations of IPS: updates since the May 2009 workshop

The Mexican Array Radio Telescope (MEXART) consists of a 64x64 (4096) full-wavelength dipole antenna array, operating at 140 MHz, with a bandwidth of 2 MHz, occupying about 9,660 square meters (69m x 140m) (http://www.mexart.unam.mx). This is a dedicated radio array for Interplanetary Scintillation (IPS) observations located at: latitude 19 degrees 48' N, longitude 101 degrees 41' W. We describe the technical characteristics of the instrument. We report the current configuration of the array and the observations and data analysis that we perform on daily basis. We present an updated list of strong IPS radio sources detected by the instrument. We report the power spectral analysis procedure of the intensity fluctuations.

Primary author: Dr GONZALEZ-ESPARZA, Americo (MEXART, UNAM)

Co-authors: Dr AGUILAR-RODRIGUEZ, Ernesto (MEXART, UNAM); Mr MEJÍA-AMBRÍZ, Julio (MEXART, UNAM); Mr VILLANUEVA-HERNÁNDEZ, Pablo (MEXART, UNAM)

Presenter: Dr GONZALEZ-ESPARZA, Americo (MEXART, UNAM)

Contribution ID: **14** Type: **not specified**

Calibration of the solar wind velocity fitting model for MEXART observations.

The Mexican Array Radio Telescope (MEXART) is a transit station to perform IPS observations at 140 MHz. The antenna is a matricial array of dipoles covering a collecting area of about 10,000 square meters. Previously, we reported the first MEXART IPS observations (Mejia, et al. 2010) employing a quarter of the total array. At this moment we are performing observations with an half of the total area. The technique to perform the power spectral analysis of the intensity fluctuations of IPS radio sources is based on the one developed at ORT (Rao, Bhandari, and Ananthakrishnan, 1974; Manoharan, 1991; Oberoi, 2000). We report power spectra analysis for some IPS radio sources observed in the actual ascending phase of solar activity. We discuss the determination of solar wind velocities applying a fitting model (Manoharan and Ananthakrishnan, 1990) to the power spectra adapted to MEXART observations. We show the scintillation index variation for some radio sources during the solar minimum period of 2009-2010.

Primary author: Mr MEJIA-AMBRIZ, julio Cesar (MEXART, UNAM)

Co-authors: Dr AGUILAR-RODRIGUEZ, Ernesto (MEXART, UNAM); Dr GONZALEZ-ESPARZA, Juan Americo (MEXART, UNAM); Mr VILLANUEVA-HERNANDEZ, Pablo (MEXART, UNAM)

Presenter: Mr MEJIA-AMBRIZ, julio Cesar (MEXART, UNAM)

Contribution ID: **15** Type: **not specified**

Multi-spacecraft observations of Type II radio emission during July-August 2011

Interplanetary Type II radio burst radiation results from the excitation of plasma waves in the ambient medium by a coronal mass ejection (CME) driven shock, propagating outward from the Sun. Hence, these radio emissions provide a means of remotely tracking CME/shocks. The aim of this work is to present an analysis on the Type II radio bursts observed by Wind/WAVES and STEREO/SWAVES radio instruments during July-August 2011 in order to link these remote-sensing observations of the inner heliosphere with those closer-in to the Sun as well as with in-situ measurements, and investigate further the ways in which these data sets all complement each other to track CME/shocks that move outward from the Sun to 1 AU.

Primary author: AGUILAR-RODRIGUEZ, Ernesto (Instituto de Geofisica, UNAM)

Co-author: GONZALEZ-ESPARZA, Americo (Instituto de Geofisica, UNAM)

Presenter: AGUILAR-RODRIGUEZ, Ernesto (Instituto de Geofisica, UNAM)

Contribution ID: **16** Type: **not specified**

Results of the 2009 MESSENGER Faraday Rotation Experiment

On November 9, 2009, during the longest solar minimum in a century, the MESSENGER spacecraft en route to Mercury was in superior conjunction allowing the acquisition of Faraday rotation measurements. At 1.66 solar radii (456 Mm from the surface) on November 8th, MESSENGER's 8GHz radio frequency signal was absorbed. The observations taken on November 8th, 10th, and 11th show a 5 minute periodicity as well as other fluctuations and a strong rotation across a thin magnetic field structure.

MESSENGERs radio frequency signal was acquired by the Green Bank Telescope with its spectral processor and J.L. Margot's RADAR instruments. Most of the spectral processor data were lost; however, the RADAR instrument performed nominally recording the raw radio frequency samples of the incoming signal. Direct comparison of the raw radio frequency plane of polarization calculations to the spectral processor measurements shows that the technique described in Jensen and Russell (2007) generates the same average plane of polarization but with a larger variance.

Modeling of the sources of error contributing to the variance in the Jensen and Russell (2007) plane of polarization calculations show a weak dependence on signal noise, a significant dependence on frequency scintillation, and a strong dependence on the Alfven wave frequency of magnetic field rotations relative to the 100 second integration time of each plane of polarization calculation.

We will discuss the Jensen and Russell (2007) technique relative to the estimation of error, the presence of magnetic field fluctuations with/without electron density fluctuations, the variation of the fluctuation spectrum relative to solar maximum in 2002, and the potential candidates for the strong rotation coronal structure observed on the 10th.

Primary author: Dr JENSEN, Elizabeth (Planetary Science Institute)

Co-author: Dr VILAS, Faith (Planetary Science Institute)

Presenter: Dr JENSEN, Elizabeth (Planetary Science Institute)

Contribution ID: **17** Type: **not specified**

Determining CME Properties from Remote-Sensing White-Light Observations

In this talk, I will review different methods to determine a CME direction and velocity from single and multiple spacecraft remote-sensing observations. I will discuss why the assumptions of constant speed and directions and very narrow CMEs have been successful so far and why this may change in the near future as the STEREO spacecraft move farther apart.
I will finally discuss the case of successive CMEs and why fitting methods and even J-maps can only be used with extreme caution in this case.

Primary author: LUGAZ, Noe (Institute for Astronomy)

Co-authors: MOESTL, Christian (University of Graz); ROUSSEV, Ilia (Institute for Astronomy); HERNANDEZ-CHARPAK, Jorge (Universidad de los Andes)

Presenter: LUGAZ, Noe (Institute for Astronomy)

Contribution ID: **18** Type: **not specified**

Multi-point in situ observations and flux rope modeling of the August 2-4 2010 ICMEs

A complex solar eruption occurred at the beginning of August 2010 releasing a disappearing filament and a halo CME on an Earthward trajectory from Region 1092. The first ICME arrived on August 3rd followed by a second stronger ICME on the 4th; both were traveling at approximately a factor of 2 greater than the surrounding solar wind. The CMEs triggered a G2-class geomagnetic storm.

We have performed multipoint in situ, non-force-free flux rope modeling of the series of ICME events occurring on August 2-4, 2010 as observed by the ACE, VEX, and STB spacecraft using the Mulligan and Russell (2001) method. We find the flux rope fits at VEX and STB result in right-handed structures while the ACE fit shows a sibling structure with the opposite handedness. This indicates the ICME observed at ACE is not the same structure as that observed by VEX and STB. Additionally, the rope at ACE is oriented with its axis at a high inclination to the ecliptic plane. The structure observed at both VEX and STB is oriented quasiparallel to the ecliptic plane, showing a slight bending along its axis between the two spacecraft.

We will discuss these results within the framework of comparing these in-situ fits with 3-D tomographic inversions of white light data and radio scintillation observations.

Primary author: Dr MULLIGAN, Tamitha (Aerospace Corporation)

Co-author: Dr JENSEN, Elizabeth (Planetary Science Institute)

Presenter: Dr JENSEN, Elizabeth (Planetary Science Institute)

Contribution ID: **19** Type: **not specified**

Pushchino: heliospheric-remote-sensing progress since the May 2009 workshop

Big Scanning Array of Lebedev Physical Institute (BSA LPI) Radiotelescope has operating frequency 111 MHz and two independent 16 beams systems, each of them covering strip of the sky of about 8o width in declination. Since 2006 one of the beams systems is used for IPS observations in monitoring regime. In the present state several hundred of scintillating radio sources is observed during 24 hours every day. Strong reference sources 3C 48 and 3C 298 are located in the used sky strip in summer and winter time correspondingly. IPS data processing modes including recent modifications are described briefly. Starting from 2009 new beams system containing 128 beams is designed and created. Expected width of sky strip will be about 64o. As a result, the number of scintillating sources observed daily will increase up to about one thousand.

Primary author: CHASHEY, Igor (Pushchino Radio Astronomy Observatory)

Presenter: CHASHEY, Igor (Pushchino Radio Astronomy Observatory)

Contribution ID: **20** Type: **not specified**

Global structure of the solar wind during the solar minimum and in the beginning of ascending phase as deduced from IPS observations

Since 2006 IPS observations are carried out using 16-beams Big Scanning Array of Lebedev Physical Institute in monitoring regime. All the sources with scintillating flux greater than 0.2 Jy are recorded daily at the frequency 111MHz during 24 hours in the sky strip of 8o width in declination. Methods of observations and data processing are briefly discussed. Results are presented showing the strong contribution to scintillation index from low latitude high plasma density region even in the case when the line of sight proximate point is located at mid-latitudes. We show that statistical ensemble of radio sources used in observations is sensitive to the distant low latitude plasma at low solar activity level. Dynamics of high density low latitude sheet is considered for the period 2006 –2011.

Primary author: TYUL'BASHEV, Sergei (Pushchino Radio Astronomy Observatory)

Presenter: TYUL'BASHEV, Sergei (Pushchino Radio Astronomy Observatory)

Contribution ID: **21** Type: **not specified**

"PERSEUS", a Pegasus Explorer for Remote SEnsing and in-sitU Space science

We present "PERSEUS", a Pegasus Explorer for Remote SEnsing and in-sitU Space science. PERSEUS instruments work together to provide all sky coverage that enables mapping and 3D reconstruction of the global heliosphere. A coronagraph (CRG) observes rapidly-changing material flow and events (CME's) near the solar surface while all-sky visible-light imagers (ASIs) observe light from these same solar wind flows and heliospheric structures as they pass through the inner solar system. The CRG fills the inner portion of the FOV 360° around the Sun, and the four-degree separation between ASI's two camera's views are placed so that the ecliptic plane is viewed completely out to the near-Earth vicinity. The views join near the ecliptic poles and overlap at elongations greater than 90°. The ASIs view heliospheric structures that pass Earth most efficiently near 90° elongation and greater allowing these structures to be reconstructed and compared with measurements from the two in-situ instruments that observe plasma and magnetic fields at the spacecraft.

Primary authors: Dr BUFFINGTON, Andrew (Center for Astrophysics and Space Sciences); Dr JACKSON, Bernard (Center for Astrophysics and Space Sciences); Dr BISI, Mario (Institute of Mathematics and Physics, Aberystwyth University, Penglais Campus)

Co-authors: Mr CLOVER, John (Center for Astrophysics and Space Sciences); Dr HICK, P. Paul (Center for Astrophysics and Space Sciences)

Presenter: Dr BISI, Mario (Institute of Mathematics and Physics, Aberystwyth University, Penglais Campus)

Contribution ID: **22** Type: **not specified**

Heliospheric Imaging - Data Processing and Future Plans

Heliospheric imaging has evolved considerably since the early days of SMEI in 2003. Progress has been made from two directions: improving the quality of the data themselves; and developing techniques to exploit the geometry and Thomson scattering physics. Through the former we have improved noise reduction and enabled the detection of smaller and fainter transients and through the latter we have the means to extract additional information about the structure, trajectory, and kinematic evolution of those transients. Both of the currently-functioning heliospheric imagers (SMEI and HI) have room to improve. We present images from a recent breakthrough in separation of the Thomson scattered light from the background in STEREO/HI-2 data, enabling analysis of detailed solar wind structure over 0.5 AU from the Sun and new results in understanding 3-D structure of CMEs and related events.

Despite these advances we are approaching the limit of the information we are able to extract from the current generation of heliospheric imagers. This is largely because of the quality of the datasets (e.g. SMEI is degraded by magnetospheric particles and hot pixels and the HIs are limited in their field of view and suffer motion blur). New instruments are required to take heliospheric imaging to the next level, where transient substructure and small-scale solar wind transients can be tracked and measured.

We will discuss the plan for a next-generation heliospheric imager that has been proposed to the NASA Explorer program. The Solar wind Anatomy and Dynamics Imaging Explorer (SADIE) is a constellation of five nanosat spacecraft that orbit the Earth with varying configuations to optimise cadence and spatial resolution at various times of the mission. The mission has been designed to be low-cost, higly redundant, and to be completed quickly in order to replace the current generation of heliospheric imagers before they have ceased or are no longer useful. Building on hardware and data analysis lessons, SADIE will yield large improvements in spatial resolution and sensitivity compared to existing imagers, enabling detailed understanding of variability and origin of both transient (CME) and “quiet” (slow solar wind) structures.

Primary authors: Dr DEFOREST, Craig (SWRI, Boulder, CO, USA); Dr HOWARD, Timothy (SWRI, Boulder, CO, USA)

Presenter: Dr HOWARD, Timothy (SWRI, Boulder, CO, USA)

Contribution ID: **23** Type: **not specified**

Quasi-perpendicular waves in the dissipation range of the solar wind turbulence

The solar wind electric and magnetic field data from Cluster spacecraft is analysed to investigate the behaviour of the turbulence dissipation range. The dependence of both electric and magnetic field power spectra on wave number k can be categorised as several power laws: at relatively low wave number, the power index is about -5/3 indicating a turbulence inertial range. Beyond an inertial break point where $k\rho \leq 1$ (ρ is proton gyro-radius), the power spectra become steeper and the subrange is often called turbulence dissipation (or dispersion) range. Eventually the spectra will flatten again at a second breakpoint. There is evidence that the electric field spectral power in the dissipation range is enhanced or not enhanced over the magnetic field spectral power at different observational time. We investigate the effect of the orientation of background magnetic field in the Geocentric Solar Elliptic coordinates and wave propagation on the observation of the turbulent electromagnetic field. Kinetic Alfven waves alone are generally unable to account for the spectra when the enhancement exists. Instead, quasi-perpendicular propagating fast magnetosonic waves are suggested to play a role in accounting for the enhancements.

Primary authors: Dr ALLEN, Loraine (Department of Science, U. S. Coast Guard Academy); Dr LI, Xing (IMAPS, Aberystwyth University)

Presenter: Dr LI, Xing (IMAPS, Aberystwyth University)

Contribution ID: **24** Type: **not specified**

The progress on EISCAT_3D and its aims/capabilities for heliospheric and space-weather science

This talk will cover the progress of EISCAT_3D development, its implementation, and also its capabilities for use in space weather and as a future remote-sensing instrument.

Primary author: Dr MCCREA, Ian (RAL Space)

Presenter: Dr MCCREA, Ian (RAL Space)

Contribution ID: **25** Type: **not specified**

Solar Physics Topical Issue: "Observations and Modelling of the Inner Heliosphere"- A Brief Overview

Observations and modelling of the solar wind in the inner heliosphere via remote-sensing methods and data are of a critical importance to improving our understanding of the physics behind the origin and development of the solar wind, transients, and the various interactions which take place throughout the inner heliosphere. They are also essential to further our understanding of space weather both in the vicinity of the Earth, and at other solar-system bodies. This second workshop on remote-sensing observations of the inner heliosphere, to be held at Aberystwyth University again during the week of 06-10 June 2011, will consider a wide assortment of heliospheric remote-sensing observations as well as detailed three-dimensional (3-D) modelling and reconstruction methods of the inner heliosphere. A particular focus of the workshop will be an entire day concentrating on the July/August 2010 events, their complexity of interpretation and modelling, and their use as a case study to bring together all the key observational and modelling techniques we have available to us. The workshop will also look at occasions where remote-sensing observations and/or heliospheric modelling have failed us, and investigate these options and the causes behind them. It is envisaged that some of the early remote-sensing heliospheric results from the newly-operational LOw Frequency ARray (LOFAR), Solar-Terrestrial Environment Laboratory (STELab) Toyokawa array, and the Murchison Widefield Array (MWA) radio systems will feature in this Topical Issue (T.I.), as well as future space-based remote-sensing instrumentation and plans. The T.I. of Solar Physics will act as proceedings to the workshop, the fifth in a series of workshops on heliospheric remote sensing (the second of direct remote-sensing of the inner heliosphere themes), and will provide a primary reference for further future collaborations and science resulting from our workshop (as the first T.I. published in August 2010 is starting to now). Originally, this workshop was scheduled for early 2011 to be held at the Massachusetts Institute of Technology (MIT) in Cambridge, MA, USA, but due to other commitments from colleagues there, Aberystwyth University stepped in again to host this next Workshop in early summer 2011 instead. It is hoped that a further workshop in this series will occur again in another two years either at Aberystwyth University or hosted elsewhere.

Full Workshop Title:
"Second Remote Sensing of the Inner Heliosphere Workshop"

Envisaged Timeline of Special Edition:
- Titles, Author Lists, Abstracts, and Suggested Referees due by Friday 29 July 2011.
- Full Paper Submissions due by Friday 25 November 2011.
- Estimated Publication between May and August 2012.

Primary author: Dr BISI, Mario M. (CASS, UCSD / IMAPS, Aberystwyth University)

Presenter: Dr BISI, Mario M. (CASS, UCSD / IMAPS, Aberystwyth University)