Cosmic Ray Anisotropy Workshop 2017

Report of Contributions

https://events.icecube.wisc.edu/e/cra17

Contribution ID: **0** Type: **Invited Talk**

Update on Combined Analysis of Cosmic-Ray Anisotropy with IceCube and HAWC

Tuesday, 10 October 2017 10:35 (30 minutes)

Individual observations of the sidereal anisotropy in the arrival direction distribution of Galactic cosmic rays are restricted by limited sky coverage. As a result, the power spectrum of the anisotropy obtained from any one measurement displays a systematic correlation between different multipole modes C_ℓ. We describe the methods used to combine the IceCube and HAWC data, address the individual detector systematics, and study the region of overlapping field of view between the two observatories and we present updated results of the joint anisotropy analysis. The results include a combined sky map and an all-sky angular power spectrum in the overlapping energy range of the two experiments at around 10 TeV on all angular scales using cosmic-ray data collected during 2 years of operation of the High-Altitude Water Cherenkov (HAWC) Observatory (located at 19° N) and 5 years of data taking from the IceCube Neutrino Observatory (located at 90° S).

Primary author: DÍAZ VÉLEZ, Juan Carlos (Universidad de Guadalajara)

Co-authors: FIORINO, Dan (University of Wisconsin–Madison); Dr DE LA FUENTE, Eduardo (Dpto. de Fisica, CUCEI, Universidad de Guadalajara); AHLERS, Markus (o=uwmad,ou=Institutions,dc=icecube,dc=wisc,dc=edu); Dr DESIATI, Paolo (University of Wisconsin - Madison)

Presenter: DÍAZ VÉLEZ, Juan Carlos (Universidad de Guadalajara)

Session Classification: Session I

Contribution ID: **1** Type: **Public Lecture**

Astronomy's "Next Big Thing:" What can we expect from direct observations of Einstein's elusive predictions?

Tuesday, 10 October 2017 18:00 (1 hour)

Advanced LIGO provided humanity with the first direct detection of gravitational waves, just in time for the 100th anniversary of Einstein's prediction. Beyond the discovery, there is a growing focus on incorporating gravitational waves as a new window on the Universe addressing questions from violent cosmic transients to cosmological enigmas. I will discuss some aspects of (i) the instrumental breakthroughs that enabled the unprecedented sensitivity reached by Advanced LIGO and (ii) the key scientific directions in which gravitational wave searches can be utilized, directly as well as in the context of multimessenger astronomy.

Primary author: Prof. SZABOLCS, Marka (Columbia University, NY, USA)

Presenter: Prof. SZABOLCS, Marka (Columbia University, NY, USA)

Session Classification: Public Lecture II

Contribution ID: **2** Type: **Public Lecture**

Multi-Messenger Astronomy

Saturday, 14 October 2017 11:00 (1 hour)

Astronomy began with people looking at the night sky to see the visible light from the stars. As technology was developed, they augmented their own eyes with optical telescopes, then radio telescopes, then even launched satellites to detect other wavelengths of light from infrared to UV to x-rays and gamma-rays. Today the study of the stars has branched out to use giant detectors on the earth which not only look at the highest energy light in the universe, but also use other messengers beyond light such as neutrinos and even gravitational waves to study the sky. In this talk we will present a look at this emerging field of "multi-messenger astronomy" describing a new generation of experiments which are giving us a new look at the Universe.

Primary author: Prof. GOODMAN, Jordan (o=umd,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: Prof. GOODMAN, Jordan (o=umd,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Public Lecture III

Contribution ID: **3** Type: **Invited Talk**

Heliospheric Tail Models

Thursday, 12 October 2017 14:05 (45 minutes)

In the tail direction of the heliosphere an anisotropy in the cosmic ray flux is observed by the large area telescopes. These ansiotropy is partly explained by the modulation of cosmic rays in the tail region. But, most of the modeling of the large scale heliosphere is concentrated on the nose direction, because there are the in situ observations of the Voayger spacecraft available. The heliospheric tail physics is only sparsely addressed in literature. I will give an overview of heliospheric tail models and will discuss their observability as well as their theoretical advances and shortcomings. I will also shortly address astrospheres around hot stars and their possible influence on comsic ray modulation.

Primary author: Dr SCHERER, Klaus (Ruhr University Bochum)

Presenter: Dr SCHERER, Klaus (Ruhr University Bochum)

Session Classification: Session IX

Contribution ID: **4** Type: **Invited Talk**

Cosmic ray flux anisotropies caused by astrospheres

Thursday, 12 October 2017 17:05 (30 minutes)

Large area telescope show spatial anisotropies of the high energy cosmic ray flux in the permille. We model the cosmic ray flux through a sphere of 1 kpc, in which we have located different astrosphere (or the like) with a radii varying from 1 to 10\,pc at a large distance from the observer. We discuss cosmic ray anisotropies for different setups of the location of the astrospheres. We will present the setup of our model and discuss the results, which are in the expected amplitude range for the anisotropic flux.

Primary author: Dr SCHERER, Klaus (Ruhr University Bochum)

Co-authors: Dr FICHTNER, Horst (RUB); GLANEMANN, Linus (RUB)

Presenter: Dr SCHERER, Klaus (Ruhr University Bochum)

Session Classification: Session X

Contribution ID: **5** Type: **Invited Talk**

Analytic heliospheric magnetic field modeling

Thursday, 12 October 2017 16:30 (35 minutes)

Studying the propagation of charged cosmic rays requires a realistic prescription of the background magnetic field of the traversed environment, such as the Galaxy or the heliosphere. In the latter case, analytic models may provide a less accurate, yet simpler and more accessible alternative to computationally expensive high-resolution magnetofluid simulations. In this talk, I will present and review the physical basis, method, and properties of our analytic model for the interstellar magnetic field draping around the heliosphere, including a comparison and performance evaluation with respect to a fully self-consistent simulation.
Together with the Rankine half-body flow, the field forms an exact solution to the induction equation of ideal MHD, and maintains this property even after transformations such as flattening and bulging of the heliotail have been imposed. While the model presently only covers the interstellar magnetic field exterior to the heliopause, its extension to the inside part is possible, and will also be tentatively discussed.

Primary author: Dr KLEIMANN, Jens (Ruhr-Universität Bochum)

Co-authors: Dr RÖKEN, Christian (Universität Regensburg); Dr FICHTNER, Horst (Ruhr-Universität Bochum)

Presenter: Dr KLEIMANN, Jens (Ruhr-Universität Bochum)

Session Classification: Session X

Contribution ID: **6** Type: **Invited Talk**

Cosmic Ray Anisotropy with IceCube

Tuesday, 10 October 2017 09:35 (30 minutes)

This is a summary of the cosmic ray anisotropy observed with the IceCube Observatory. Comparisons with similar experiments are also shown, along with the future perspectives.

Primary author: DESIATI, Paolo (o=uwmad,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: DESIATI, Paolo (o=uwmad,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Session I

Contribution ID: **7** Type: **Invited Talk**

Sub- and multi-TeV cosmic ray anisotropy and the Tibet Air shower experiment

Tuesday, 10 October 2017 12:05 (30 minutes)

The Tibet Air Shower (AS) experiment has successfully observed the sidereal anisotropy of multi-TeV cosmic ray intensity, while the long-term two-hemisphere observations with underground muon detectors in Japan and Australia have reported the sidereal anisotropy of sub-TeV cosmic rays and its solar modulation. The Tibet Air Shower (AS) experiment also succeeded for the first time in observing influences of the solar magnetic field on the Sun's shadow. This paper will present a brief review of these observations and discuss those physical implications.

Primary author: Prof. MUNAKATA, Kazuoki (Shinshu University)

Presenter: Prof. MUNAKATA, Kazuoki (Shinshu University)

Session Classification: Session II

Contribution ID: **8** Type: **Invited Talk**

Magnetic field in the Milky Way

Friday, 13 October 2017 09:15 (35 minutes)

I will review our observational knowledge of the interstellar magnetic field in the Milky Way. I will first describe the main methods traditionally used to probe the interstellar magnetic field, and I will explain what the different methods have taught us regarding its strength, direction, and spatial distribution. I will then describe a new method, known as rotation measure synthesis or Faraday tomography, which combines synchrotron emission and Faraday rotation, and I will illustrate the potential of this method with a couple of examples.

Primary author: Dr FERRIERE, Katia (IRAP/OMP)

Presenter: Dr FERRIERE, Katia (IRAP/OMP)

Session Classification: Session XI

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

Cosmic Ray Propagation Simulations and Spectral Features in the Observed TeV Anisotropy with the HAWC Detector

Tuesday, 10 October 2017 10:05 (30 minutes)

With its high duty cycle and large field of view ($\sim$ 2 sr), the High-Altitude Water Cherenkov (HAWC) Observatory
continuously surveys the cosmic ray arrival distribution at very high energies (100 GeV $-$ 1 PeV) in the Northern Sky.
Previous measurements by other air shower experiments at the TeV scale reveal energy-dependent angular features of the cosmic-ray anisotropy at both large ($> 60°$) and small ($< 20°$) scales.
With a specially selected two-year data set of cosmic-ray air-shower events and a new statistical method,
we present results from HAWC observations confirming the presence of these features at a signal-to-noise ratio $> 10^{-5}$.
The event selection allows for improved energy and angular resolution from $1.4 - 70.0$ TeV.
We also present a graphics processing unit (GPU) accelerated simulation that tracks charged particle
propagation through magnetic fields, which permits the rapid testing of various field configurations and properties.
We demonstrate the ability to simulate 10^9 particles in hour timescales, allowing unprecedented TeV-scale
cosmic ray simulation capabilities.

Primary authors: FIORINO, Dan (University of Wisconsin−Madison); HAMPEL-ARIAS, Zig (o=ulb,ou=Institutions,dc=ice

Presenter: HAMPEL-ARIAS, Zig (o=ulb,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Session I

Contribution ID: **10** Type: **Invited Talk**

CALET preliminary results on the cosmic ray observations for the first two-years on the ISS

Wednesday, 11 October 2017 17:10 (30 minutes)

The CALorimetric Electron Telescope (CALET) space experiment, which has been developed by Japan in collaboration with Italy and the United States, is a high-energy astroparticle physics mission. The instrument was launched on August 19, 2015 to the ISS with HTV-5 (H-II Transfer Vehicle 5) and installed on the Japanese Experiment Module - Exposed Facility (JEM-EF) on August 25.
The primary goals of the CALET mission include investigating on the presence of possible nearby sources of high-energy electrons, studying the details of galactic particle propagation and searching for dark-matter signatures. During a two-year mission, extendable to five years, the CALET experiment is measuring the flux of cosmic-ray electrons (including positrons) to 20 TeV, gamma-rays to 10 TeV and nuclei with Z=1 to 40 up to several 100 TeV. The instrument consists of two layers of segmented plastic scintillators for the cosmic-ray charge identification (CHD), a 3 radiation length thick tungsten/scintillating-fiber imaging calorimeter (IMC) and a 27 radiation length thick lead-tungstate (PWO) calorimeter (TASC). CALET has sufficient depth, imaging capabilities and excellent energy resolution to allow for a clear separation between hadrons and electrons and between charged particles and gamma rays.
Since the start of operation from in mid-October, 2015, continuous observation has been carried out without any major interruption, mainly by triggering on high-energy (>10 GeV) showers. The number of triggered events is about 20 million per month. By using the data obtained so far, we will present a summary of preliminary results by from the CALET observations on 1) Electron energy spectrum, 2) Proton and Nuclei spectra, 3) Gamma-ray observations, with results of the an on-orbit performance study.

Primary authors: Prof. TORII, Shoji (Waseda University); Dr ASAOKA, Yoichi (WISE, Waseda University)

Presenter: Dr ASAOKA, Yoichi (WISE, Waseda University)

Session Classification: Session VI

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

Welcome message

Tuesday, 10 October 2017 08:20 (30 minutes)

Presenter: DÍAZ VÉLEZ, Juan Carlos (Universidad de Guadalajara)

Session Classification: Session I

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

Indirect CR experiments

Tuesday, 10 October 2017 08:50 (45 minutes)

Presenter: BENZVI, Segev (o=rochester,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Session I

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

CR Anisotropy with HAWC

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

CR anisotropy with neutrinos

Presenter: WILLS, Lizz (o=drexel,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

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

Discussion

Tuesday, 10 October 2017 13:05 (25 minutes)

Session Classification: Session II

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

Welcome message

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

Cosmic Rays in Mexico

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

Muon Tomography

Wednesday, 11 October 2017 11:25 (30 minutes)

Session Classification: Session IV

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

CR Astrophysics

Wednesday, 11 October 2017 08:15 (40 minutes)

Presenter: Dr EVOLI, Carmelo (Gran Sasso Science Institute)

Session Classification: Session III

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

CR Anisotropy with Auger

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

TBA

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

Gamma Rays, Neutrinos & CRs

Wednesday, 11 October 2017 14:05 (30 minutes)

Presenter: VANDENBROUCKE, Justin (o=uwmad,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Session V

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

CR Anisotropy and local IS turbulence

Wednesday, 11 October 2017 14:35 (30 minutes)

Presenter: Dr GIACINTI, Gwenael (University of Oxford)

Session Classification: Session V

Contribution ID: **26** Type: **not specified**

Cosmic Ray Origin and Propagation in Milky Way

Wednesday, 11 October 2017 15:05 (30 minutes)

Presenter: Dr MORLINO, Giovanni (Gran Sasso Science Institute, ITALY)

Session Classification: Session V

Contribution ID: **27** Type: **not specified**

CR Diffusion

Contribution ID: **28** Type: **not specified**

Astrophysics of Galactic and Extra-Galactic CRs

Contribution ID: **29** Type: **not specified**

Direct CR experiments

Contribution ID: **30** Type: **not specified**

AMS02

Contribution ID: **32** Type: **not specified**

Bess-Polar II

Contribution ID: **33** Type: **not specified**

Discussion

Wednesday, 11 October 2017 18:10 (30 minutes)

Session Classification: Session VI

Contribution ID: **34** Type: **not specified**

Fermi

Presenter: VANDENBROUCKE, Justin (o=uwmad,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Contribution ID: **35** Type: **not specified**

SuperTiger

Contribution ID: **36** Type: **not specified**

Interstellar medium

Presenter: FRISCH, Priscilla (University of Chicago)

Contribution ID: **37** Type: **not specified**

Entry and transport of GCR through heliosphere

Contribution ID: **38** Type: **not specified**

Composition of GCR near solar vicinity

Thursday, 12 October 2017 09:50 (35 minutes)

Presenter: Dr WIEDENBECK, Mark (Jet Propulsion Laboratory, California Institute of Technology)

Session Classification: Session VII

Contribution ID: **39** Type: **not specified**

Properties of interstellar medium

Presenter: Dr SLAVIN, Jonathan (Smithsonian Astrophysical Observatory)

Contribution ID: **40** Type: **not specified**

TBA

Contribution ID: **41** Type: **not specified**

TBA

Contribution ID: **42** Type: **not specified**

CR anisotropy and turbulence / heliososphere

Contribution ID: **43** Type: **not specified**

TBA

Contribution ID: **44** Type: **not specified**

Numerical Modeling

Thursday, 12 October 2017 15:25 (35 minutes)

Session Classification: Session IX

Contribution ID: **46** Type: **not specified**

Heliospheric modulations

Thursday, 12 October 2017 14:50 (35 minutes)

Presenter: Prof. ZHANG, Ming (Florida Institute of Technology)

Session Classification: Session IX

Contribution ID: **47** Type: **not specified**

Discussion

Contribution ID: **49** Type: **not specified**

Astrospheres

Contribution ID: **50** Type: **not specified**

Astrophysical Plasmas

Friday, 13 October 2017 08:30 (45 minutes)

Presenter: Prof. LAZARIAN, Alex (UW-Madison)

Session Classification: Session XI

Contribution ID: **52** Type: **not specified**

TBA

Contribution ID: **53** Type: **not specified**

CR anisotropy and turbulence / heliososphere

Friday, 13 October 2017 10:45 (30 minutes)

Primary author: LÓPEZ-BARQUERO, Vanessa (University of Wisconsin-Madison)

Session Classification: Session XII

Contribution ID: **54** Type: **Invited Talk**

Probing Cosmic Ray Anisotropy in the Northern Hemisphere with Atmoshperic Neutrinos

Tuesday, 10 October 2017 12:35 (30 minutes)

This talk introduces a new way of exploring Cosmic Ray Anisotropy: observation through secondary neutrinos. Using IceCube and a high-acceptance dataset of atmospheric neutrinos created for this analysis, we are nearing the sensitivity threshold to observe the phenomenon in atmospheric neutrinos arriving from the Northern Hemisphere. This analysis focuses on energy ranges that correspond to the spatially-consistent lower energy features of the dipole structure. Due to the statistical limitations of the neutrino dataset in comparison to the cosmic ray datasets, we also introduce new methods for detecting signal beyond the familiar multipole analysis, which will also be implemented. These include a 1D relative intensity fit to determine the amplitude and phase of the dipole, and a 2D binned log-likelihood analysis focusing on searching for observed anisotropy maps from the Tibet collaboration. Future hope for the work is to create a single-detector all-sky map of the anisotropy, minimizing systematical difficulties combining datasets from separate collaborations.

Primary author: WILLS, Lizz (o=drexel,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Presenter: WILLS, Lizz (o=drexel,ou=Institutions,dc=icecube,dc=wisc,dc=edu)

Session Classification: Session II

Contribution ID: **55** Type: **Public Lecture**

Rayos Cósmicos, mensajeros del Universo

Monday, 9 October 2017 18:00 (20 minutes)

En 1912, el físico austriaco Victor Hess descubrió que constantemente estamos siendo bombardeados por partículas provenientes del espacio. Estas partículas son tan energéticas que se presume que están relacionadas con eventos cataclísmicos que suceden incluso fuera de nuestra galaxia. En esta plática hablaremos sobre los rayos cósmicos y como los estudiamos desde México con el observatorio HAWC.

Primary author: Dr GONZÁLEZ SÁNCHEZ, María Magdalena (Instituto de Astronomía UNAM)

Presenter: Dr GONZÁLEZ SÁNCHEZ, María Magdalena (Instituto de Astronomía UNAM)

Session Classification: Public Lecture

Contribution ID: **56** Type: **Invited Talk**

Cosmic Ray Energy Spectrum and Anisotropy with ARGO-YBJ

Tuesday, 10 October 2017 11:35 (30 minutes)

The ARGO-YBJ experiment has been in stable data taking for more than 5 years at the YangBaJing Cosmic Ray Observatory (Tibet, P.R. China, 4300 m a.s.l., 606 g/cm^2). With a duty-cycle greater than 86\% the detector collected about 5×10^{11} events in a wide energy range, from few hundreds GeV up to about 10 PeV. High altitude location and detector features make ARGO-YBJ capable of investigating a wide range of important issues in Cosmic Ray and Astroparticle Physics by imaging the front of atmospheric showers with unprecedented resolution and detail.
In this contribution the latest results obtained by ARGO-YBJ in cosmic ray physics are summarized.

Primary author: Dr DI SCIASCIO, Giuseppe (INFN - Roma Tor Vergata)

Presenter: Dr DI SCIASCIO, Giuseppe (INFN - Roma Tor Vergata)

Session Classification: Session II

Contribution ID: **57** Type: **Invited Talk**

CRPropa 3.1 – Stochastic differential equations for anisotropic cosmic ray transport

Wednesday, 11 October 2017 08:55 (30 minutes)

The propagation of charged cosmic rays through the Galactic environment influences all aspects of the observation at Earth. Energy spectrum, composition and anisotropy are changed due to deflections in magnetic fields and interactions with the interstellar medium. Today the transport is simulated with different simulation methods either based on the solution of a transport equation (multi-particle picture) or a solution of the equation of motion (single-particle picture).

The publicly available propagation software CRPropa 3.1 can solve both approaches in two distinct modules. This duality allows the user to pick the right ansatz that suits best for the existing problem. The implemented code for the diffusion approach used stochastic differential equations (SDEs) to solve the transport equation. In doing so, it is possible to apply complicated anisotropic diffusion tensors in (nearly) arbitrary background fields which are necessary to describe the observed arrival direction of cosmic rays.

In this talk, the two propagation concepts are discussed and compared. It will focus mainly on the new diffusion ansatz and emphasize the advantages of SDEs over conventional grid based solvers. Furthermore, first use-cases of this software are presented.

Primary author: Mr MERTEN, Lukas (Ruhr-Universität Bochum)

Presenter: Mr MERTEN, Lukas (Ruhr-Universität Bochum)

Session Classification: Session III

Contribution ID: **58** Type: **Invited Talk**

Anisotropies in the flux of UHECRs

Wednesday, 11 October 2017 10:25 (30 minutes)

We review recent results on anisotropies in the flux of UHECRs measured by the Pierre Auger Observatory. These include large scale anisotropies, especially the search for dipole- and quadrupole-like patterns, auto-correlation at different angular scales, as well as searches for correlations with some classes of astrophysics objects. The results of recent full sky joint analises between Pierre Auger and Telescope Array will also be discussed.

Primary author: Mr MOURA SANTOS, Edivaldo (University of Sao Paulo)

Presenter: Mr MOURA SANTOS, Edivaldo (University of Sao Paulo)

Session Classification: Session IV

Contribution ID: **59** Type: **Invited Talk**

Physical Properties of and Evolution of The Local Interstellar Medium

Thursday, 12 October 2017 10:55 (35 minutes)

The very local interstellar medium has been proposed as a source of the small scale cosmic ray anisotropy. This region, also known as the Local Interstellar Cloud (LIC), is the closest interstellar medium and interacts with the solar wind to create the heliosphere. The current state of the LIC, however, has been determined by processes in the more distant local interstellar medium which includes a variety of regions ranging from the hot, very low density Local Bubble to the warm Complex of Local Interstellar Clouds (CLIC) to the cold, dense gas in the Local Leo Cold Cloud. We will discuss the physical properties of the LIC and the local ISM and our sources of information on them. We also discuss our modeling of the origins and evolution of Local Bubble and CLIC. The Local Bubble is found to require at least two supernova explosions for its creation and the CLIC, including the LIC, can be explained as originating as cold dense clouds embedded in a lower density warm medium which was overrun by supernova blast waves. The magnetic field configuration that results from this evolution could be important for understanding cosmic ray anisotropy.

Primary author: Dr SLAVIN, Jonathan (Smithsonian Astrophysical Observatory)

Presenter: Dr SLAVIN, Jonathan (Smithsonian Astrophysical Observatory)

Session Classification: Session VIII

Contribution ID: **60** Type: **Invited Talk**

History of Cosmic Rays in Mexico

TBA

Summary

TBA

Primary author: Dr DE LA FUENTE, Eduardo (Dpto. de Fisica, CUCEI, Universidad de Guadalajara)

Presenter: Dr DE LA FUENTE, Eduardo (Dpto. de Fisica, CUCEI, Universidad de Guadalajara)

Contribution ID: **61** Type: **Invited Talk**

Interstellar Magnetic Fields and Turbulence

Friday, 13 October 2017 09:50 (35 minutes)

Magnetic fields and turbulence fill the interstellar medium and play an active role in a broad range of astrophysical processes over different ranges of spatial scales. I will first talk about the properties of interstellar magnetic fields and turbulence as revealed by a variety of observables. Based on the observational facts and the advanced theories of MHD turbulence, I will further talk about the effects of the dynamics of turbulent magnetic fields on the magnetic field amplification and cosmic ray (CR) diffusion in supernova remnants, magnetic field and density structure, and CR diffusion in molecular clouds, magnetic fields and CR anisotropy in the local heliosphere…… In brief, the modern understanding of MHD turbulence, in combination with diverse observations, brings us new physical insights into many astrophysical problems, in particular, those related to CRs.

Primary author: Dr XU, Siyao (University of Wisconsin-Madison)

Co-author: Prof. LAZARIAN, Alex (UW-Madison)

Presenter: Dr XU, Siyao (University of Wisconsin-Madison)

Session Classification: Session XI

Contribution ID: **62** Type: **Invited Talk**

Heliospheric effects on the anisotropy of TeV cosmic rays

The gyroradius of TeV cosmic rays is comparable to the size of the heliosphere. When cosmic rays go through the heliospheric magnetic field and electric field to reach the Earth, the trajectories are altered from their original paths in the local interstellar medium and the particle energy is shifted. Therefore, we expect to see distortions of anisotropy caused by the heliosphere. This talk presents an analysis how to derive the original cosmic ray anisotropy in the local interstellar medium. It turns out the large-scale anisotropy cosmic rays at a few TeV energy in the local interstellar medium is dominated by a dipole along the magnetic field. It is also found the heliosphere might affect the small-scale anisotropy in some regions of the sky.

Primary author: Prof. ZHANG, Ming (Florida Institute of Technology)

Co-author: Prof. POGORELOV, Nikolai (University of Alabama in Huntsville)

Presenter: Prof. ZHANG, Ming (Florida Institute of Technology)

Contribution ID: **63** Type: **not specified**

TBA

Wednesday, 11 October 2017 13:35 (30 minutes)

Presenter: Prof. FARRAR, Glennys (New York University, Center for Cosmology and Particle Physics)

Session Classification: Session V

Contribution ID: **64** Type: **not specified**

Interstellar medium

Thursday, 12 October 2017 08:30 (45 minutes)

Presenter: FRISCH, Priscilla (University of Chicago)

Session Classification: Session VII

Contribution ID: **65** Type: **not specified**

Magnetic fluctuations and cosmic rays in the Very Local Interstellar Medium (VLISM)

Thursday, 12 October 2017 09:15 (35 minutes)

Primary author: Prof. FLORINSKI, Vladimir

Presenter: Prof. FLORINSKI, Vladimir

Session Classification: Session VII

Contribution ID: **66** Type: **not specified**

Understanding the Cosmic Ray Anisotropy

Thursday, 12 October 2017 11:30 (35 minutes)

Primary author: Mr KUMAR, rahul (Ben-Gurion University)

Session Classification: Session VIII

Contribution ID: **67** Type: **Invited Talk**

The Astrophysics of Galactic and Extragalactic Cosmic Rays

Wednesday, 11 October 2017 10:55 (30 minutes)

The centers of star-forming galaxies are often characterized by dense concentrations of young massive stars along with large amounts of dense molecular gas, strong magnetic fields, and high radiation fields. Thus, regions of star-forming galaxies and regions of intense star formation naturally generate high number densities of cosmic rays and are therefore strong sources of radio, gamma-ray, and neutrino emission. As such, they are of particular interest for studying the fundamental properties of cosmic rays populations and their importance in feedback mechanisms. In this talk, I will present an overview of cosmic ray interaction models for starburst galaxies and and of the role of cosmic rays in galaxy evolution

Primary author: YOAST-HULL, Tova (University of Wisconsin-Madison)

Presenter: YOAST-HULL, Tova (University of Wisconsin-Madison)

Session Classification: Session IV

Contribution ID: **68** Type: **Invited Talk**

Direct measurement of cosmic rays (with emphasis on anisotropies)

Wednesday, 11 October 2017 15:55 (45 minutes)

This talk will give an overview of direct cosmic ray measurements, sort of focussed on AMS, and an outlook to what is expected from future experiments like ISS-CREAM, DAMPE and CALET.

Primary author: Dr GEBAUER, Iris (Karlsruhe Institute for Technology)

Presenter: Dr GEBAUER, Iris (Karlsruhe Institute for Technology)

Session Classification: Session VI

Contribution ID: **69** Type: **Invited Talk**

Fermi LAT studies of cosmic-ray anisotropy at the 100 GeV scale

Wednesday, 11 October 2017 17:40 (30 minutes)

The Fermi Large Area Telescope (LAT) is optimized for gamma-ray measurements, but most of the events it records are protons. Compared to ground-based air shower arrays, the LAT provides complementary capabilities regarding cosmic-ray anisotropy. It is sensitive in the ~100 GeV energy range and above, views the entire sky using a single instrument with no holes in exposure, and can efficiently discriminate protons from heavier nuclei as well as from leptons and gamma rays. Moreover, while ground-based instruments are only sensitive to the right ascension component of cosmic-ray anisotropy, the LAT is sensitive to all orientations of anisotropy. I will present a search for cosmic-ray proton anisotropy with eight years of LAT data, the largest all-sky cosmic-ray proton data set ever collected in this energy range (80 GeV to 10 TeV). I will also review recent LAT results on cosmic-ray electron and positron anisotropy.

Primary authors: Prof. VANDENBROUCKE, Justin (University of Wisconsin); Mr MEEHAN, Matthew (University of Wisconsin)

Presenter: Prof. VANDENBROUCKE, Justin (University of Wisconsin)

Session Classification: Session VI

Contribution ID: **70** Type: **Invited Talk**

Recent results of the AMS-02 experiment on the ISS

Wednesday, 11 October 2017 16:40 (30 minutes)

The Alpha Magnetic Spectrometer (AMS) is a multi-purpose particle physics detector designed to perform accurate measurements of cosmic ray (CR) charged particles in the GeV-TeV range. In 2011 it was installed onboard the International Space Station (ISS) and it continues taking data steadily since then. So far, AMS-02 has collected more than 100 billion charged cosmic ray events. AMS-02 has provided precise measurements that cannot be fully explained within the current understanding of CRs origin and propagation. The latest AMS results will be presented.

Primary author: Mr VELASCO FRUTOS, Miguel Ángel (CIEMAT)

Presenter: Mr VELASCO FRUTOS, Miguel Ángel (CIEMAT)

Session Classification: Session VI