2nd Workshop on Atmospheric Monitoring

Report of Contributions

https://events.icecube.wisc.edu/e/30

Contribution ID: **0** Type: **not specified**

Breakfast and Registration

Monday, 13 September 2010 08:30 (30 minutes)

Session Classification: Introduction

Track Classification: Intro

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

Logistics and Overview

Monday, 13 September 2010 09:00 (30 minutes)

Primary author: BENZVI, Segev (University of Wisconsin–Madison)

Presenter: BENZVI, Segev (University of Wisconsin–Madison)

Session Classification: Introduction

Track Classification: Intro

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

The Astronomical Flux Measurement Problem: Implications for Atmospheric Monitoring

Monday, 13 September 2010 09:30 (45 minutes)

I will provide an overview of the motivation for direct determination of atmospheric transmission, from the standpoint of broadband photometric measurements. The primary sources of variability (or unpredictability) in transmission are clouds, aerosols and water vapor. I will review our approach to date, and the results we have obtained from initial prototype instruments.

Primary author: Prof. STUBBS, Christopher (Harvard University)

Presenter: Prof. STUBBS, Christopher (Harvard University)

Session Classification: Astronomical Monitoring I

Track Classification: Astronomical Monitoring I

Contribution ID: **3** Type: **not specified**

Towards Poisson-Limited Photometric Precision from Ground-Based Telescopes

Monday, 13 September 2010 10:45 (30 minutes)

Ground-Based Telescopes supported by lidar and calibrated spectrophotometry can attain levels of precision for all-sky photometry previously only attainable from space-based instruments, with uncertainties dominated by fundamental photon counting statistics and detector noise. Earth's atmosphere is a wavelength-, directionally- and time-dependent turbid refractive element for every ground-based telescope, and is the primary factor limiting photometric measurement precision. To correct accurately for the transmission of the atmosphere requires direct measurements of the wavelength-dependent transmission in the direction and at the time that the supported photometric telescope is acquiring its data. While considerable resources have been devoted to correcting the effects of the atmosphere on resolution, the effects on precision photometry have largely been ignored. We describe the facility-class lidar that observes the stable stratosphere, and a spectrophotometer that creates and maintains NIST absolutely calibrated standard stars, the combination of which enables fundamentally statistically limited photometric precision. This inexpensive and replicable instrument suite provides the lidar-determined monochromatic transmission of Earth's atmosphere at visible and near-infrared wavelengths to 0.25% per airmass and the wavelength-dependent transparency to less than 1% uncertainty per minute. The atmospheric data are merged to create a metadata stream that allows throughput corrections from data acquired at the time of the scientific observations to be applied to broadband and spectrophotometric scientific data. This new technique replaces the classical use of nightly mean atmospheric extinction coefficients, which invoke a stationary and plane-parallel atmosphere and ultimately limit ground-based all-sky photometry to 1% - 2% precision. We demonstrate application of this instrument suite to stellar photometry, and discuss the enhanced value of routinely provably precise photometry obtained with existing and future ground-based telescopes.

Primary author: ZIMMER, Peter (University of New Mexico)

Presenter: ZIMMER, Peter (University of New Mexico)

Session Classification: Astronomical Monitoring II

Track Classification: Astronomical Monitoring II

Contribution ID: **4** Type: **not specified**

The NIST Standard Stars Project: Sub-1% Absolute Stellar Photometry

Monday, 13 September 2010 11:15 (30 minutes)

NIST has undertaken a campaign to spectrophotometrically calibrate a suite of standard stars for top-of-the-atmosphere flux to a precision of better than 1%. We will describe our experimental approach and show some preliminary results. In addition to high quality spectrophotometric measurements, this project requires precise measurements of the atmospheric transmission in both the horizontal direction and along the line of site from the observing telescope to the star. We are actively seeking input from the astronomical community on both our experimental approach and useful targets for inclusion in the catalog.

Primary author: WOODWARD, John (NIST)

Presenter: WOODWARD, John (NIST)

Session Classification: Astronomical Monitoring II

Track Classification: Astronomical Monitoring II

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

General Discussion

Monday, 13 September 2010 11:45 (30 minutes)

Session Classification: Astronomical Monitoring II

Track Classification: Astronomical Monitoring II

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

Atmospheric Temperature and Water Vapor Profiles, Transmittance Calculations, and Radiative Transfer

Monday, 13 September 2010 14:00 (45 minutes)

This talk will cover cover three areas potentially of interest to the workshop:

- Numerical Weather Forecasting Models estimates of temperature/water vapor profiles from satellite
- Remote sensing of temperature/water vapor profiles from satellite.
- Broad-band and monochromatic transmittance calculations and radiative transfer in the visible and near-infrared with special emphasize on gas absorption.

Primary author: BENNARTZ, Ralf (UW-Madison)

Presenter: BENNARTZ, Ralf (UW-Madison)

Session Classification: Atmospheric Profiles and Transmission

Track Classification: Atmospheric Profiles and Transmission

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

Global Atmospheric Model Data for the Pierre Auger Observatory

Monday, 13 September 2010 14:45 (30 minutes)

B. Keilhauer, D. Epperlein, M. Will for the Pierre Auger Collaboration

For the reconstruction of extensive air showers, the atmospheric conditions at the site of the observatory have to be known quite well. This is particularly true for reconstructions based on data obtained by the fluorescence technique. For these data not only the weather conditions near ground are relevant, most important are altitude-dependent atmospheric profiles. For the Pierre Auger Observatory, we have investigated the application of "Global Data Assimilation System" (GDAS) data which provide vertical atmospheric profiles for height, temperature, and humidity at 23 constant pressure levels every 3 hours. GDAS data are available for the whole globe with 1° longitude and latitude spacing. These atmospheric data are compared with observations at the sites of the Auger Observatory using meteorological radio soundings. Finally, the atmospheric data are included in the reconstruction framework of the Auger Observatory and effects on reconstruction results of real air shower events are investigated.

Primary author: KEILHAUER, Bianca (KIT)

Presenter: KEILHAUER, Bianca (KIT)

Session Classification: Atmospheric Profiles and Transmission

Track Classification: Atmospheric Profiles and Transmission

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

HSRL Lidar

Monday, 13 September 2010 15:45 (30 minutes)

E. Eloranta

Primary author: ELORANTA, E.

Presenter: ELORANTA, E.

Session Classification: Lidar Techniques and Measurements

Track Classification: Lidar Techniques and Measurements

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

Mesospheric Lidar Studies from Cerro Pachon, Chile

Monday, 13 September 2010 16:15 (30 minutes)

The Remote Sensing and Space Science group at the U of I has developed an upper atmospheric observatory on Cerro Pachon, beginning operation in Sep, 2009. Passive instrumentation includes mesospheric airglow allsky imagers of OH (including 16 micron), airglow photometers, a meteor radar, and an Na resonance lidar.

Primary author: SWENSON, Gary (U of Illinois - Champaign Urbana)

Presenter: SWENSON, Gary (U of Illinois - Champaign Urbana)

Session Classification: Lidar Techniques and Measurements

Track Classification: Lidar Techniques and Measurements

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

Toward Comparison of RAMAN and HSRL LIDAR Technique for CTA-Type Atmospheric Monitoring

Monday, 13 September 2010 16:45 (30 minutes)

P. Fetfatzis, E. Fokitis, V. Gika, G.Koutelieris, G.Koutsourakis, H. Koubli, S. Maltezos, N. Maragos, A. Aravantinos„ M. Kompitsas

This work describes the HSRL activity at NTUA and the possibility to receive simultaneously data with a RAMAN lidar operating at NTUA campus. We believe that such a preliminary study would be a useful study as the hardware for RAMAN LIDAR is already available and operating at NTUA and significant progress has been made in development HSRL prototypes for 532 and 355 nm Fabry-Perot receivers while the laser transmitters are independent from the ones used for the RAMAN LIDAR system. The Raman LIDAR data have been published in several Journals and include results in the framework of EARLINET EU funded project. The Raman LIDAR has capabilities to record aerosol extinction, ozon and water vapour profiles. The present phase of the work focuses on the study for the mounting of both the aerosol and molecular channel etalon, a receiver Newtonian telescope and optical fiber to transmit to the two channels the collected signal from the scattering volume by the telescope. Preliminary lab results with He-Ne laser with several longitutinal modes analyzed by a 50 mm spacer etalon are discussed. The UV sensitive etalon performance is studied. The mount technique considered for the molecular UV channel is of the type of Hansen mount applied to the Dynamics Explorer etalon with 2 mm spacer thickness, while for the aerosol type we have followed the 10 cm hollow Zerodure cylinder spacer . The coating technique for the aerosol channel etalon plate pair has been selected to correspond to soft coating with proposed reflectance curve peaking at 380 nm (R= 98%), while at 355 nm R=92%.

Primary author: FOKITIS, Emmanuel (Nat Tech Athens)

Presenter: FOKITIS, Emmanuel (Nat Tech Athens)

Session Classification: Lidar Measurements in UV

Track Classification: Lidar Measurements in UV

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

Present and Future Status of LIDAR systems of HESS and CTA

Monday, 13 September 2010 17:15 (30 minutes)

Primary author: VASILEIADIS, Georges (LPTA/CNRS)

Presenter: VASILEIADIS, Georges (LPTA/CNRS)

Session Classification: Lidar Measurements in UV

Track Classification: Lidar Measurements in UV

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

The Atmosphere-Dependent Calculation of Air Fluorescence and its Implementation in the Reconstruction of Air Showers

Tuesday, 14 September 2010 09:00 (30 minutes)

The fluorescence yield – the number of photons produced per unit of deposited energy by nitrogen fluorescence as air shower particles move through air – is a crucial ingredient in the reconstruction of air shower parameters using the fluorescence technique. Several values of the absolute fluorescence yield, as well as the parameters which determine its dependence on atmospheric conditions (such as humidity and temperature) will be discussed. We also present a general algorithm for the evaluation of the fluorescence yield, and its implementation in the Pierre Auger Observatory offline reconstruction software. This algorithm can be used to estimate the dependence of reconstructed shower parameters on the yield. We will illustrate the effect of atmospheric conditions on the reconstruction of showers with several examples.

Primary author: MONASOR, Maria

Presenter: MONASOR, Maria

Session Classification: Atmospheric Light Production

Track Classification: Atmospheric Light Production

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

The Pierre Auger Atmospheric Monitoring program - Status and Future Plans

Tuesday, 14 September 2010 09:30 (30 minutes)

The Pierre Auger Observatory uses the atmosphere as a giant calorimeter to measure extensive air showers produced by the highest energy particles known to exist. The Southern hemisphere site is operational and includes an array of instruments that monitor the troposphere above the 3000 km^2 site. A Northern hemisphere site of 20,000 km^2 is planned. This talk will review the atmospheric monitoring program of the observatory.

Primary author: WIENCKE, Lawrence

Presenter: WIENCKE, Lawrence

Session Classification: Atmospheric Monitoring Programs I

Track Classification: Atmospheric Monitoring Programs I

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

Atmospheric Monitoring for the H.E.S.S. Experiment

Tuesday, 14 September 2010 10:00 (20 minutes)

A short talk on the atmospheric monitoring efforts undertaken at the H.E.S.S. site in Namibia and how the data is used in this ground-based gamma-ray astronomy experiment. Particular focus will be given toward single scattering lidars and the extinction of Cherenkov light due to low-level aerosol populations.

Primary author: RULTEN, Cameron

Presenter: RULTEN, Cameron

Session Classification: Atmospheric Monitoring Programs I

Track Classification: Atmospheric Monitoring Programs I

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

Atmospheric Simulation Outcomes of The CTA Design Study

Tuesday, 14 September 2010 10:50 (30 minutes)

The Cherenkov Telescope Array (CTA) is the next generation instrument in ground-based gamma-ray astronomy. It is just coming to the end of a 3 year design study, and in this talk we will discuss the detailed simulation studies performed to assess the need for atmospheric monitoring and the methods by which correction for atmospheric variation may be achieved.

Primary author: NOLAN, Sam

Presenter: NOLAN, Sam

Session Classification: Atmospheric Monitoring Programs II

Track Classification: Atmospheric Monitoring Programs II

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

Development of a 1.8M Raman LIDAR for CTA

Tuesday, 14 September 2010 11:20 (30 minutes)

The use of a Raman LIDAR together with Image Air Cherenkov Telescopes (IACT) would allow to improve the duty cycle and reduce systematical uncertainties of the latter. The Raman LIDARs allow the monitoring of the atmospheric transmission probability with a quite good accuracy but the altitude range needed by the IACT is challenging, 20 km. A Raman LIDAR is being developed at IFAE for CTA by reclycing an old telescope from the CLUE experiment. The large 1.8 diameter mirror and the use of the most advanced technologies will hopefully allow fulfilling the requirements.

Primary author: LOPEZ ORAMAS, Alicia

Presenter: LOPEZ ORAMAS, Alicia

Session Classification: Atmospheric Monitoring Programs II

Track Classification: Atmospheric Monitoring Programs II

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

The Rapid Atmospheric Monitoring Program for the Pierre Auger Observatory

Tuesday, 14 September 2010 11:50 (30 minutes)

M. Will, S. BenZvi, B. Keilhauer, M. Prouza and A. Tonachini for the Pierre Auger Collaboration

The Pierre Auger Observatory measures extensive air showers from interactions of cosmic rays with Earth's atmosphere. More than 1600 Surface Detectors (SD) sample the secondary shower particles that reach the ground while 27 Fluorescence Detectors (FD) constantly scan the night sky for faint fluorescence emissions from nitrogen molecules, excited by the secondary particles. For the reconstruction of air showers from FD data, information about the current atmospheric conditions is needed. For this purpose, several monitoring systems have been implemented. Five ground-based weather stations and atmospheric soundings provide ground values and altitude-dependent profiles of the molecular atmosphere, four elastic lidars measure the attenuation of light due to aerosols and scan for clouds, four cloud cameras at each of the FDs, and one photometric robotic telescope (FRAM) also measures the aerosol attenuation. Two aerosol phase function monitors, a horizontal attenuation monitor and a Raman lidar provide additional information about aerosol scattering. The atmospheric monitoring program has been upgraded to allow for triggering the monitoring instruments shortly after the detection of high-energy events and other showers of interest. During FD shifts, incoming shower data are reconstructed by an automated online analysis. Interesting showers then trigger dedicated measurements by the various subsystems if they meet certain individualized criteria to obtain detailed information of the atmosphere, for some subsystems even in the vicinity of the shower track. The data are used to supplement the regular observations of the atmosphere. In the cases of sparse regular measurements or rapidly changing atmospheric conditions the rapid monitoring data can significantly improve the accuracy of the reconstruction of showers. We will present an overview of the implementation, performance and first results of the rapid monitoring system.

Primary author: WILL, Martin

Presenter: WILL, Martin

Session Classification: Atmospheric Monitoring Programs II

Track Classification: Atmospheric Monitoring Programs II

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

Atmospheric Monitoring at the Auger North Site

Tuesday, 14 September 2010 12:20 (20 minutes)

Primary author: STARBUCK, David

Presenter: STARBUCK, David

Session Classification: Atmospheric Monitoring Programs II

Track Classification: Atmospheric Monitoring Programs II

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

Analysis of Data from the Central Laser Facility

Tuesday, 14 September 2010 14:00 (30 minutes)

Primary author: VALORE, Laura

Presenter: VALORE, Laura

Session Classification: Aerosol Properties

Track Classification: Aerosol Properties

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

First Aerosol Concentration Measurements at the Auger North Site

Tuesday, 14 September 2010 14:30 (30 minutes)

Micheletti, María Isabel, Freire, Martín, Coco, Michael, Wiencke, Lawrence, Piacentini, Rubén

We performed the first aerosol concentration measurements at the Auger North site at Lamar, Colorado, during summer 2010, with the Grimm 1.109 spectrometer. We evaluate the time evolution –along the hours of the days and the days of the measurement period– of the concentrations and their mean and extreme values for particles of sizes bigger than 0.22 microns.

Primary author: MICHELETTI, Maria Isabel

Presenter: MICHELETTI, Maria Isabel

Session Classification: Aerosol Properties

Track Classification: Aerosol Properties

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

Measurement of the Aerosol Phase Function by the Central Laser Facility at the Pierre Auger Observatory

Tuesday, 14 September 2010 15:00 (30 minutes)

In the Pierre Auger Observatory, the Central Laser Facility (or CLF) emits all along the night laser shots in the field of view of the four fluorescence buildings. The goal of this talk is to show how it is possible to monitor the aerosols during the night. Two obtained quantities should be present: the Aerosol Phase Function (linked to the probability density function of the scattering angles) and the Aerosol attenuation length (linked to the aerosol concentration).

Primary author: LOUEDEC, Karim

Presenter: LOUEDEC, Karim

Session Classification: Aerosol Properties

Track Classification: Aerosol Properties

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

Identifying Clouds over the Pierre Auger Observatory using Satellite Data

Tuesday, 14 September 2010 16:00 (30 minutes)

We describe a new method of identifying clouds over the Pierre Auger Observatory using infrared data from the Imager instrument on the GOES-12 satellite. For the pixel covering the Central Laser Facility(CLF) we compare cloud identifications with this method to those made with the Fluorescence Detector observations of CLF vertical laser events. The methods agree. We develop cloud probability maps of the array.

Primary author: CHIRINOS, Johana

Presenter: CHIRINOS, Johana

Session Classification: Cloud Identification and Monitoring

Track Classification: Cloud Identification and Monitoring

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

Development of an IR All-Sky Cloud Monitor for the LSST Site

Tuesday, 14 September 2010 16:30 (30 minutes)

Primary author: SEBAG, Jacques

Presenter: SEBAG, Jacques

Session Classification: Cloud Identification and Monitoring

Track Classification: Cloud Identification and Monitoring