

A Demonstration of the Solmirus All Sky Infrared Visible Analyzer

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Introduction

A demonstration of the Solmirus All Sky Infrared Visible Analyzer was conducted in Spring and Summer 2009 at the ARM Climate Research Facility Southern Great Plains (SGP) site to compare measurements of cloud fraction and cloud height with the Total Sky Imager (TSI) and existing Infrared Sky Imager (IRSI).

ASIVA Demonstration

- ▶ Conducted at SGP Guest Instrument Facility
- ▶ Instrument installed by Solmirus
- ▶ Data collected from 21 May to 27 July 2009
- ▶ Provides radiometric sky images, cloud percent, cloud/sky temperature, sky opacity, and water vapor determination



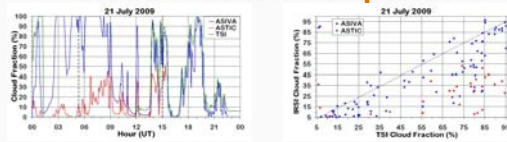
Summary

- ▶ Daytime images from both ASIVA and ASTIC compare well with TSI
- ▶ ASIVA cloud fraction data correlate very well with TSI values
- ▶ ASTIC cloud fraction data underestimate TSI values
- ▶ ASIVA cloud height algorithm needs refinement
- ▶ ASIVA's capabilities provide additional cloud property measurements that require future research and development

Background

- ▶ IRSI system installed in October 2005 at SGP
 - ▶ Blue Sky Imaging All Sky Thermal Infrared Camera (ASTIC)
 - ▶ daytime measurements significantly underestimated those from TSI
- ▶ IRSI Intercomparison Study conducted in September 2007 at SGP
 - ▶ compared measurements from five different types of infrared sky imagers
 - ▶ results did not provide a clear solution for obtaining nighttime cloud fraction
- ▶ After field campaign, Solmirus Corporation made significant improvements to hardware and retrieval algorithms of their All Sky Infrared Visible Analyzer (ASIVA)
- ▶ Solmirus offered to conduct demonstration of upgraded ASIVA at SGP

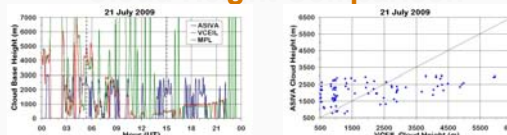
Cloud Fraction Comparison



Time series of 5-minute average cloud fraction in percent at SGP on 7/21/2009 from ASIVA, ASTIC, and TSI.

Scatter-plot of 5-minute average cloud fraction in percent at SGP on 7/21/2009 from ASIVA and ASTIC vs. TSI.

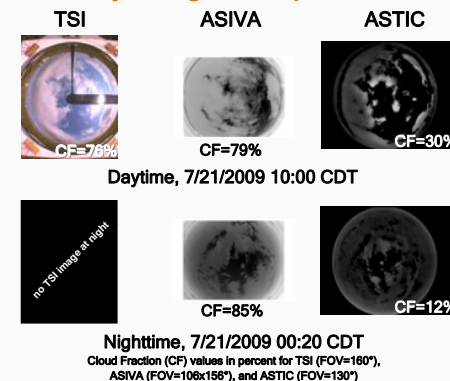
Cloud Height Comparison



Time series of 5-minute average cloud-base height in meters at SGP on 7/21/2009 from ASIVA, VCEIL, and MPL.

Scatter-plot of 5-minute average cloud-base height in meters at SGP on 7/21/2009 from ASIVA vs. VCEIL.

Sky Image Comparison



Objectives

- ▶ Produce nighttime cloud fraction product
- ▶ Capture hemispheric infrared images of the sky during both the day and night
- ▶ Compare ASIVA's cloud fraction and cloud height data with an existing IRSI, TSI, Ceilometer (VCEIL), and Micropulse Lidar (MPL) measurements
- ▶ Evaluate ASIVA's improved capabilities, which include wider field-of-view, absolute spectral radiance calibration, and ability to measure color temperature.

Instrument Specifications

	Detector	Wavelength range (μm)	Field of view (°)	Min. time resolution (sec)	Min. temp. detected (C)	Image resolution (pixel)
ASIVA	Microbolometer	8 - 14	130	0.5	-150	324 x 256
ASTIC	Ferroelectric	8 - 14	180	30.0	-30	320 x 240

Acknowledgements

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Reference

Morris, V.R. 2008. "The Infrared Sky Imager Intercomparison Study." In *Proceedings of the Eighteenth ARM Science Team Meeting*, U.S. Department of Energy, Washington, D.C.