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).

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

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.

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

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.

Instrument Specifications
<table>
<thead>
<tr>
<th>Detector</th>
<th>Wavelength range (µm)</th>
<th>Field of view (°)</th>
<th>Min. time resolution (sec)</th>
<th>Min. temp. detected (°C)</th>
<th>Image resolution (pixel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASIVA Bolometer</td>
<td>8 - 14</td>
<td>150</td>
<td>0.5</td>
<td>-150</td>
<td>324 x 256</td>
</tr>
<tr>
<td>ASTIC Infra-red</td>
<td>8 - 14</td>
<td>180</td>
<td>30.0</td>
<td>-30</td>
<td>320 x 240</td>
</tr>
</tbody>
</table>

Sky Image Comparison
- Daytime, 7/21/2009 10:00 CDT
  - ASIVA vs. TSI
- Nighttime, 7/21/2009 00:20 CDT
  - ASIVA vs. ASTIC

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Reference