Infrared Sky Imager

IR Sky Imager

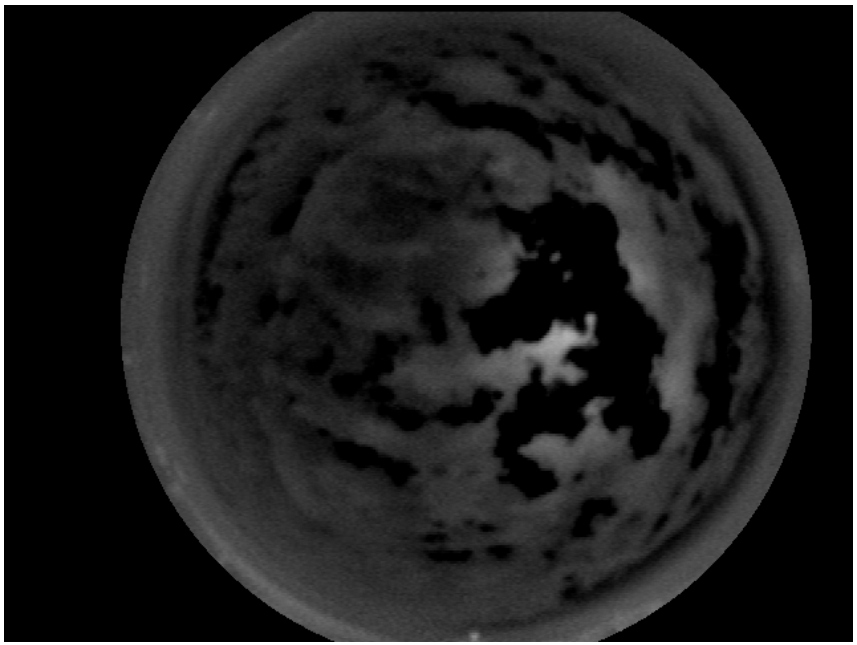
- Blue Sky Imaging 320C All-Sky Thermal Infrared Camera
- Uncooled ferroelectric detector
- Wavelength range is 8 to 14 microns
- Captures full hemisphere infrared images of the sky
- Images clouds during both the day and night
- Does not require solar occultor
- Software calculates percentage of cloud cover (cloud fraction) for four fields-of-view

IR Sky Imager Status

- Installed in October 2005 at SGP Guest Instrument Facility for testing
- Failed after 3 weeks due to moisture intrusion
- Modified by Blue Sky Imaging
  - added low-wattage heaters to reduce condensation
  - added vents with Gortex screens to prevent pressure differential
  - added Styrofoam insulation to minimize changes in temperature
  - increased amount of desiccant
- Reinstalled on 15 August 2006

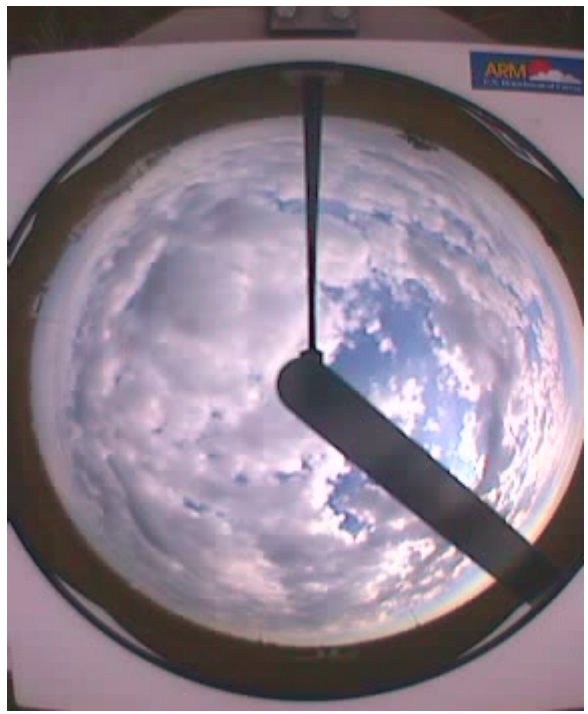
Sky Image at SGP GIF
with sun covered by clouds

IRSI



10/19/2005 15:31:39

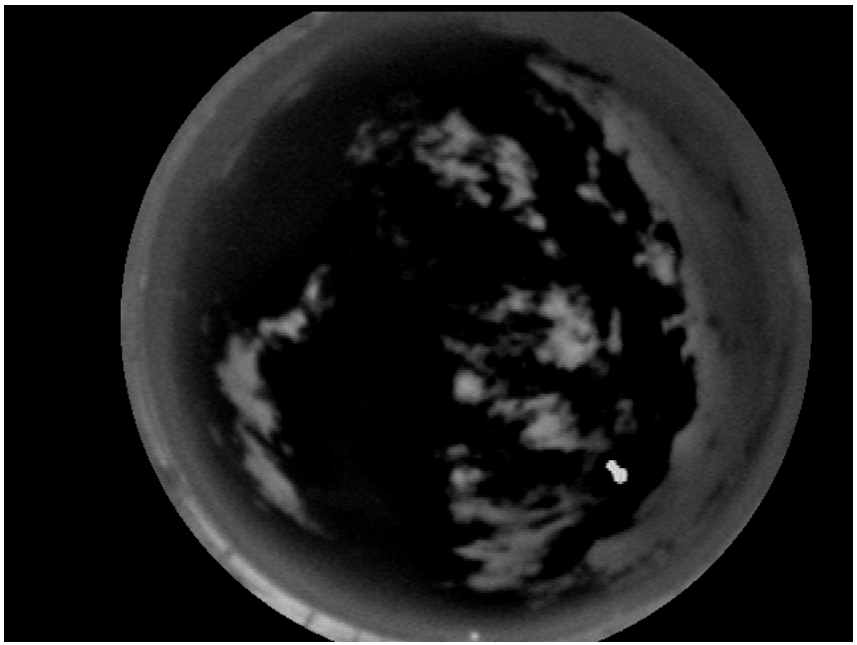
TSI



10/19/2005 15:31:30

Sky Image at SGP GIF
with sun exposed

IRSI



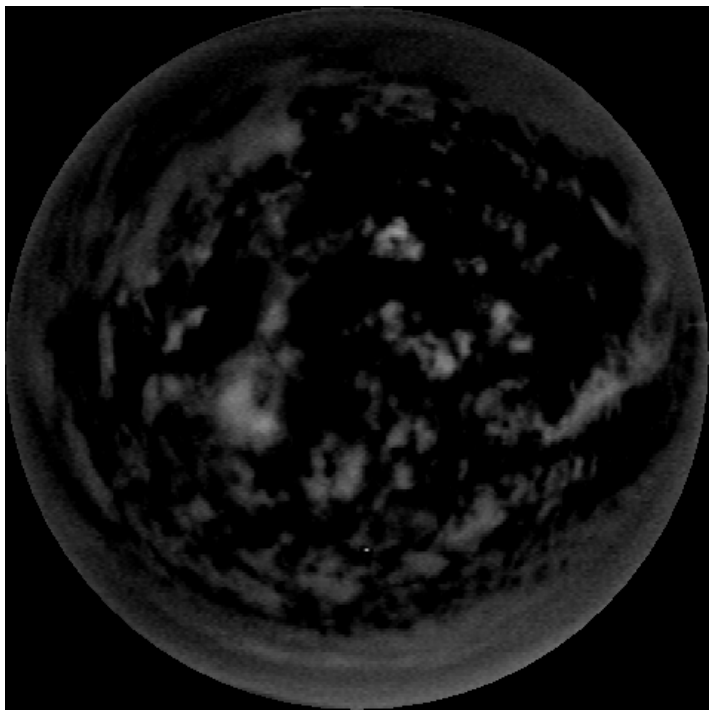
10/19/2005 16:00:09

TSI

10/19/2005 16:00:00

Sky Image at SGP GIF
at night

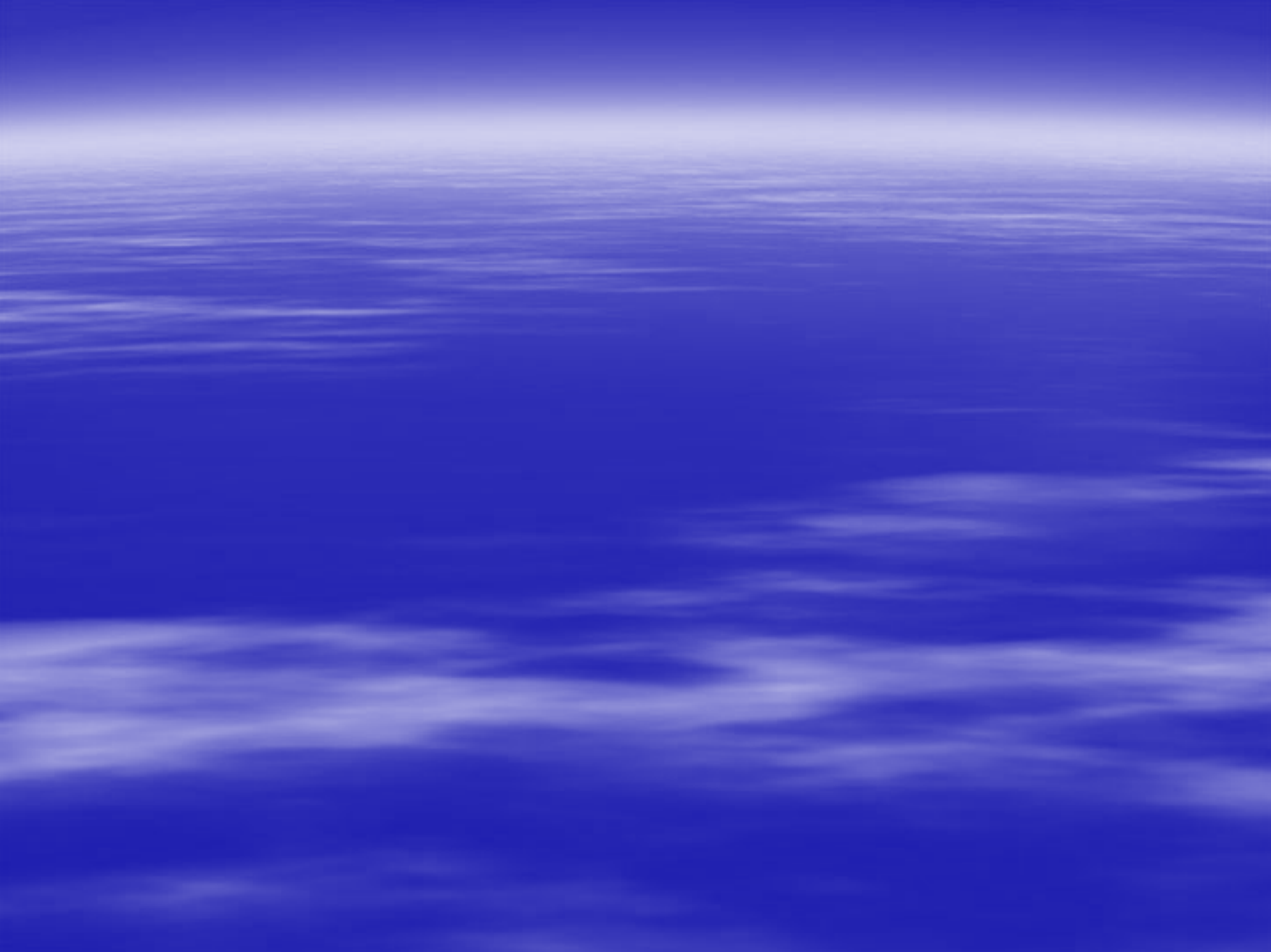
IRSI



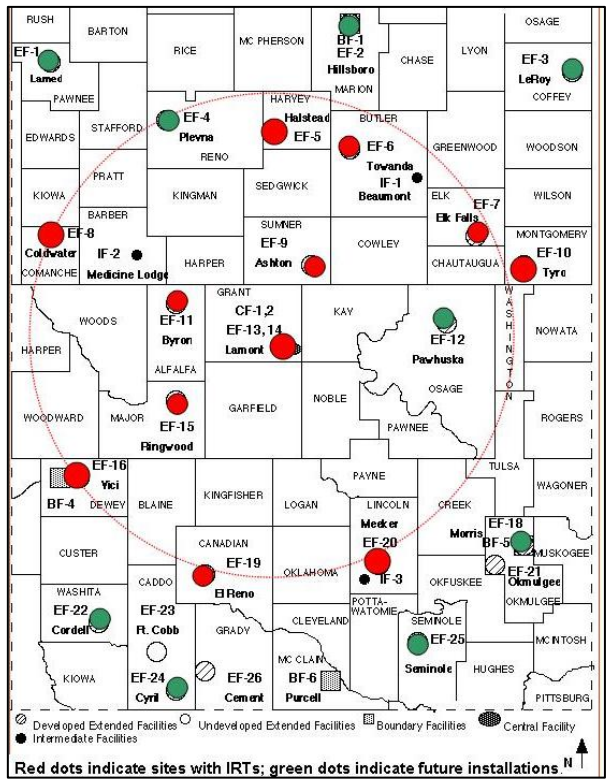
9/28/2006 01:47:41

Plans

- Evaluate effectiveness of heaters
- Verify cloud fraction data
  - compare with TSI
- Improve vendor's software
  - system settings
  - region masking
  - user interface
  - output file



Infrared Thermometers
at SGP Extended Facilities



IRT Status

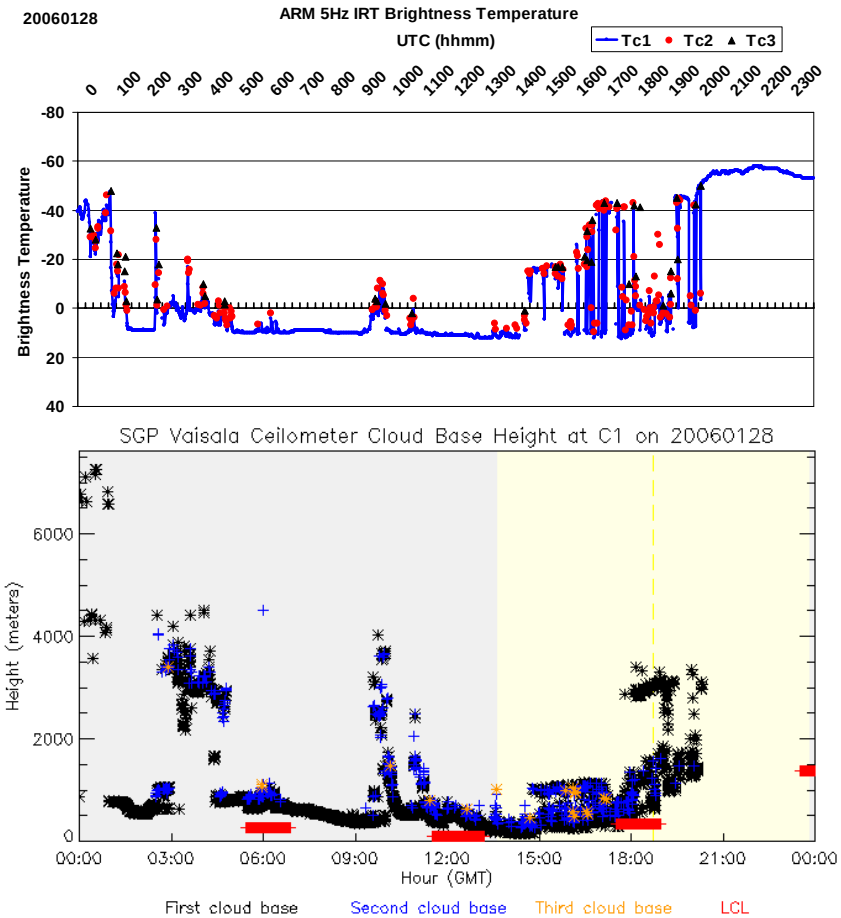
- Twelve IRTs deployed across SGP domain
  - installed at eleven Extended Facilities from August to December 2005
  - replaced existing IRT at Central Facility in January 2006
- Enclosure developed to prevent contamination of gold mirror
  - filtered fan for positive air flow

IRT Status

- Data sampled at 5 Hz
  - extended temperature range (-100C)
  - serial output
  - diagnostic values
- Data being ingested and archived
  - datastreams: irt and irt200ms
- Problem measuring sky temperatures < -60C
  - does not compare well with AERI
  - checked dependence on instrument, mirror type, incidence angle, path length, etc.
  - apparent influence by enclosure or mirror
  - on-going tests by manufacturer

Cloud Temperature Screening

- Conditional sampling detects clear-sky and opaque-cloud data
  - produces 1-minute frequency histogram of all temperatures
  - screens for temperature of up to three opaque cloud layers
- Methodology developed to account for intervening atmosphere below cloud



Plans

- Infer longwave effective sky cover
  - adapt technique of Takara and Ellingson (2003)
- Estimate cloud radiating surface height
  - empirical relationship with optical thickness and radiating temperature
- Explore possibility of inferring cloud emmisivity for non-opaque clouds (periods rejected by conditional screening)
- Install IRTs at remaining ten Extended Facilities

Proposal: IRT Cloud Temperature VAP

- Currently no post-processing of 5-Hz data
- Propose processing the data through the conditional sampling methodology and adjust for below-cloud contribution
  - makes data more useful to ARM users
  - gives what is needed for further development/refinement of LW sky cover, cloud height, and non-opaque cloud emmisivity retrievals