Assessment of HISUI Radiometric Performance Using Vicarious Calibration and Cross-Calibration

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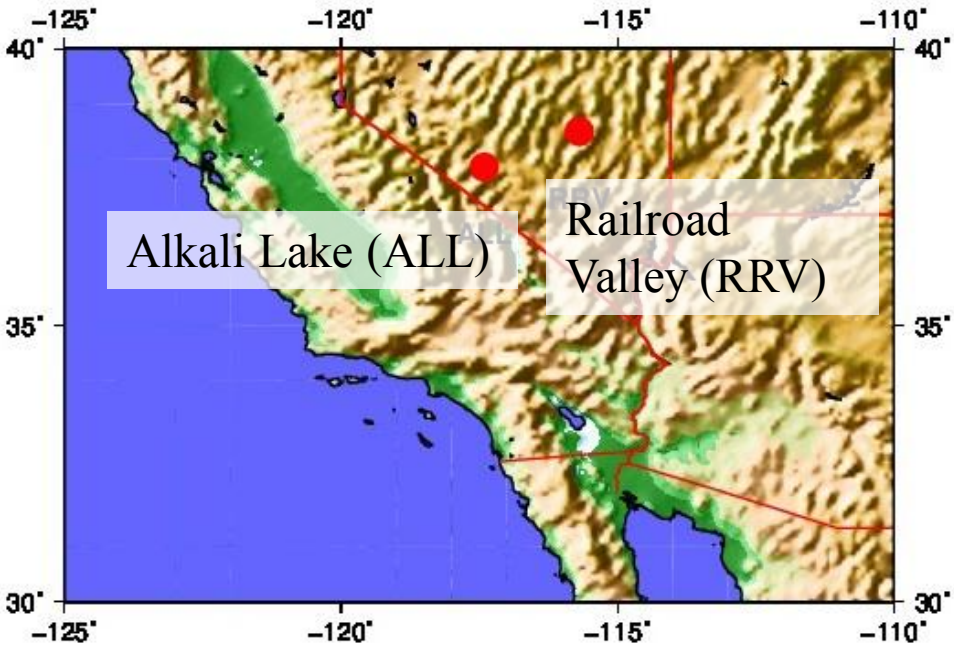
Outline

- Introduction
- Vicarious calibration
- Cross-calibration
- Radiometric Database (DB)
- Calibration data archive system (CAS)
- Conclusion

Introduction

- The Hyperspectral Imager Suite (HISUI) is the Japanese next-generation Earth observation project, and is being developed by Japanese Ministry of Economy, Trade, and Industry (METI).
- HISUI Calibration Working Group considers the following calibration methods.
  - Onboard Calibration : Calibrated using the calibration device on satellite
  - **Vicarious Calibration : Calibrated by simultaneous ground measurement**
  - **Cross Calibration : Calibrated using other satellite instruments**
  - Lunar Calibration (TBD): Calibrated by viewing the moon (stable radiance)*

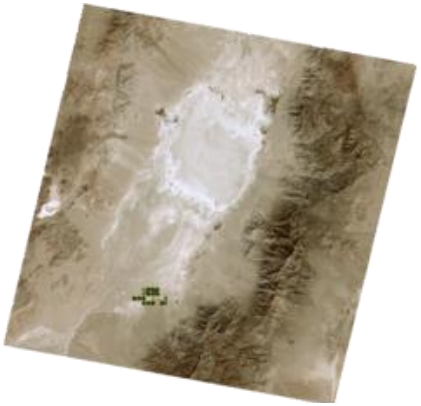
Vicarious calibration sites for HISUI

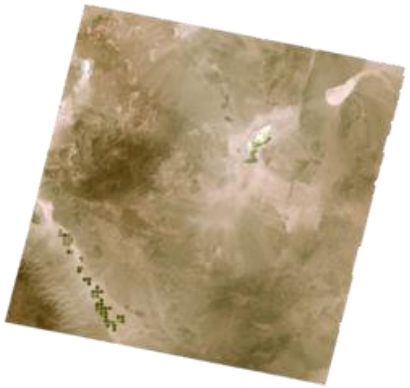


Summer in northern hemisphere

Summer in southern hemisphere

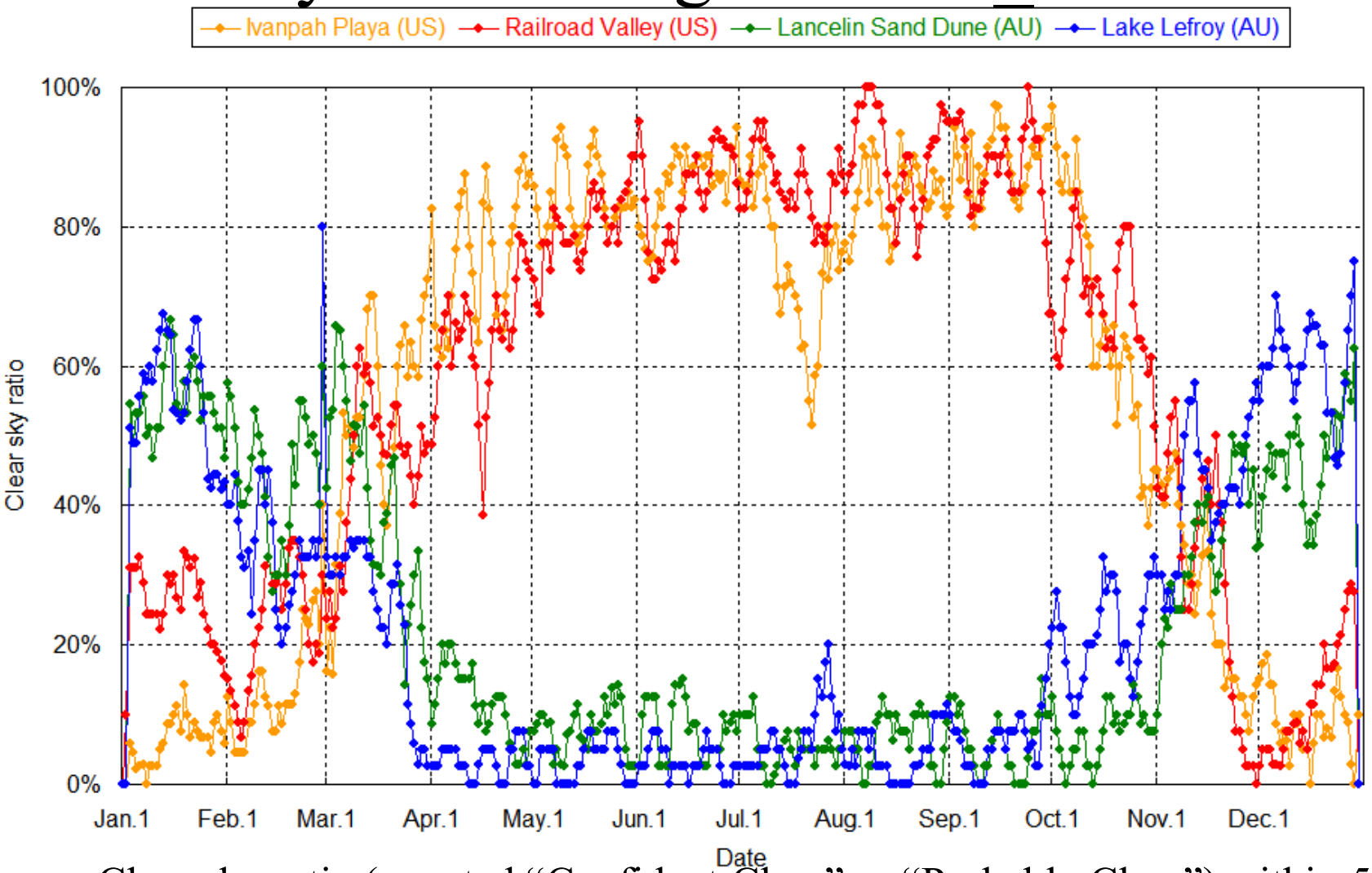
- Collaboration with CSIRO since 2009



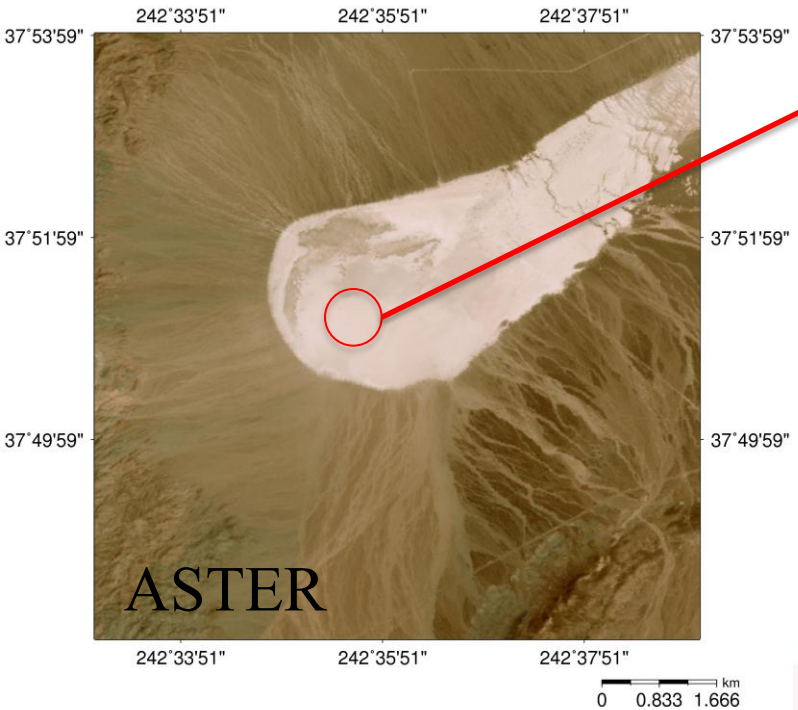


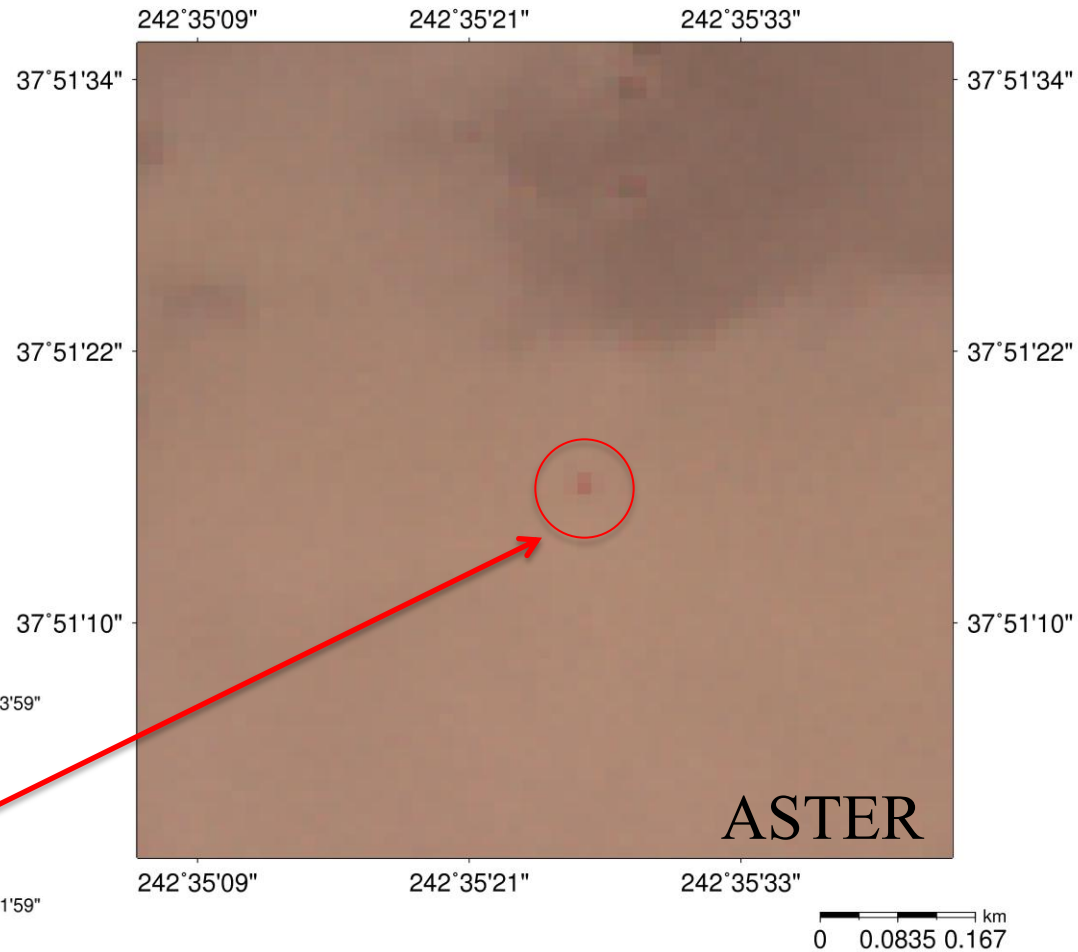
We try to increase vicarious calibration frequency using both of northern hemisphere and southern hemisphere.

Clear Sky Ratio using MOD35_L2



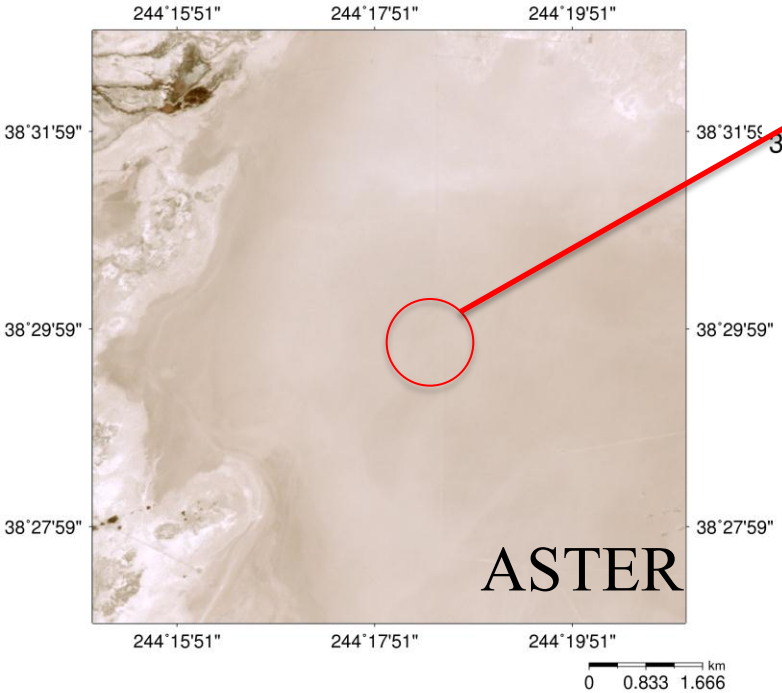
- Clear sky ratio (counted "Confident Clear" or "Probably Clear") within 5days from 2000 to 2011 is calculated.

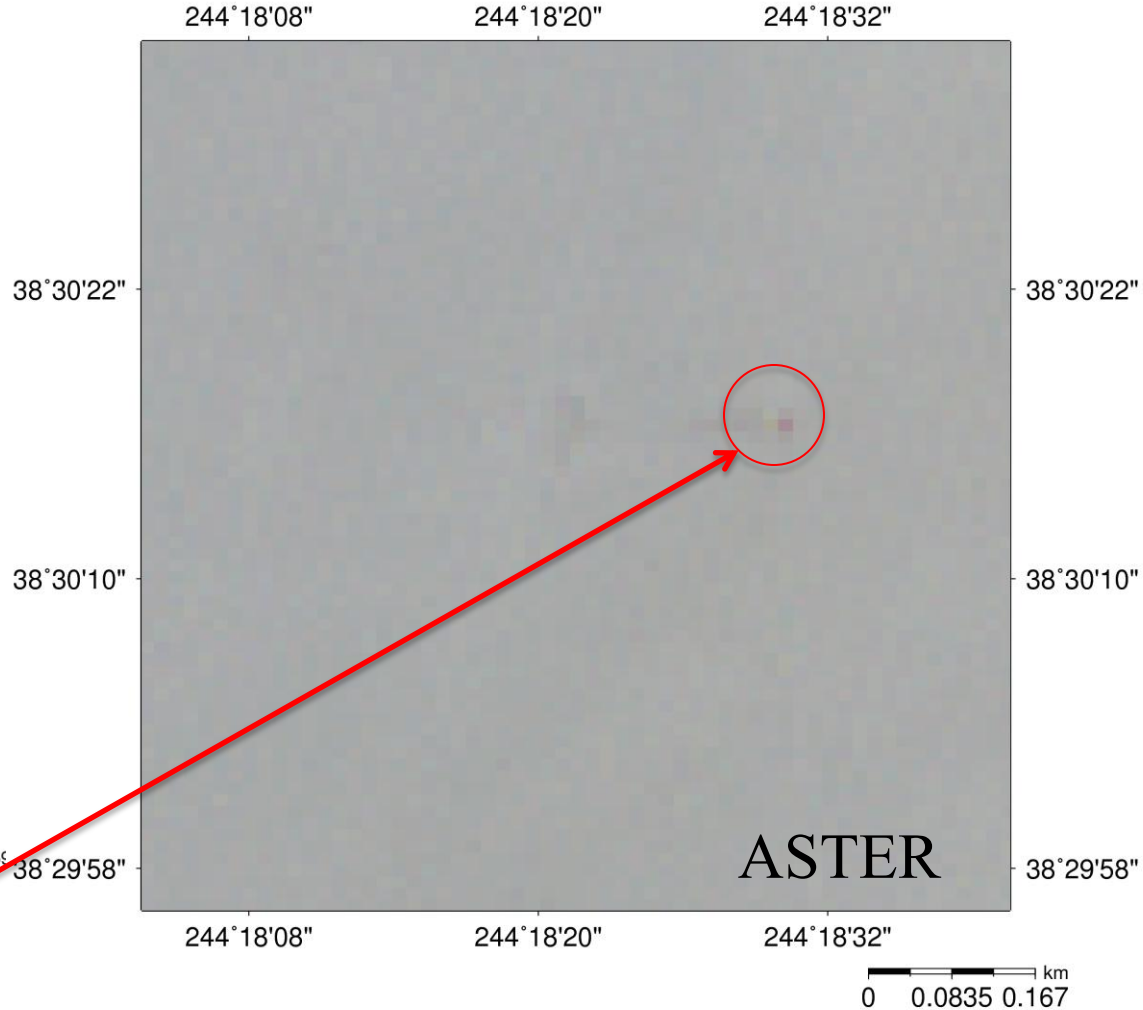




ASTER@Alkali Lake
(042-097, 8.5deg)

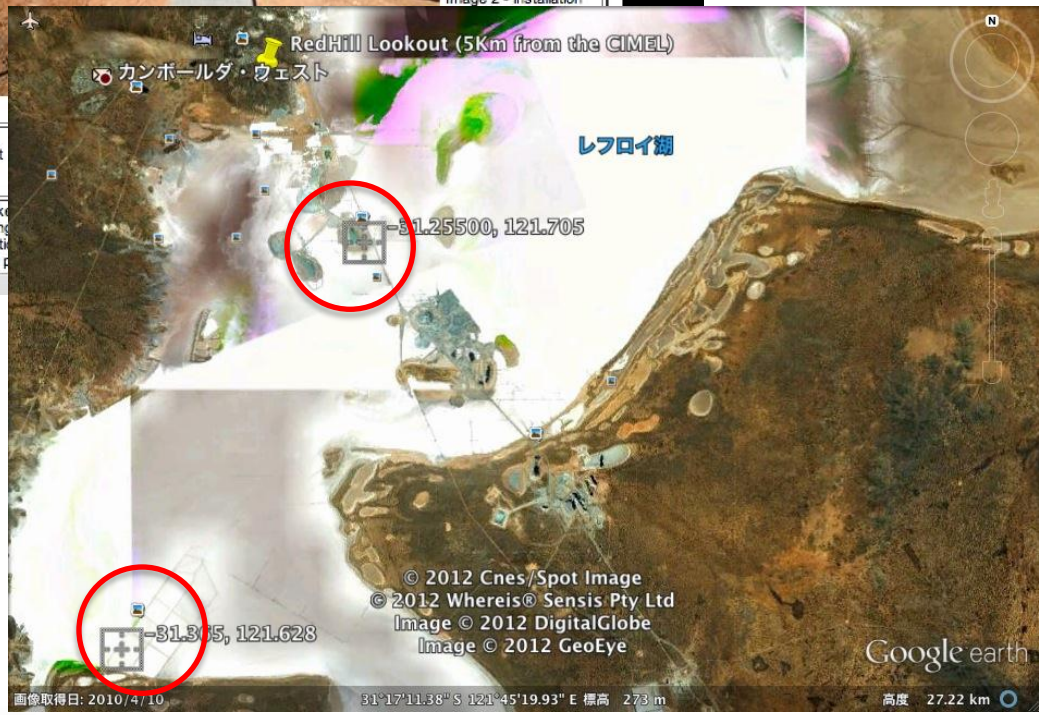
Alkali Lake in US measured on Sep 4, 2014





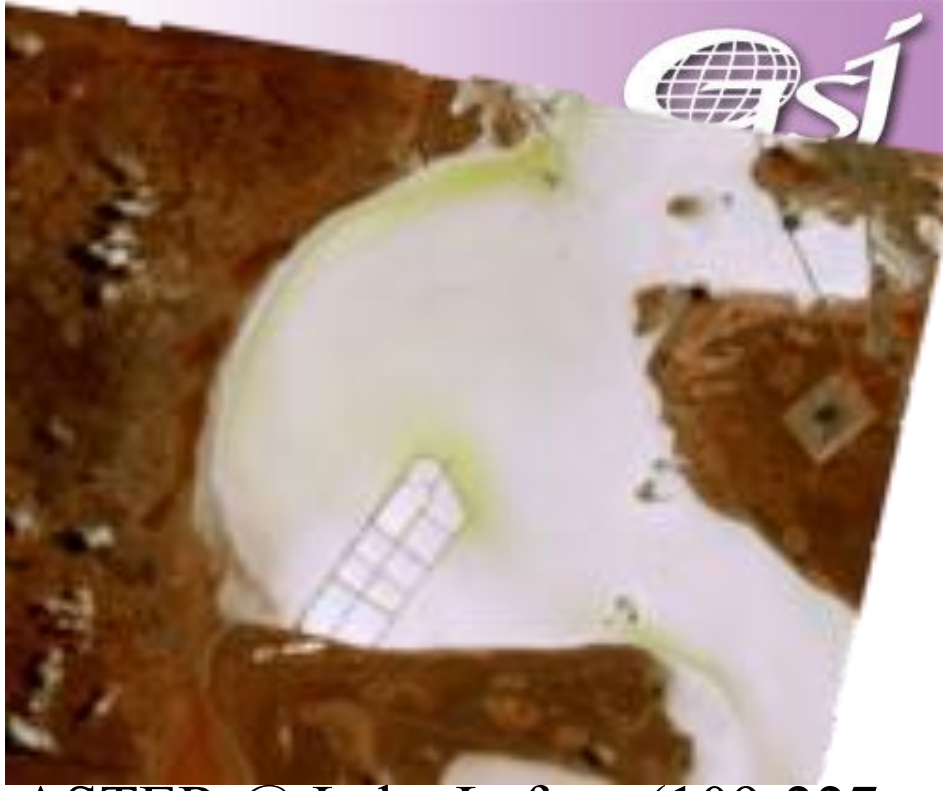
: ASTER@Railroad Valley
(040-096, 0[deg])

Railroad Valley in US measured on Sep 6, 2014



CSIRO set up the CIMEL site, which is known as Aeronet (http://aeronet.gsfc.nasa.gov/) station close to Lake Lefroy, and ground-based atmospheric data can be downloaded from Aeronet since June, 2012.

Nov 28, 2014



ASTER @ Lake Lefroy (109-227, 0deg pointing)

Nov 29, 2014

Instruments

Ozonometer and Sunphotometer

Sunphotometer

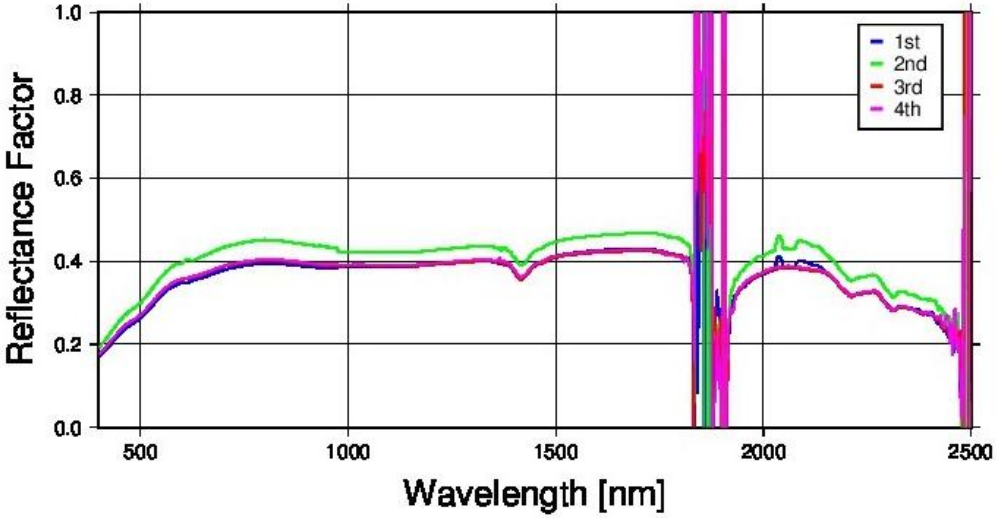
Sky Camera

Thermo Recorder
(Pressure/Temperature)

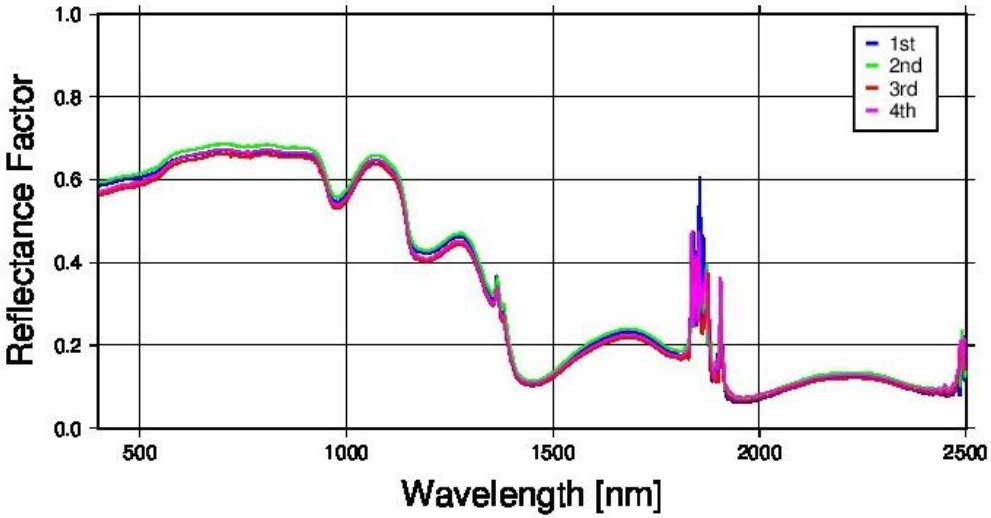
White reference panel

Spectroradiometer

Example of averaged surface reflectance factor

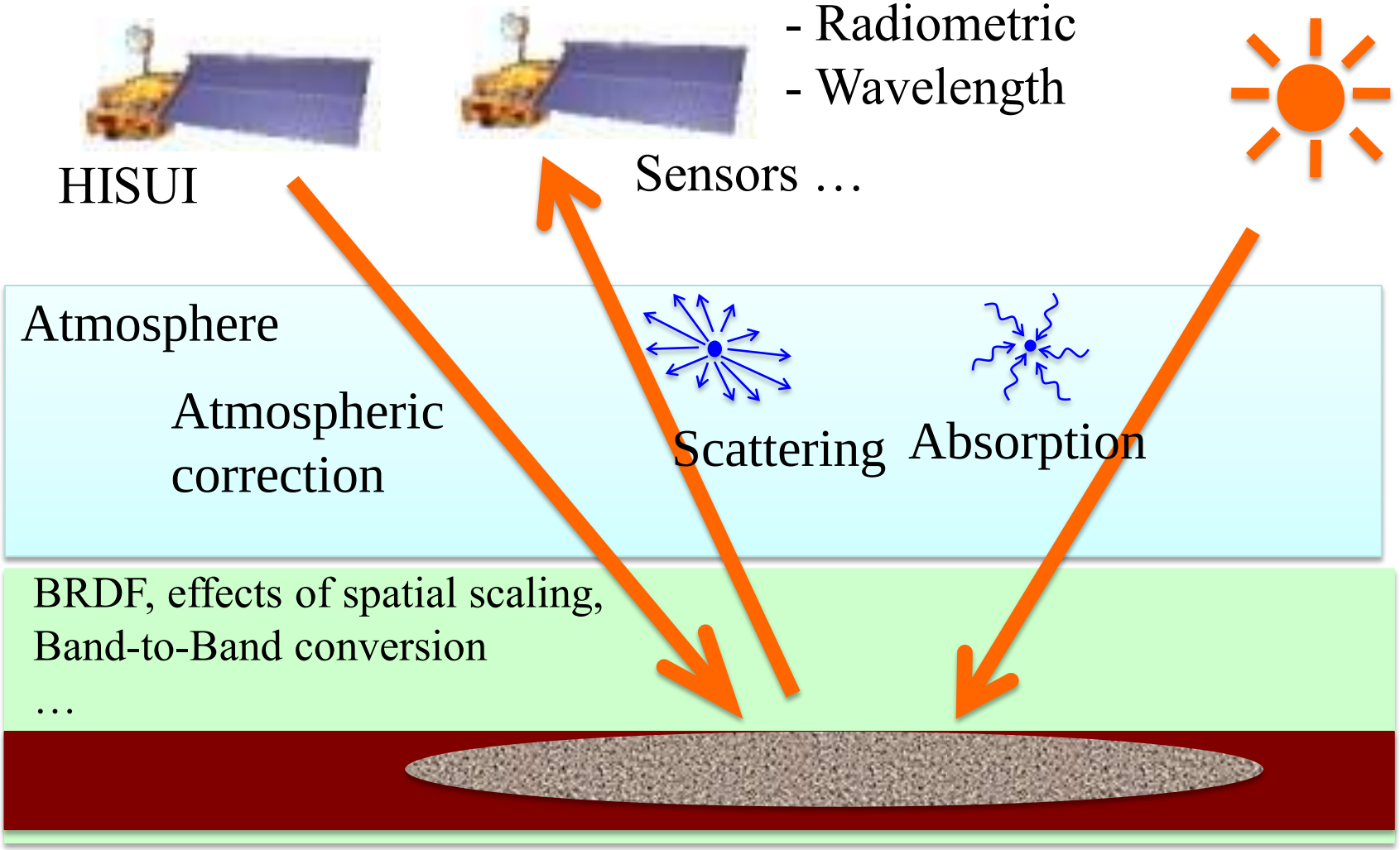


Railroad Valley



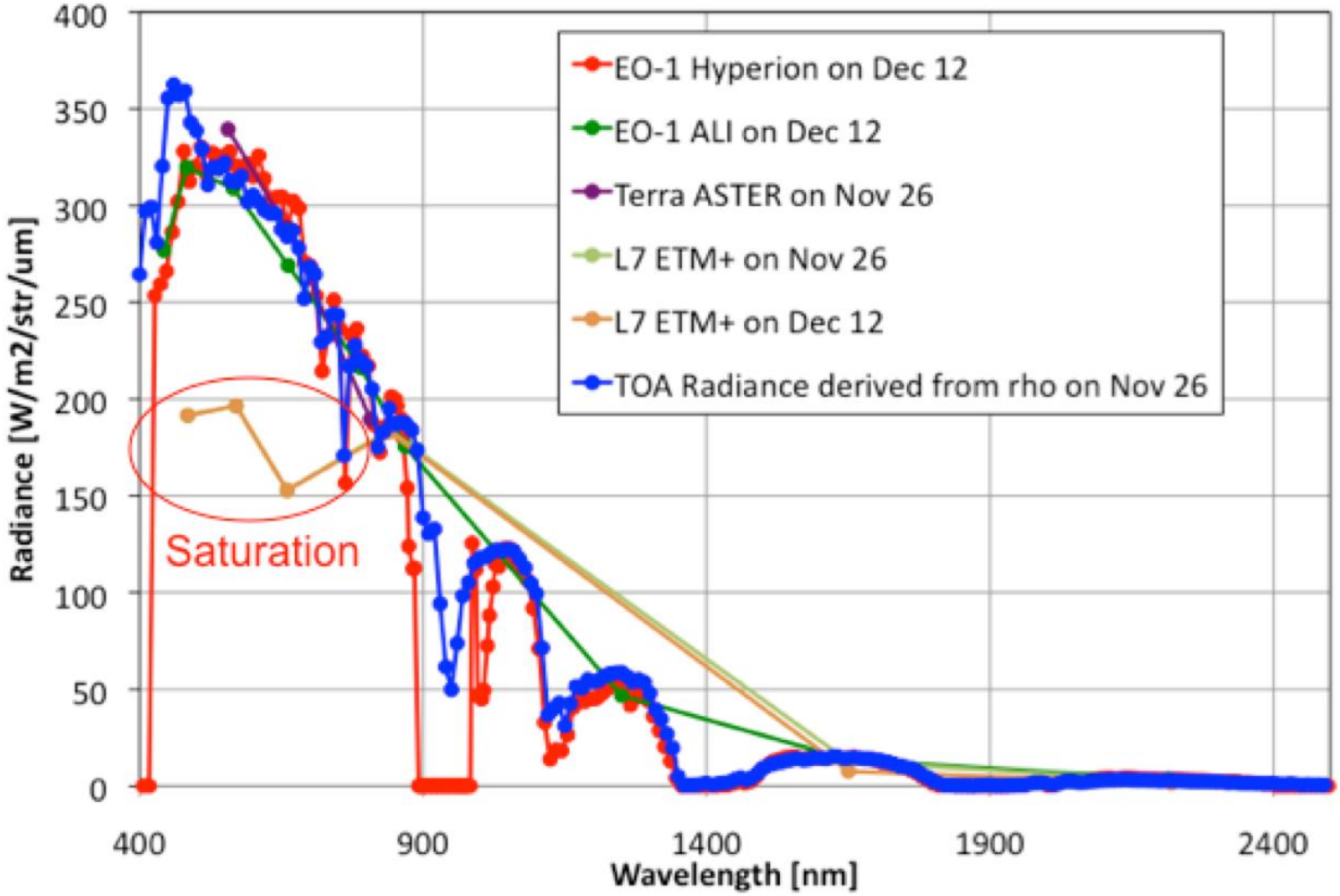
Lake lefroy

Cross-calibration



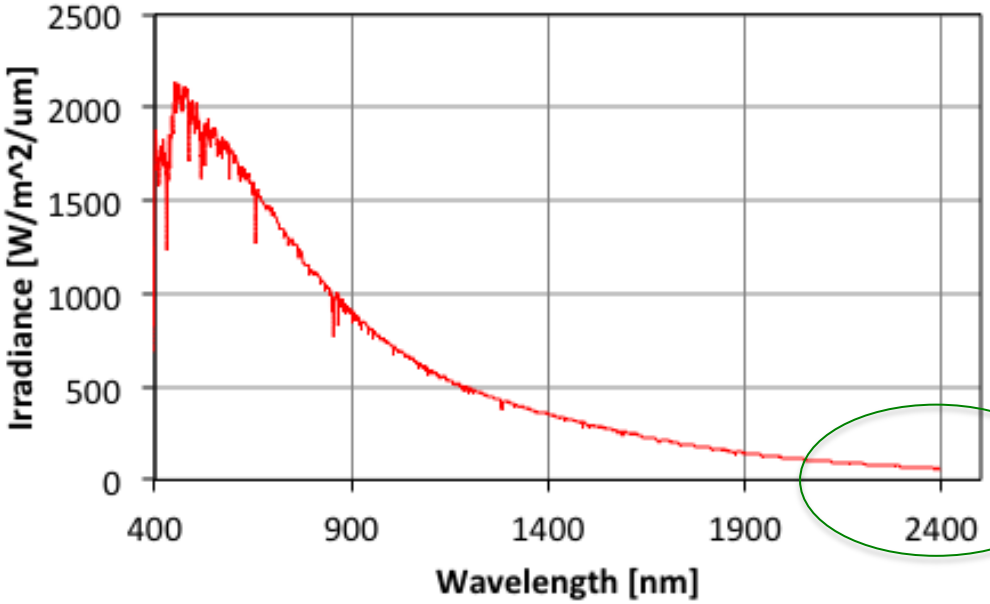
- The CEOS IVOS sub-group intends to define calibration reference test sites for land.
- The algorithm of cross-calibration for HISUI will be constructed.

Comparison of TOA radiance



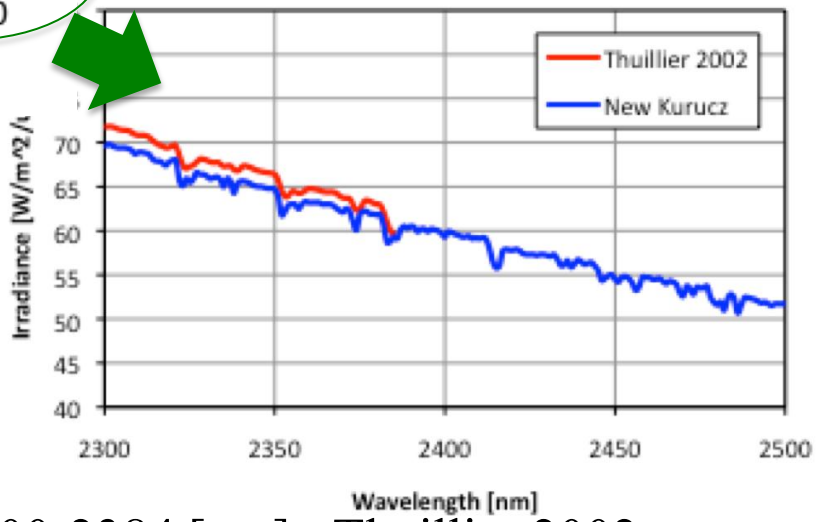
Atmospheric condition and BRDF should be considered in case of different measurement date.

Spectral Irradiance



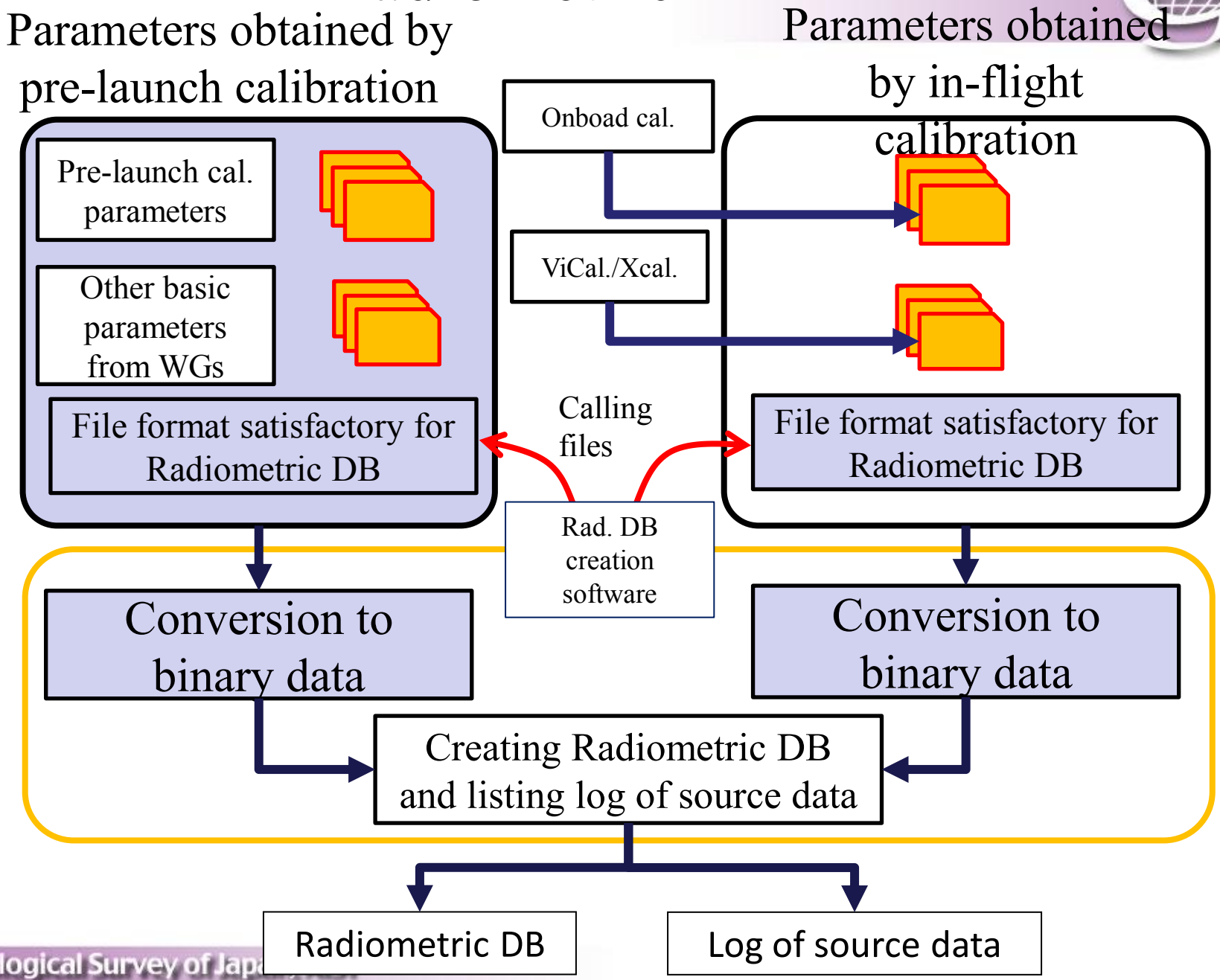
CEOS recommended solar irradiance spectrum (Thuillier 2002)

SUN01kurucz2005 irradiance model is included in MODTRAN5 code.

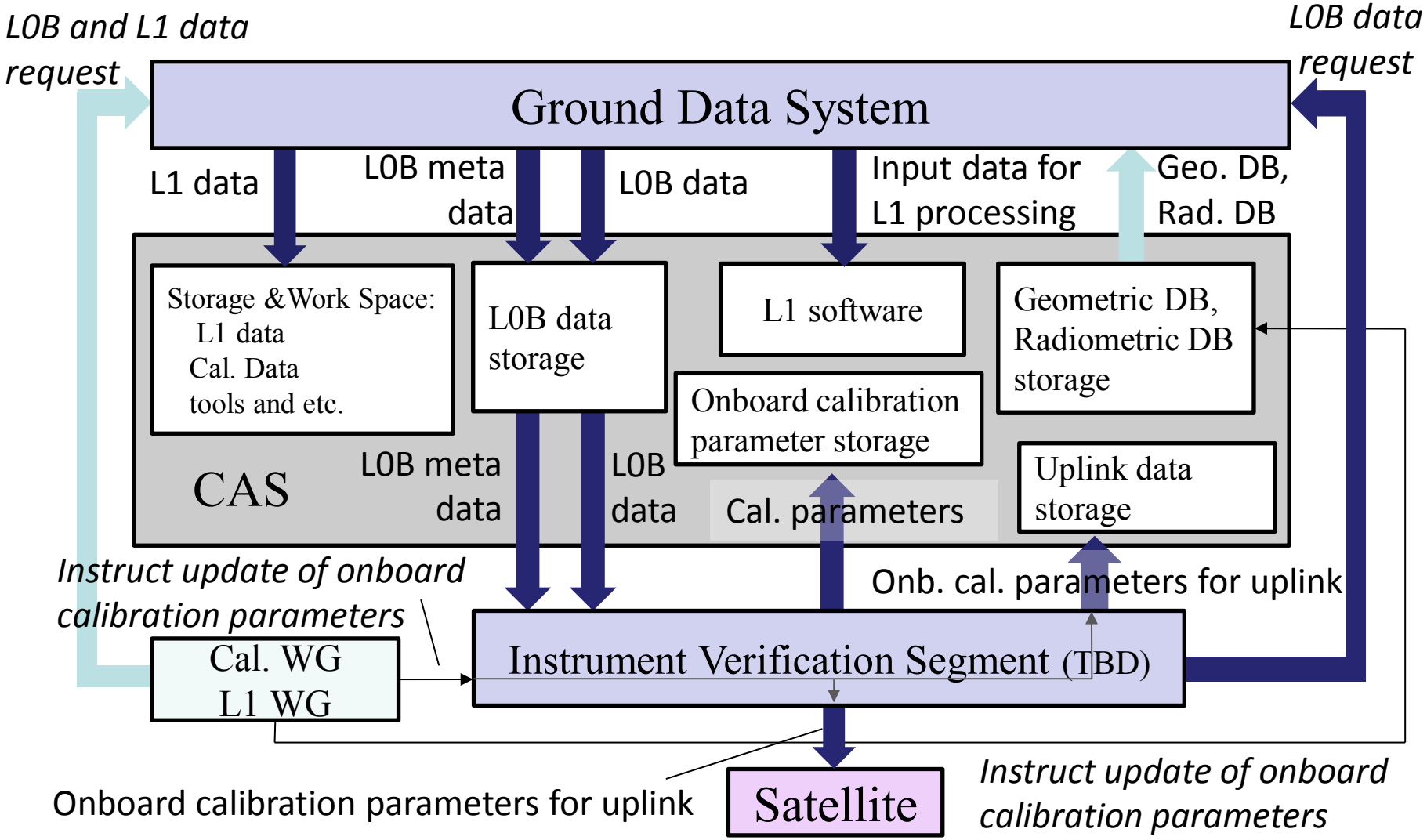


400-2384 [nm] : Thuillier 2002
2384 -2500[nm] : SUN01kurucz2005

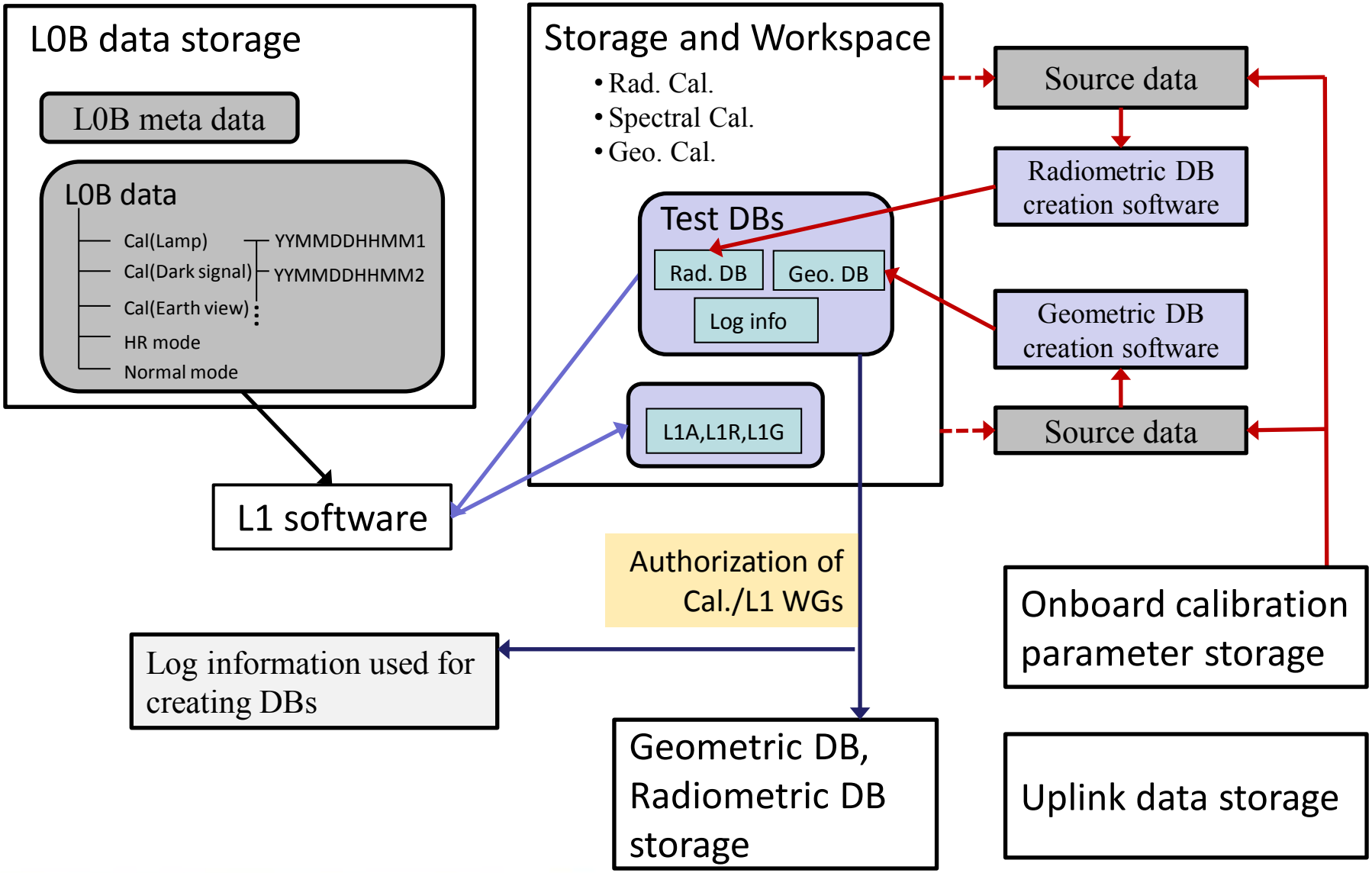
Radiometric DB



Overview of HISUI calibration data archive system (CAS) and its surroundings (Planning)



HISUI calibration archive system (CAS) plan



Conclusions

- HISUI CalWG plans to conduct vicarious calibration in both of northern hemisphere and southern hemisphere.It is important to understand the characteristics between the NIST traceable reference panel and other panels used in the field experiments.

- Multispectral sensors data can be also used in cross-calibration of HISUI hyperspectral imager over the dry lake, salt lake, and CEOS reference test sites.

- HISUI CalWG is going to maintain the radiometric DB and CAS for renewing HISUI calibration parameters.

- EO-1 Hyperion and ALI, Landsat-7 ETM+, Landsat-8 OLI, and Terra MODIS and ASTER with ground-based data by vicarious calibration experiment is useful as HISUI vicarious calibration and cross- calibration in the pre-launch phase.