1. CLARREO RSS as Calibration Reference

CLARREO Reflected Solar Spectrometer (RSS) Accuracy Fresh 0.15% (+1%) over reflected solar broadened.

CLARREO RSS reflectance inter-calibration SRF uncertainty goal: 0.15% (+1%) error contribution over an averaging time period of 10 months (Lark, 2003). Random error, from data matching noise.

2. CLARREO RSS Pointing Ability

CLARREO RSS pointing ability will provide RI coincident data matched in RAZ and VZA (scan) angles.

Angular matching:
- Type ‘SS’ allows to match azimuth angle.
- Green ‘RSS’ allows to match scan/RZA angle

3. CLARREO RSS Spectral Range & Sampling

Spectral range: CLARREO RSS will make observations with required accuracy from 300 nm to 2300 nm wavelength to allow reference inter-calibration of CERES SW broadband measurements.

Sampling Summary for CLARREO RSS/JPSS:

- TOP: CLARREO nadir-only sampling, BOTTOM: CLARREO pointing sampling. Numbers in arrows and lines, respectively.

4. CLARREO RSS Spatial Coverage - Swath

CLARREO RSS swath, 100 km (at nadir) to provide sufficient inter-calibration sampling.

5. CLARREO RSS Preferred Orbit

CLARREO RSS Preferred Orbit 90° Polar orbit, 609 km altitude, RAAN = 0° or 180° (+/- 10°)

6. CLARREO RSS RI Sampling

TI Method: Sensor measurements compared to high accuracy reference on orbit (CLARREO RSS observations). The method is statistical, different from sensor to sensor depending on its calibration model.

Example: CERES SRF Degradation Test

Clear ocean (N = 1000) and marine stratus scenes (N = 7000)

Sampling Summary for CLARREO RSS/JPSS:

7. Numeric Uncertainty Estimates

Example: MODIS Band 1: 620 - 670 nm

0.5 km CERES, Gain 1%, Offset 0.2 Wm

RI Imager Error (k= 1) ( % )

All Data

RI Imager Error (k= 1) ( % )

0.05, 0.1, 0.15

RI Imager Error (k= 2) ( % )

0.05, 0.1, 0.15

RI Imager Error (k= 2) ( % )

0.05, 0.1, 0.15

8. Summary

- With required accuracy of 0.15% (+1%) and 2.0-pointing ability CLARREO RSS will be able to perform reference inter-calibration of CERES and VIIRS sensors on JPSS with expected average accuracy of 0.7% (k=1).

- The parameters of inter-calibration constraint:
  - Effective Offset
  - Effective Gain
  - Effective Instrument Response
  - Month-to-month sensor stability
  - Sensitivity to polarization (VIBES)
  - Degradation of Spectral Response (CERES)