VIIRS NCC Imagery at Beta
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DR 4859

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The NCC Imagery EDR takes VIIRS DNB SDRs and transfers the appropriate values on as Ground Track Mercator (GTM) projection.

GTM uses the nearest pixel, it does not use an average unless an isolated pixel has a bad value.

Creating NCC Imagery includes two additional steps not taken for any other imagery product:
- It computes an albedo for each pixel.
- It mitigates solar/lunar variations across scan lines through the use of Look-Up Tables (LUTs).
Typical Terminator NCC Image

- Image is extreme northern Canada
  - Transition from light to dark not obvious
NCC Imagery Requirements

• Current requirements based on the Level 1 Requirements Document (L1RD) are restricted to resolution, mapping accuracy, and latency
  – Quality requirements found in the old NPOESS program are no longer present

• Actually use of NCC Imagery tied to ability of a human analyst to determine his/her features of interest through Imagery
  – If the operational user is not satisfied, the Imagery EDR has failed, independent of any quantitative requirements

• The Imagery validation team has focused on the later in the early stages of validation
• The two fundamental features the Imagery Cal/Val team focused on for NCC Imagery at this stage was its performance in the terminator and under lunar illumination conditions
  – The terminator is where the LUTs have their greatest impact
  – Nighttime visual imagery is unique to the NCC product

• Other aspects were deferred to the SDR team
  – Quantitative validation of resolution and latency handled by other teams
  – Geolocation qualitatively addressed at this time
    • Earlier issues have been resolved
Beta Definition

• Early release product
• Initial calibration applied
• Minimally validated and may still contain significant errors
• Available to allow users to gain familiarity with data formats and parameters
• Product is not appropriate as the basis for quantitative scientific publication studies and applications
Beta Evaluation

• Early release product
  – NCC Imagery has not been extensively analyzed by operational users
  – Imagery is not available to real-time users on a timely basis
    • Neither NDE or AFWA can make Imagery available to their general set of customers in near real time as of this briefing
    • Only the Navy is regularly reviewing the product in a near real time environment
  – NCC only useful at night within 48 hours of the full moon
    • Therefore only 5 nights out of the 29 day lunar cycle
• Initial calibration of the DNB is complete
  – VIIRS DNB SDRs declared “beta” in May 2012
  – No software changes have yet been made to the NCC Imagery EDR
Beta Evaluation

- Minimally validated and may still contain significant errors
  - Significant errors have been identified and are documented as Discrepancy Reports
    - Fill values in the shape of triangles at corners of the Imagery
      - This issue is related to the ground system and has already been mitigated
    - Stray light evident on the dark side of the terminator
    - Dark pixels contain fill indicating albedos are out-of-bounds
    - Missing data exists in granules crossing the 105 solar angle boundary
  - Examples of the three issues in work follow
Stray Light

• Root cause is sunlight shining into the sensor
• Work in progress to mitigate through software
Fill in Very Dark Pixels

- Root cause unknown, likely from multiple causes
  - Number of pixels affected increase as lunar illumination decreases
No NCC Imagery at 105 Solar Angle

• Root cause unknown
  – Speculation is an adverse effect from a granule level flag indicating the entire granule is “day”

Diagonal follows the 105 solar angle
Beta Evaluation

• Available to allow users to gain familiarity with data formats and parameters
  – NCC Imagery may be retrieved through CLASS or GRAVITE
  – Both NDE and AFWA working towards real-time support
    • AFWA is shipping NCC Imagery to NRL-Monterey in near real time
      – Some of this Imagery appears on their NexSat web site

• Product is not appropriate as the basis for quantitative scientific publication studies and applications
  – NCC Imagery, in general, does not contain quantitative applications
  – VIIRS DNB SDRs only at beta stage
  – Also note the issues just shown
Conclusion

• NCC Imagery has met the beta stage based on the definitions and the evidence shown
  – It exceeds the definition of beta in some cases

• Remaining issues are known and at least a preliminary way ahead has been established
  – Each of the four identified issues has been mitigated or is actively being resolved

• NCC imagery has reached the beta stage of validation