VIIRS NCC Imagery at Beta
CCR 12-0683
DR 4859

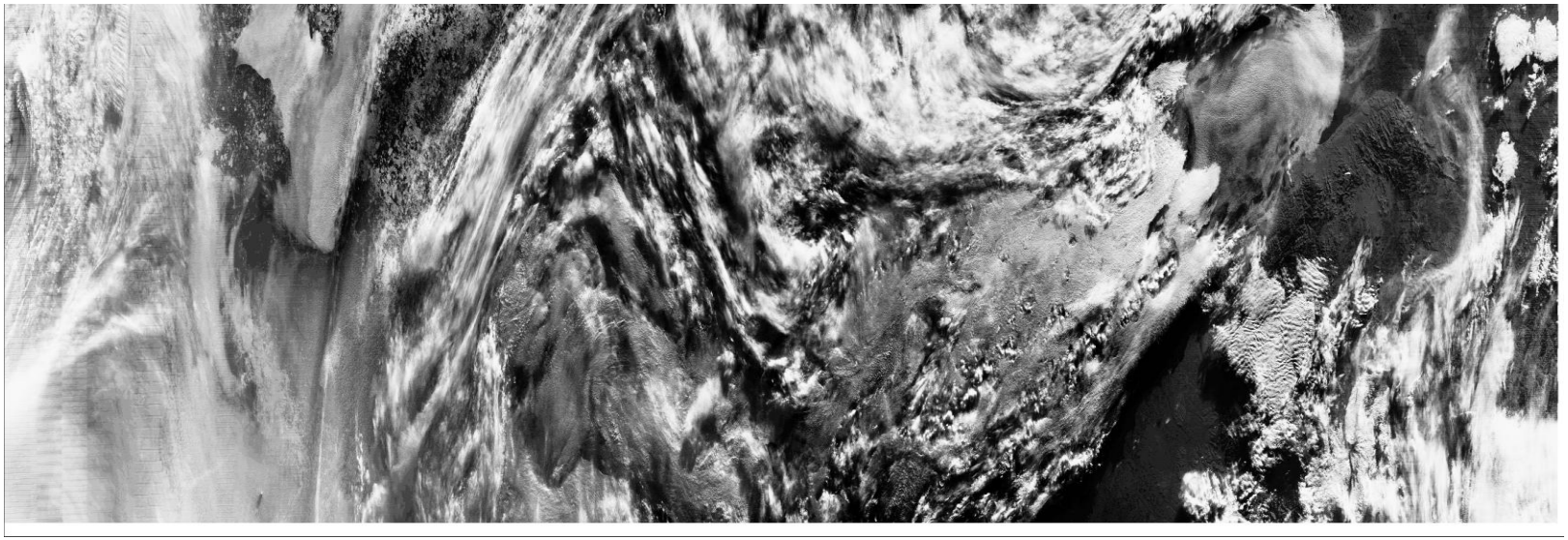
Dr. Thomas Kopp – Imagery Validation Lead
Dr. Donald Hillger – Imagery Product Lead
Mr. Ryan Williams - Imagery JAM

Brief summary of NCC Imagery

- 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

General Guidelines

- 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

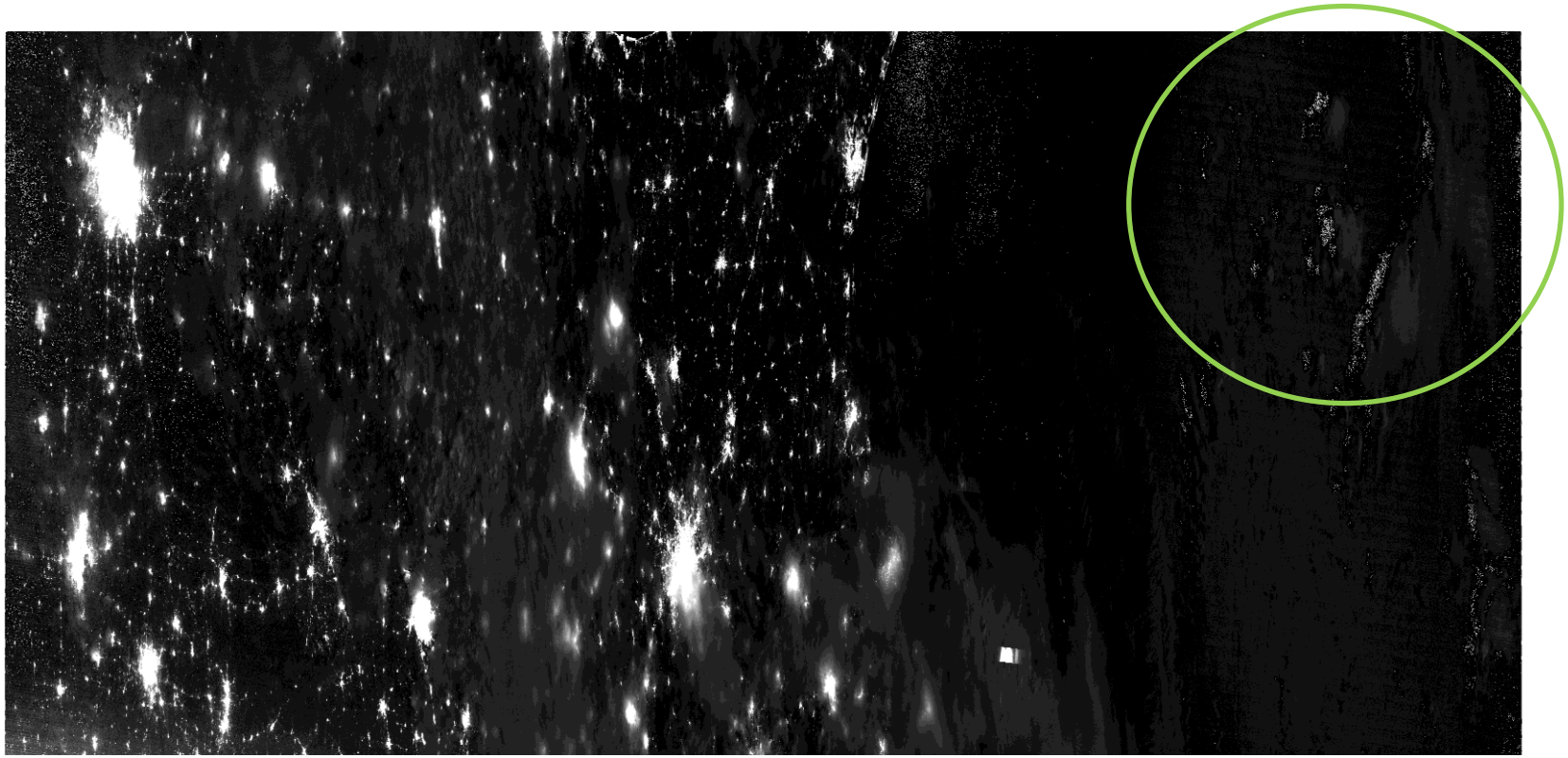
- Minimally validated and may still contain significant errors
  - Significant errors have been identified and are documented as Discrepancy Reports
    - Fill values in the shape of triangles at corners of the Imagery
      - This issue is related to the ground system and has already been mitigated
    - 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

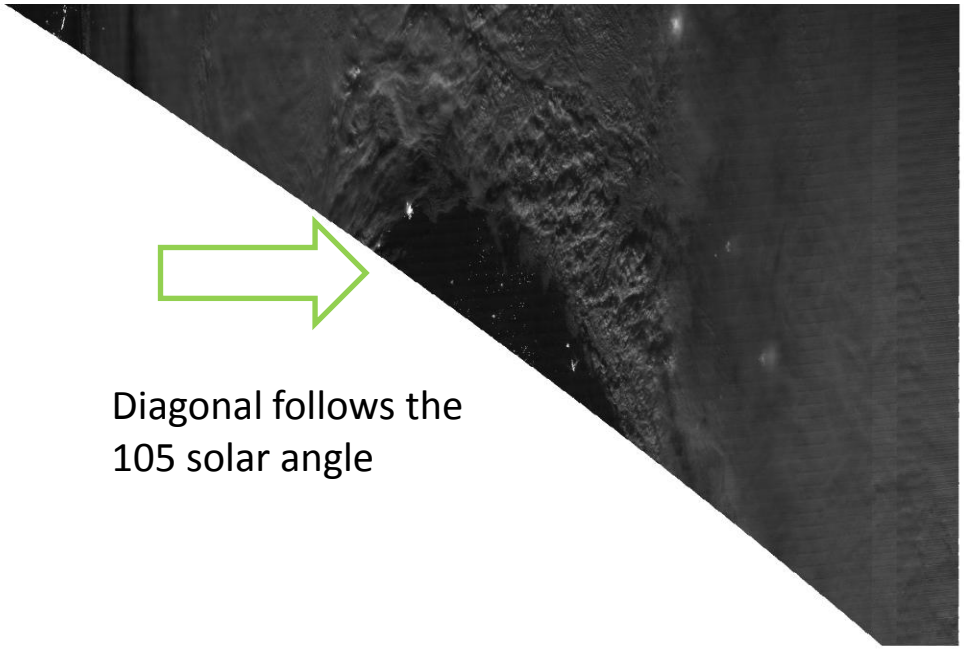
Fill in Very Dark Pixels

- 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”



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