**A Consistent EPIC Visible Channel Calibration using VIIRS and MODIS as a Reference**

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### Introduction
- EPIC onboard the DISCOVR satellite at L1. Lack of onboard calibration.
- Filter wheels radiometrically calibrated at the sensors to monitor stability.
- EPIC’s constant view of the Earth provides unique opportunity for inter-calibration of EPIC channels using well-calibrated instruments in low Earth orbit (LEO) satellites.
- Inter-calibration is performed by ray-matching with MODIS or Aqua MODIS and VIIRS on NPP.
- EPIC bands 1-4 are in the ultraviolet wavelengths and have no MODIS/VIIRS channel counterparts, and therefore are not considered here.

### Data
- EPIC L1B, bands 5-10.
- Version 01 is used for most of this study.
- Version 01 is briefly used for navigation analysis.
- Aqua MODIS Collection 6.1 L1B.
- Nominal 1-km resolution subsampled to 2-km.
- MODIS/VIIRS Land Phase 1.0 version 001.
- M-bands at 750-m resolution.
- -- Version 01 is briefly used for navigation analysis.

### Version 01 to 02: Navigation Improvement

#### EPIC V01/VIIRS Image Shift

- Total EPIC image shifts from navigation correction for ET/71 matching up through June 2016, using EPIC version 01 (V01) and version 02 (V002).
- Image shift analysis indicates that navigation could still be improved, although in V02 it does appear more consistent than in V01.
- The most common shift seems to be +1 East and +1 North, with DCC/+1 also in high frequency.
- All other channel channel pairings show similar shift frequency.
- Shifts using both MODIS and VIIRS show similar results.

#### Comparison of ATO and DCC Ray-matched Calibration

- ADG sky tropical ocean (ATO) gridded (65° S, 10° E) ray-matching, linearly regressed ET/71 radiance pairs over tropical oceans.
- Deep convective cloud (DCC) (65° S, 2.25° E) ray-matching, linearly regressed ET/71 radiance pairs that have RT = 220K.
- The DCC and ATO have their own unique SBAFs.

### Conclusion
- EPIC Version 02 shows navigation improvement over version 01, but still will be further improved.
- SBAF accounts for spectral differences and brings the offsets closer to zero.
- The ray-light improvements in V02 also bring the offsets closer to zero.
- ATO or DCC temporal trends for non-absorption band pairings are within 1% of each other.
- The absorption in bands 15 and 19 make them more difficult to calibrate, and therefore further study is required for confidence in the results those bands.

### References