ACCURACy: Adaptive Calibration of CUbesat RAdiometer Constellations

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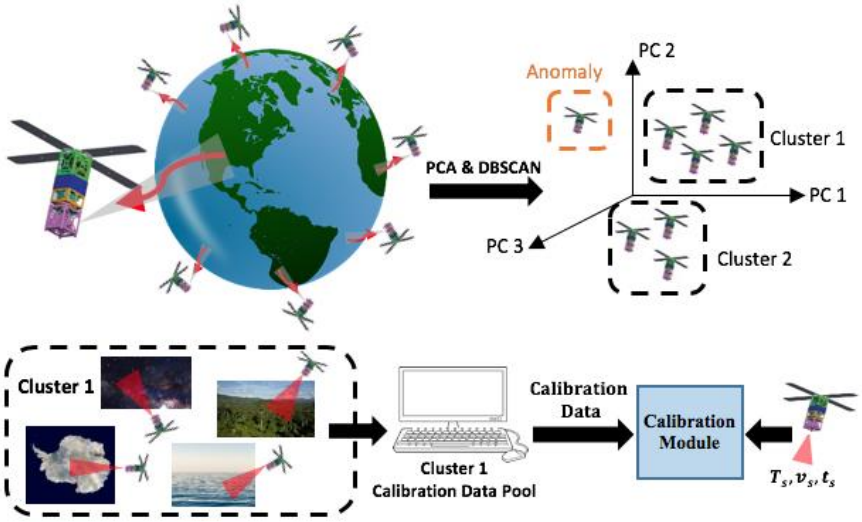
Research Objectives:

- ACCURACy framework will provide means to consistently calibrate CubeSat radiometer constellations in their entirety wherein calibration uncertainty and temporal stability is quantifiable.
- Unlike current inter-calibrating techniques adjusting individual calibrated instruments based on overlapping measurements, ACCURACy will perform constellation level calibration.



ACCURACy Framework to Calibrate Constellations of CubeSat Radiometers by (1) Clustering radiometers in similar states, (2) creating shared vicarious calibration data pools for each cluster, and (3) implementing cluster-level, adjustable, multi-point absolute calibration.

- Entry TRL is 2 as the theory of the clustering algorithms are present in the literature whereas time adaptive N>2-point absolute calibration techniques are only proposed in preliminary studies.
- Exit TRL will be 3 with development and testing of the framework in MATLAB.

Approach:

1) Establish a machine learning based algorithm to gather radiometers in similar states into distinct and time-adaptive groups within the constellation.

2) Build a procedure to form shared calibration data pools for each group of similar-state radiometers.

3) Construct an adjustable group-level N>2-point absolute calibration structure to be implemented in each group using their calibration data pools. Quantification of calibration uncertainties, errors, and drifts utilizing this structure.

4) Combining 1-3 as the ACCURACy calibration framework.

5) Testing, validation and further improvement of ACCURACy using virtual and real (TROPICS) CubeSat radiometer constellation data .

Potential Impact:

- The future of Remote Sensing is constellations of CubeSats due to their low cost, small size, and reduced power requirements, as well as their ability to provide frequent-revisit, real-time, and consistent observations with large coverage.
- ACCURACy will address the challenges in CubeSat radiometer calibration due to their susceptibility to ambient conditions, and provide constellation-level consistent calibration with reduced and quantifiable errors and uncertainties for traceable measurements.
- Developed ACCURACy modules can also be utilized in single radiometer calibration, or characterization and calibration of other types of distributed sensors.