Laboratory Emulation of Observations from Space

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Abstract: A substantial motivation for conducting wide-field surveys from space is the desire for increasing measurement precision and calibration accuracy. In many cases the limits of performance of detectors, optics, calibration techniques and even image processing algorithms are being pushed. Meanwhile budgetary constraints drive mission designs to coarser sampling of the PSF, compounding the difficulties by requiring recombination of dithered images to recover the optical resolution. We describe current and (possible) future examples of laboratory experiments conducted by Caltech/JPL, which are designed to build confidence that the planned detector technology is capable of delivering the necessary control of systematic errors. We note how these experiments bring about a paradigm shift by promoting close collaboration between scientists and engineers to address real world issues, during the concept development phases. This leads to stronger proposals based on experimental confirmation that calibration methods and algorithms will (still) work, and confidence that specifications for key mission parameters such as PSF sampling, pointing jitter, observing cadence, calibration plans, and data processing needs are neither over or under-specified. A number of these issues can have profound effects on technical or fiscal viability.