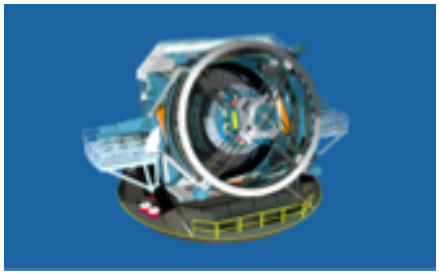

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Creating DCR-matched templates for image differencing

Wednesday, 14 June 2017 09:30 (30 minutes)

The frequency-dependent spectral index of the atmosphere leads to spectrum-dependent distortions of sources away from zenith. While the effect of bulk refraction is easily corrected during astrometric calibration, this Differential Chromatic Refraction (DCR) introduces distortions that depend on the intrinsic spectrum of a source and vary with the parallactic angle and airmass of the observation. Past surveys have avoided DCR by restricting observations to low airmass, but LSST operations will require observations up to an airmass of 1.4 across the sky and up to 2 in some fields. With current image differencing techniques, we would have to choose between a high rate of false positive detections that would have to be culled with machine learning, or restrict template images to have similar airmasses and parallactic angles of the science image. However, the refraction of the atmosphere has been modeled for decades with increasing refinement, and we can use iterative forward modeling to estimate a sky model using that knowledge of the atmosphere to fit all observations of a patch simultaneously. We use this model to calculate new DCR-matched templates for image differencing, and find that it reduces the number of spurious source detections in DECam g-band images.

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