Seeing values for LSST strategy simulations

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Abstract

The `opsim4` operations simulation program for the LSST astronomical survey uses a database of seeing values covering the range of times to be simulated. I describe the creation of such a database using Dual Image Motion Monitor (DIMM) data collected at Cerro Pachon from 2004-03-17 to 2019-10-07. In times during which the data overlap, I compare the distribution of DIMM seeing values to the seeing measured in DECam images, taken at a site 10 km away. Instrumental problems in the DIMM may indicate unreliable measurements, cuts on image quality (as indicated by the measured Strehl ratio) were explored. The DIMM has significant gaps, so I model the data (with and without cuts on Strehl ratio) and generate artificial data in the gaps according to the model. The model consists of a sinusoidal variation with a period of one year, an autoregressive (AR1) model for variations in mean seeing from one night to the next, and another AR1 model for variations on a 5 minute timescale. I create four databases according to this procedure, two based on DIMM data starting 2006-01-01 (with and without a Strehl ratio cut), and two starting 2009-01-01. I then run `opsim` simulations using each, and an otherwise identical simulation using the default seeing database, and explore the differences.

Change Record

Version	Date	Description	Owner name
1	YYYY-MM-DD	Unreleased.	Eric Neilsen

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