On-Sky Adaptive Secondary Interaction Matrix Calibration on the MMT

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Abstract

With the commissioning of the refurbished adaptive secondary mirror (ASM) for the 6.5-meter MMT Observatory under way, special consideration had to be made to properly calibrate the mirror response functions to generate an interaction matrix (IM). Like many upcoming extremely large aperture telescopes (ELTs), the MMT lacks a point in the optical path to place a calibration source to accurately sample the ASM's actuator response functions. Furthermore, to create an interaction matrix (IM) to operate a closed-loop adaptive optics (AO) system we must use on-sky or simulated methods. In this paper, we show how the DO-CRIME on-sky calibration method was successfully implemented at the MMT to extract the IM. We also present improvements to its base algorithm, which greatly improves its robustness to noise as well as errant actuators. We present both optical bench AO system validation as well as preliminary on-sky results from the MAPS (MMTO Adaptive optics exoPlanet characterization System) project on the MMT.

Keywords: calibration, interaction matrix, adaptive secondary, mmt, adaptive optics

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