GPI 2.0: End-to-end simulations of the AO-coronagraph system

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Abstract

The Gemini Planet Imager 2.0 (GPI 2.0) is an in-progress upgrade to the original GPI, an instrument for directly imaging exoplanet systems, which is being moved to the Gemini North telescope atop Mauna Kea, Hawaii. Major changes involve improved coronagraph designs and upgrading the adaptive optics (AO) system with a new pyramid wavefront sensor (PWFS). The addition of these new components require revised models for evaluating the performance and understanding the limitations of the system. This in turn helps us inform the broader GPI 2.0 science goals. We use PASSATA, an end-to-end AO simulation software, to assess the performance of GPI 2.0 AO under typical atmospheric conditions on Mauna Kea. We use these simulations to help us determine operating parameters such as the limiting stellar magnitude, maximum Strehl ratio, and the contrast achieved by the joint AO-coronagraph system before speckle-suppression. The point spread function of the system is also thoroughly characterized. This information will be used to predict the science performance on a range of targets and design observing strategies.

Keywords: point spread function characterization, direct imaging, AO simulation, GPI 2.0

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