SUBMIT TO: AM122

CONFERENCE: ASTRONOMICAL ADAPTIVE OPTICS SYSTEMS and APPLICATIONS
(Tyson/Lloyd-Hart, Chairs)

TITLE: "Speckles in a Highly Corrected Adaptive Optics System"

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PRESENTATION: Poster

Abstract

Understanding the behavior of post-correction speckles in adaptive optics systems at very high Strehl ratio is critical to determining the ultimate effectiveness of such systems for companion searches that may eventually allow the study of extrasolar planets. Recent investigations indicate that speckles, to first order in remnant phase left by the AO system, have a strong "anomalous" component that is not included in standard estimates, proportional to (1-S), of the power in the focal plane image. Brightness of these anomalous speckles can exceed that of "classical" speckles by orders of magnitude, although it is expected that other unusual properties of the anomalous speckles may cause them to average away rapidly in time integrations, or be instantaneously cancelled by suitable observational techniques. For example, the anomalous speckles are also "pinned", or spatially localized on secondary Airy maxima, causing them to be suppressed on Airy nulls; they also have distinct symmetry properties that might be exploited. In this paper, I explore in some detail the range of operational parameters over which anomalous speckles are problematic.

KEYWORDS: adaptive optics, speckles, atmospheric turbulence

Biography:

Eric Bloemhof received a Ph.D. in Physics from UC Berkeley in 1984, in infrared instrumentation and astrophysics. From 1984 to 1994 he worked at the Harvard-Smithsonian Center for Astrophysics on VLBI and astronomical instrumentation, including fabrication of superconducting tunnel junctions and SIS receivers. At Caltech, he participated in the development of adaptive optics for the 5 meter telescope at Palomar Observatory, and he has been at JPL since 2001, working on a ground-based testbed for the Space Interferometry Mission.