
One turbulent night: a thorough look at temporal tomography

Ryan Dungee^{*1}, Mark Chun², Olivier Lai³, and Eden Mcewen⁴

¹Dunlap Institute for Astronomy and Astrophysics [Toronto] – Canada

²University of Hawai'i [Hilo] – United States

³Université Côte d'Azur – Observatoire de la Cote d'Azur, CNRS, Laboratoire Lagrange – France

⁴Wyant College of Optical Sciences [University of Arizona] – United States

Abstract

The 'imaka instrument is a ground layer adaptive optics (GLAO) system on the UH88" telescope on Maunakea, Hawaii. With five natural guide star wavefront sensors and an observing strategy that includes recording of open loop wavefront sensor slopes, it provides a wealth of information about the turbulence conditions during operation. We have been using 'imaka to develop a new technique that we call "temporal tomography" which extends Fourier Wind Identification to also provide altitudes for the turbulent layers. We present a case study of the effectiveness of temporal tomography on a particular night by comparing the results to a variety of alternative approaches and external sources of data. For this we include the MASS/DIMM profile, the GFS and WRF weather forecasting models, wind ground speed and direction measurements from the Canada France Hawaii Telescope weather tower, and two alternate approaches to turbulence profiling with 'imaka wavefront sensor data: SLODAR and temporal cross-correlations.

Keywords: Tomography, Turbulence Profiling, Maunakea

*Speaker