Contribution ID: **64** Type: **Paper**

How the Evil Atmosphere Affects Ground-based Astronomy, and How to Correct for It

Monday, 16 April 2012 14:20 (20 minutes)

Earth's atmosphere is a wavelength-, direction-, and time-dependent turbid medium through which all ground-based telescopes observe. Transmission through the atmosphere is a significant source of systematic radiometric error which can best be obviated by direct, real-time measurements of the column of atmosphere through which a telescope is observing. Using weather and imaging radiometric data we describe and demonstrate the effects that the atmosphere has on wide-field imaging radiometric surveys. We assess the wavelength, angular and time scales on which these absorption and scattering effects operate and estimate the resulting loss of radiometric precision.

We further demonstrate application of a suite of facility-class small instruments that supports wide-area observations by monitoring in real-time the column of atmosphere through which the survey telescope is observing. This instrument suite includes a lidar, a spectroradiometer and optical/infrared cameras.

We assert that application of atmospheric metadata provided by this instrument suite corrects for a significant fraction of systematic errors currently limiting radiometric precision, and provides a major step towards measurements that are provably dominated by random noise, ultimately at the fundamental photon shot noise limit.

Primary author: MCGRAW, John (University of New Mexico)

Co-authors: CRAMER, Claire (National Institute of Standards and Technology); ZIRZOW, Daniel (University of New Mexico); KARLE, Jeffrey (University of New Mexico); WOODWARD, John (National Institute of Standards and Technology); LYKKE, Keith (National Institute of Standards and Technology); ZIMMER, Peter (University of New Mexico)

Presenter: MCGRAW, John (University of New Mexico)

Session Classification: Session 1C