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Infrared and Visible Measurements of Atmospheric Water for Evaluating New Submillimeter Radio Telescope Sites

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We have an ongoing program of investigating new sites for the Event Horizon Telescope (EHT) aimed towards improving imaging of black holes and extending EHT capability to making real-time movies of black holes on event horizon scales [1]. A major factor in selecting a new site is the submillimeter transmittance of the atmosphere, which is strongly affected by water. We report on a purpose-built instrument to monitor atmospheric water at candidate telescope sites. We use a total intensity measurement at 8 μm wavelength together with radiative transfer [2] and atmospheric state models to determine precipitable water vapor. We also measure cloud cover in the visible part of the spectrum using techniques developed by Dev *et al.* [3]. We will describe the instrument and present results from test deployments in Cambridge, MA as well as the Submillimeter Array (SMA) site in Hawai'i, which sits at an altitude of 4000 m. Finally, we will describe how the field measurements will inform future site selection.

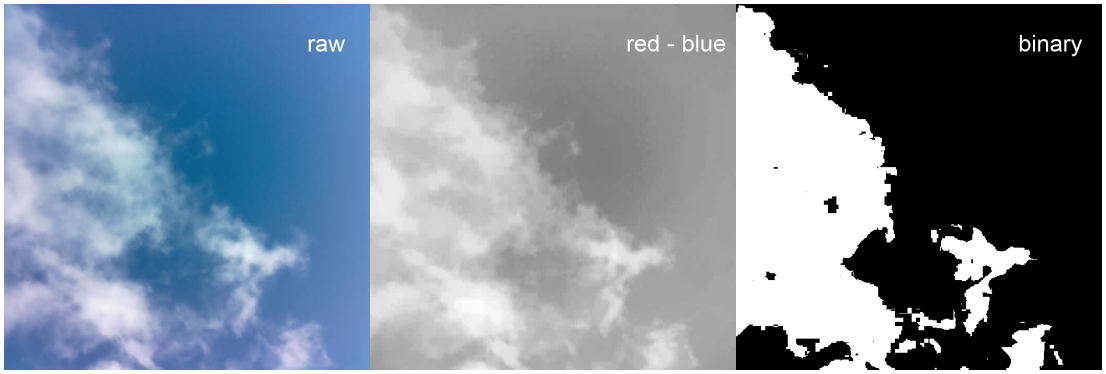

Figure 1. Sample cloud cover measurement from the SMA field test. The difference of the red and blue channels from a raw image is calculated, and pixels exceeding a threshold are logged as clouds.

References

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