

# Calibration and Standardization of Large Surveys and Missions in Astronomy and Astrophysics



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## SkyProbe: Real-Time Precision Monitoring, in the Optical, of the Absolute Atmospheric Absorption on the Telescope's Science and Calibration Fields

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Mauna Kea is known for its pristine seeing conditions, but sky transparency can be an issue for science operations since some 25% of the observable nights are not photometric, mostly due to high-altitude cirrus. Since 2001, the original single-channel SkyProbe on the Canada-France-Hawaii Telescope has gathered one V-band exposure every minute during each observing night using a small CCD camera with a very wide field of view (35 sq. deg.) encompassing the region pointed by the telescope for science operations, and exposures long enough (40 seconds) to capture at least 100 stars of Hipparcos' Tycho catalog at high galactic latitudes (and up to 600 stars at low galactic latitudes). A key advantage of SkyProbe over direct thermal infrared imaging detection of clouds, is its capacity to derive an accurate absolute measurement, within a few percents, of the true atmospheric absorption by clouds affecting the data being gathered by the telescope's main science instrument. This system has proven crucial for decision making in the CFHT queued service observing (QSO) representing today the majority of the telescope time: science exposures taken in non-photometric conditions are automatically registered a new observation later on at 1/10th of the original exposure time per pointing in the observed filters in photometric conditions to ensure a proper final absolute photometric calibration. Photometric standards are observed only when conditions are reported stable by SkyProbe. The new dual color system (simultaneous B&V bands) will allow a better characterization of the sky properties atop Mauna Kea and will enable a better detection of the thinner cirrus (absorption down to 0.02 mag., i.e. 2%). SkyProbe is operated within the Elixir pipeline, a collection of tools used for handling the CFHT CCD mosaics (CFH12K and MegaCam), from data pre-processing to astrometric and photometric calibration.

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