Astronomical Seeing on Mauna Kea

The Mauna Kea site is now well-known for offering high quality images compared to most of the existing sites. Quantitative data are needed to give a better estimate. Figure 1 summarizes all compilations of seeing measurements available to us at this time. Each individual series of observations has its own shortcomings and peculiarities. They are of varying quality but they appear self-consistent enough for a significant evaluation of the seeing as experienced by users of astronomical telescopes on Mauna Kea.

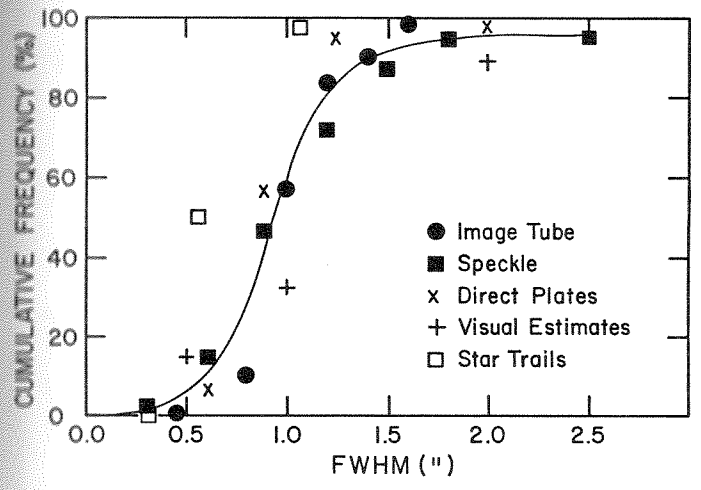

Fig. 1: Compilation of seeing measurement observations available from UH 88-inch and CFHT obtained by different techniques.

The most systematically accurate and representative data are probably those from the ITT image tube (CFHT prime focus, by Hutchings et al.) and the near-IR speckle data of Howell and Dyck (88-inch, IR cassegrain). Their mutual agreement is as good as can be expected. Image tube data give a significantly lower frequency than the speckle data at FWHM ≃ 0.75 arc sec. This is most likely because the MTF of the ITT F-4089 tube falls off sharply beyond 20 cycles/mm.

Direct photographic plates data, from calibrated microdensitometry or visual inspection of image profile, yield much the same seeing distribution as these previous data.

Visual estimates, "eyeballed" by various observers at the telescope eyepiece and recorded in the CFHT log book, are of limited quantitative value but, reassuringly enough, do not deviate widely from the results of more quantitative measurements.

A data set which does deviate grossly from the others is the one from zenith star trails. The measured trail widths do not include the image wander component of the seeing spread. This must account partly for the smaller FWHM thus obtained. Guided plates, taken on the same nights as the star trails, do conform to the direct plates statistics. This indicates that high frequency guiding could shrink the integrated FWHM by as much as a factor of 1.5.

Further studies of the telescopic seeing on Mauna Kea are clearly needed. And it is likely that a significant improvement of the seeing obtained remains possible through reduction of dome induced turbulence. Considerable efforts, reported in previous Bulletins, are being made at CFHT in this direction. As a result the average seeing has steadily improved from 2 arc sec in 1980 to less than 1 arc sec in 1983. However, the data available to date from operating telescopes do allow a meaningful, quantitative evaluation of the situation. Table 1 gives the coordinates of the smooth curve drawn in Fig. 1 as a representation of the data. It yields FWHM = 0.93 arc sec.

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Table 1
Cumulative Distribution of Seeing from CFHT and UH 88-inch. Data

FWHM ⟨ (arc sec)	Percent Frequency
0.50	6
0.75	21
1.00	60
1.25	85
1.50	92
1.75	95
2.00	96

Staff Changes

Departures

Raymond JONES, who was in charge of the telescope hardware, returned to the state of Washington in April, after two years at CFHT.

Arrivals

Richard McGONEGAL, after obtaining in the fall of 1982 his Ph.D. from the University of Toronto (under the supervision of Resident Astronomer Robert McLaren) moved to Waimea in January to work with the software group.

Diane PEPIN, a Kona resident from Québec, filled a vacancy in the secretarial staff in mid-February. She is our French-speaking secretary.

Mark BARBOUR brought to the CFHT in early March the experience he gained at the University of Oregon as a designer and a constructor of electronic hardware for astronomical instrumentation .

Freddy ECHEVERRIA abandoned self-employment to join the electronics hardware group as a technician in March.

Daniel MICHET, who had specialized in electronographic receptors at the Paris Observatory at Meudon, came to CFHT in mid-April as an Instrumentation technician.