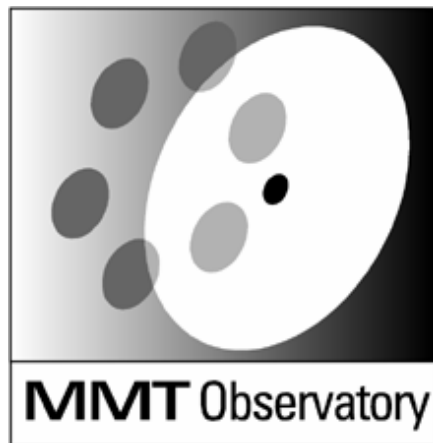


MMTO Internal Technical Memorandum #99-1



Smithsonian Institution &
The University of Arizona®

Mt. Hopkins Sky Brightness

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February 22, 1999

To: The Record
From: Nelson Caldwell, Craig Foltz, Perry Berling
Subject: Mt. Hopkins Sky Brightness
Date: February 22, 1999

Summary

We have assembled both broad band and spectroscopic measurements of the dark night sky in order to monitor the changes due to solar cycle as well as to provide a benchmark for assessing the increasing light pollution in southern Arizona.

Broad Band Measurements

CCD data from the FLWO 1.2m telescope taken since 1993 have been collected and reduced. The frames were typically of supernovae or other objects without extended emission that would interfere with obtaining a pure sky measurement. Standard star frames taken during the night were measured for zero points, though minimal effort was made to form a precise standard transformation. The transformations used should be good to 5% nevertheless, much smaller than the typical variation of sky brightness during the night. Frames used were taken at less than 1.2 airmasses, were not in twilight, and were taken in photometric conditions. Various CCD cameras have been in use over those years and these have different pixel scales; the scales used are 0.62 arcsecond per pixel for single CCD cameras, and 0.667 arcsecond per pixel for the 4shooter.

The broad band measurements are presented in Figure 1.

Spectral Measurements

Spectra covering 3600-7500 Å were taken with the FAST spectrograph on the 1.5m telescope during the night of 1998 November 17. Observations were taken at the zenith and at elevation of about 45 degrees at the four cardinal points. The night was photometric, dark and without visible haze. Each observation was exposed for 1800s, using a 300 gpm grating and a 5 arcsecond slit, giving a dispersion of 1.5 Å per pixel, and a resolution of about 11 Å. The data were reduced using standard techniques. Figure 2 shows the spectra taken at zenith and to the north. Of particular interest is the strong component of broad Na I emission, due to high-pressure sodium lights.

Figure 3 shows the zenith data compared to equivalent data taken in 1988. It is encouraging to note that there is little change in the sky brightness shortward of about 5500 Å. However, a marked increase in the high-pressure sodium component is noted.

FLWO 1.2m Telescope Night Sky Measurements

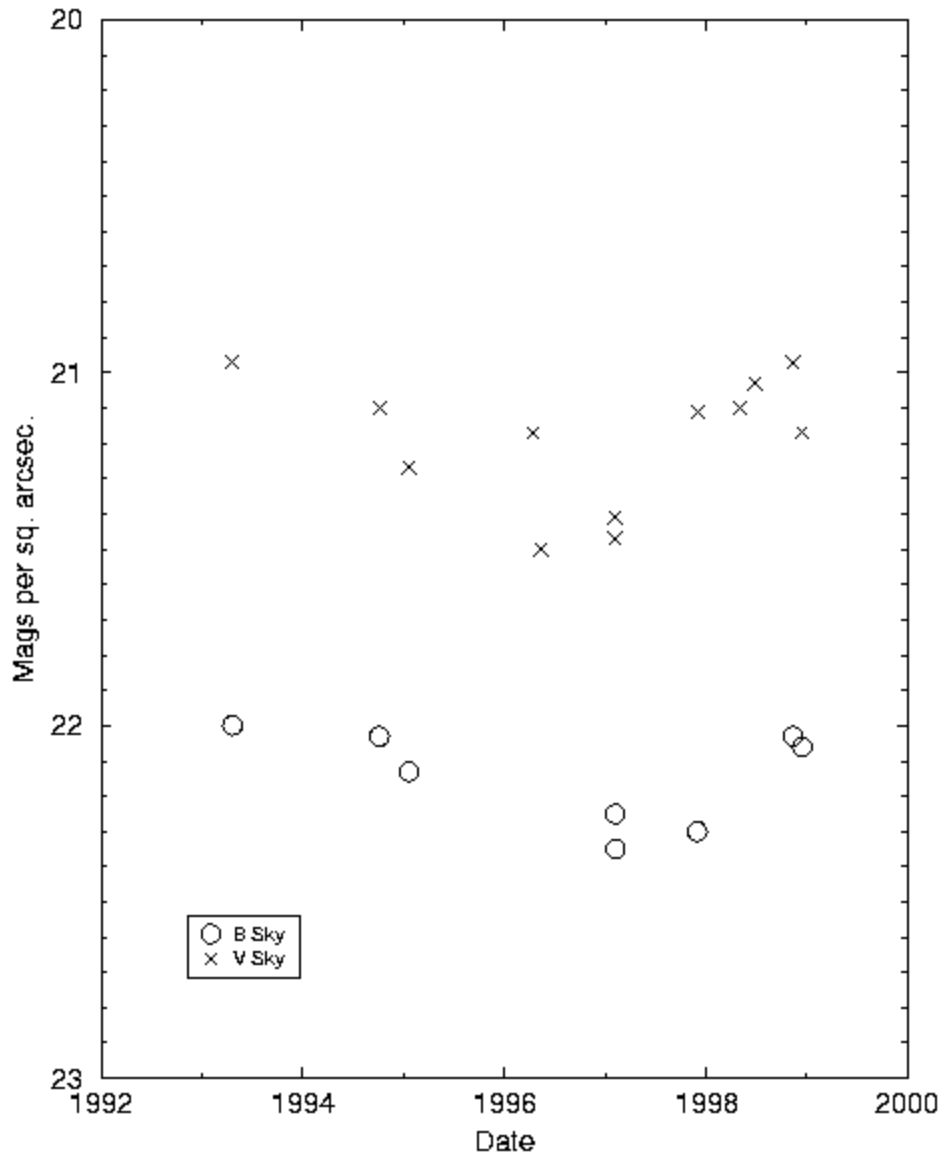


Figure 1. Broad band measurements of the night sky over Mt. Hopkins taken with the FLWO 1.2m telescope.

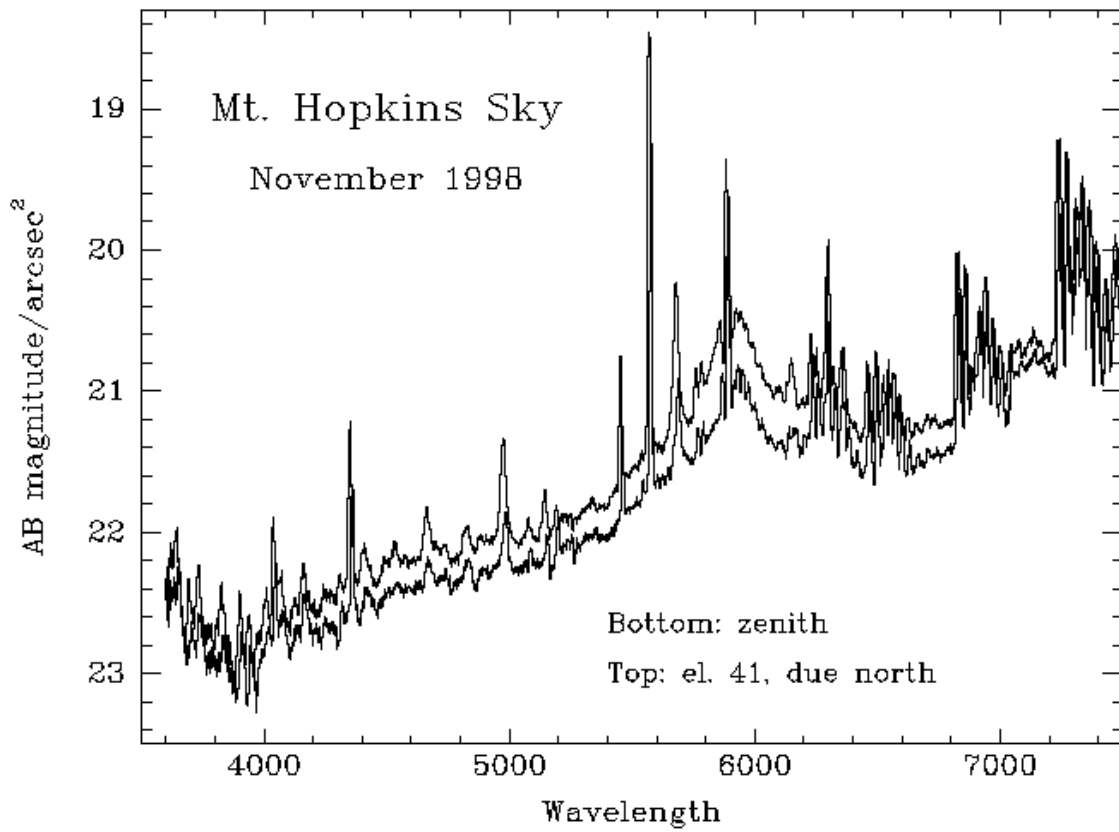


Figure 2. Comparison of the night sky spectrum at the zenith with that at an elevation of 41 degrees, due north.

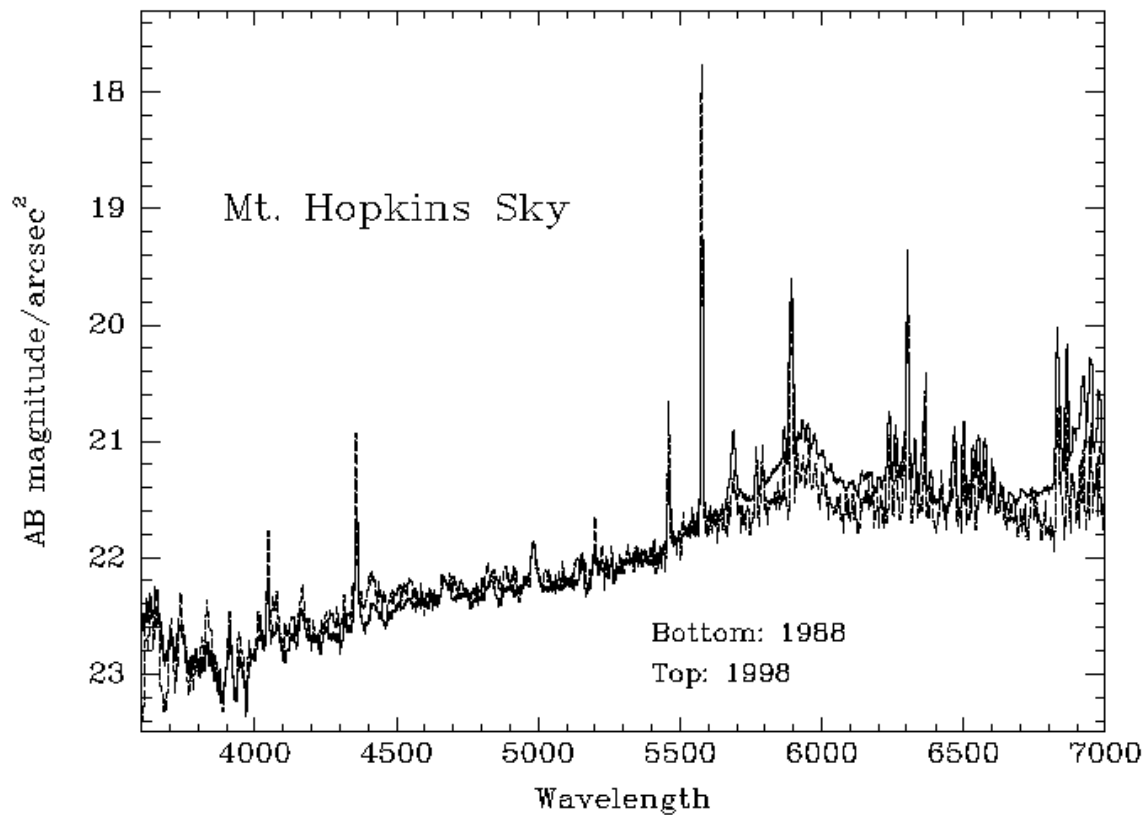


Figure 3. 1998 sky brightness compared with equivalent measurements obtained in fall of 1998.