Long term behavior of Hα-emission in BU Tau (Pleione)

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Summary

The long-term monitoring of Be-stars has a high meaning for clarifying of different typical phenomena. The development of the star disk and thus the behavior of the emission strength of the Hα-emission is a area, in that amateur observations supply helpful information about long periods. Before this background BU Tau is an object, which was examined in the past decades by many professional observers.

One approach to better understand Be stars is to provide systematic, frequent, long-term monitoring of the magnitudes and spectra of these objects. This is something that amateur astronomers can do. Those who are equipped with appropriate spectrographs and who can systematically observe these stars over years can supply information about changes in Hα-equivalent width (EW). In this note, I report my spectroscopic observations of the Hα-emission line in BU Tau (Pleione, 28 Tau) measured in units of EW. Hα-emission was first detected in BU Tau by E. C. Pickering in 1890. Hirata (1995) describes the range of research on this interesting object in an excellent survey.

For all but two observations of BU Tau, I used the 200 mm Schmidt-Cassegrain telescope at the Cologne Stargazer's Association Observatory in the mountains of Odenthal, Germany (latitude: 51°02' longitude: 7°15'). My spectrograph with diffraction grating has a dispersion of 0.39 Å/pixel and a wavelength range of 6600Å to 6700Å. The detector is a Kodak KAF600 sensor with 768x512 pixels. Pixels are 9x9 micrometers. The resolving power is R = 8600. This telescope and instrument serve my extensive Be star monitoring program. For observations on JD 2450840 and 2451165, I used a Maksutov objective prism spectrograph that has f = 1000 mm, a flint glass prism with 30-degree breaking angle, and a dispersion of 5.6 Å/pixel. Its resolving power is R = 1500. CCD frames containing spectra were processed with standard techniques, and Hα-emission line EWs were measured in Richard Gray's program, MK32.

The variations of the spectrum of BU Tau, from 1938 to 1975, have been described in detail by Gulliver (1977) who give a welldocumented bibliography of the star. I did not observe in BU Tau the development of absorption lines for singly ionized elements such as appeared in the spectrum of 88 Her in 1959 as Balmer emission decreased. Figure 1 shows Hα-behavior from JD 2440601 to 2453807 (1970 to March 2006). This includes observations by Hirata (1995), Klotz (2003), Slettebak and Reynolds (1978), Andrillat and Fehrenbach (1982), Fontaine et al. (1982), Sharov, Lyutyi, and Esipov (1994), Menchenkova and Luthardt (1993), and Ojha and Joshi (1991). My observations began coincidentally near maximum intensity of Hα and covered the period JD 2450840 to 2453807. Hirata (1995) describes the overall increase in EW as an effect of an active Be phase. Given this condition, interesting, brief decreases in EW occurred at JD 2445187 and 2449367 in route to maximum.

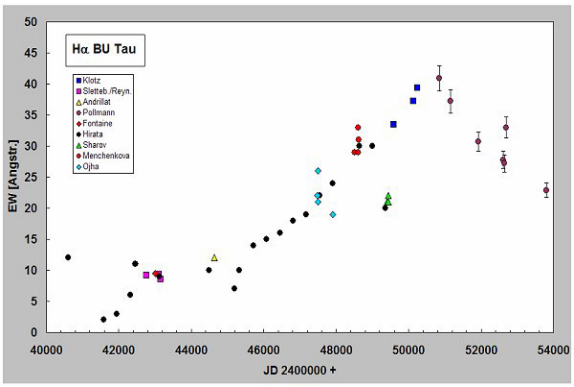

Fig. 1: Changing Ha-intensity in BU Tau over 33 years as measured by several observers.

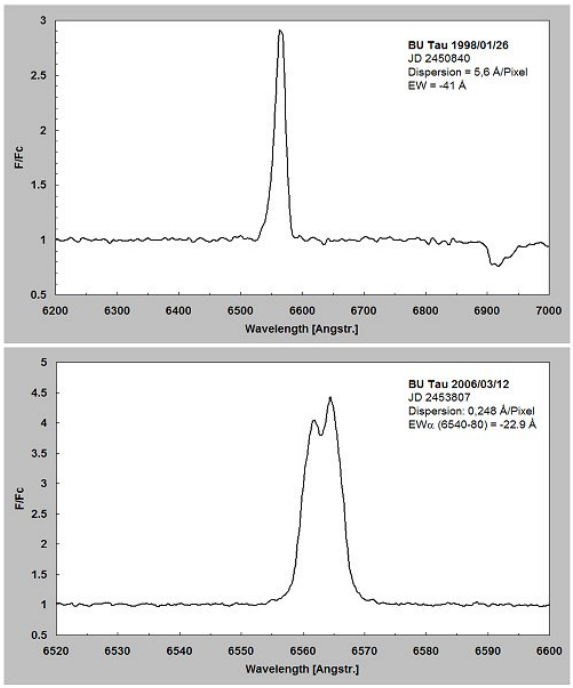

Fig. 2

Figure 2 compares Hα-emission line profiles in BU Tau as observed at different times with the two spectrographs.

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