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HD 36705 - A POST T TAURI STAR*

By identifying a flaring X-ray source with the star HD 36705 (which had been known to be chromospherically active: Hearnshaw (1979)) and by determining its short rotational period of only 0.514 days seen in the brightness modulation due to spots, Pakull (1981) pointed out an object which is going to be one of the most important for studying the rotation-activity connection in late-type stars. However, its membership to any of the recognized classes of active stars is not obvious at all. The existing spectral classifications K1IIIp and K2IVp suggest an RS CVn-type system whereas the short period argues that the star cannot be too large and might be more alike BY Dra-type stars. The short period and fast spot migrations observed by Pakull could also indicate similarity to the white dwarf - red dwarf pair V471 Tauri (the necessary IUE observations have not been obtained yet).

Confusion with the variability type of HD 36705 increased when Collier (1982) pointed out that the star does not show any systematic radial velocity changes. This finding coupled with the giant spectral classification and the appearance of Hα in weak emission suggested to him that the star belongs to the group of extremely active fast-rotating giants for which FK Com is now considered as a prototype (Bopp and Stencel 1981).

Here, we would like to point out that HD 36705 might be one of the brightest post T Tauri stars (Herbig 1973, 1978, 1981). Observations made in January 1982 with the Reticon detector on the 1.5m ESO telescope in La Silla with the resolution of about 3 Å reveal the existence of the strong lithium line at 6707 Å (cf. figure). Four obtained spectra show this line very clearly; unfortunately, due to the low resolution, the line is partly

*Based on observations obtained at the European Southern Observatory, La Silla, Chile.

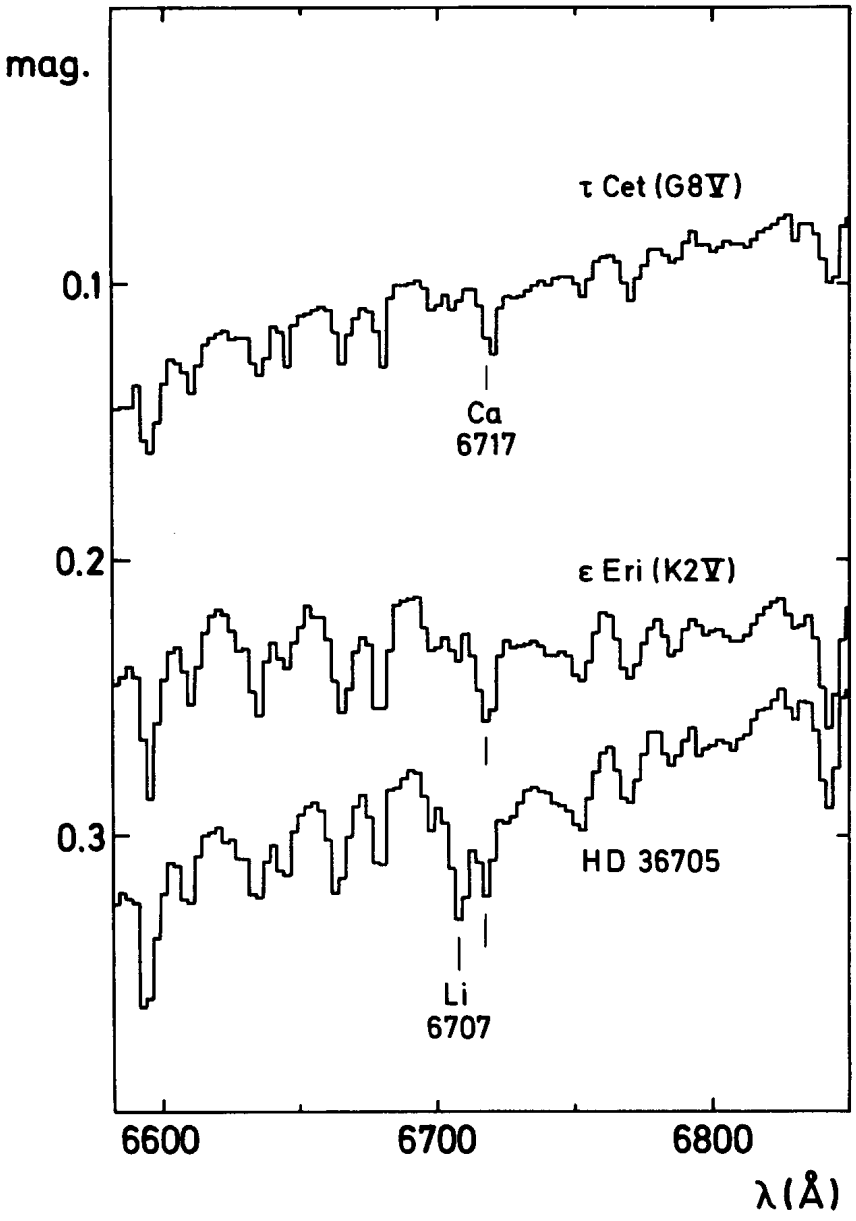
mag.
τ Cet (G8V)
0.1
Ca
6717
0.2
ε Eri (K2V)
0.3
HD 36705
Li
6707
6600
6700
6800
λ(Å)

Figure 1

blended with the Ca line at 6717 Å so that one can only roughly estimate the equivalent widths: EW(6707) = 0.32 ± 0.03 Å and EW(6707)/EW(6717) = 1.7 ± 0.1. Applying the method which uses the line ratio (Danziger and Conti 1966) we obtain logN(Li) = 2.7 (assuming the same Ca abundance as on the Sun); working directly with the equivalent width (Zappala 1972) one obtains logN(Li) = 2.5 + saturation corr.; the abundances are in the scale logN(H) = 12. So high lithium abundances in late spectral types are observed only among very young stars. Therefore, we suggest that the star belongs to the still small group of young, fast rotating stars which for some reason escape detection but should be relatively numerous according to Herbig's estimates. However, as already mentioned in the literature a number of times, the groups of post-T Tau and BY Dra stars might partly overlap since many indications exist that members of the latter group, including its prototype, are relatively young objects.

It should be mentioned that in addition to the partly filled-in Hα, the lines of the infrared Ca II triplet (8498, 8542, 8662 Å) were found to be definitely shallower than in stars of similar spectral types (K0-K2) as estimated from absorption lines. No other emissions were seen in the region between Hα and 9500 Å.

HD 36705 was also photometrically observed from La Silla in October 1981 and January 1982. The light curves (to be published elsewhere) reveal a very high level of variability in time scales of a few days so that closures in phase diagrams were not always possible during 5-7 days intervals necessitated by the proximity of the period to one half of a day. In addition, the light curves separated by 3 months have distinctly different shapes and direction of a systematic spot migration (if any) is still undecided. The ranges of variability were: V = 6.80 - 6.85 in October 1981 and V = 6.83 - 6.88 in January 1982 whereas the mean values of indices in the Strömgren and Cousins photometries were: b-y = 0.509, m_1 = 0.285, c_1 = 0.253, and U-B = 0.361, B-V = 0.825, V-R = 0.485, V-I = 0.945.

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