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o And: A PUZZLE WHICH CAN BE RESOLVED

Analyzing records of the spectral behaviour of o And (1 And, HR 8762, HD 217675-6, BD+41°4664) since 1890 which I found in the astronomical literature as well as many sets of photoelectric observations of the star obtained by various authors since 1915 (with the exception of as yet unpublished data secured by several groups of observers during the on-going international observing campaign), I arrived at the following preliminary conclusions:

1. Photometric variations of o And arise from a superposition of the following variations:

i. Long-term variations with an amplitude of about 0.1^m in V and B characterized by relatively narrow minima and flat maxima. At maximum light, V $\doteq 3.61^m$ and B $\doteq 3.50^m$. There is a strong suspicion that these long-term variations are periodic, with a period of about 3100 days (i.e. 8.5 years).

ii. Rapid truly-periodic variations with a period of 1.571272 days, characterized by a light curve with two unequal minima and maxima and by variable amplitude and shape. These variations almost disappear in the maxima, and have the largest amplitude (of roughly about 0.1^m) in the minima of the long-term changes. A preliminary epoch of the (usually deeper) minimum is HJD 2429981.250.

iii. Further analyses, and probably further observations, are needed to see if there is some regularity in the variations of the shape of the 1.571-day light curve. There is a suspicion that a characteristic time scale of such changes is 11-15 days.

2. The minima of the long-term light variations coincide well with the presence of the hydrogen shell lines in the spectrum of o And. The recorded hydrogen- shell episodes seem also to occur with the 3100-day periodicity. If these long-term variations are indeed periodic, then it is probable that the shell episodes and the accompanying long-term light variations are somehow connected with the orbital motion of the closer visual companion to o And discovered

probably by Wilson (1950) and re-discovered by Blazit et al. (1977). The observed angular separation of the pair and the observed parallax of o And are in excellent agreement with an 8.5-year orbital period.

3. Considering the shape of the light curve and the fact that all the light variations represent light decreases from a stable maximum level, it seems more probable that the rapid light variations of o And are caused by some density inhomogeneities carried across the disk of the star by its rotation as suggested by Harmanec (1984 a,b) not by non-radial pulsations as proposed by Vogt and Penrod (1983). It is tentatively suggested that the model of "rotating spokes", also considered (and refuted) for Zeta Oph by Vogt and Penrod may provide a better representation of the data. Strange rapid profile variations of the Mg II 4481 line are known for o And for a long time (for the best available description see Gulliver et al., 1980). I tentatively propose that the density inhomogeneities could be connected with the presence of a magnetic field and that the "spokes" considered by Vogt and Penrod could in fact be some density enhancements along the magnetic lines of force. The presence of such spokes could cause rather complicated radial-velocity variations which could explain the failure of the attempts to find some regularity in the rapid radial-velocity changes observed. The material forming the shell and/or these density enhancements could come from the visual secondary component of o And, in agreement with the general binary hypothesis of the Be phenomenon as reformulated by Harmanec (1982).

A detailed study with full analyses of the data will soon be submitted for publication in Bull.Astron.Inst.Czechosl. I publish this note as an urgent appeal to all Be-star observers: o And now appears to be an ideal object for a concentrated international effort which could lead to a rapid and substantial progress in our understanding the Be phenomenon. In particular, I stress the importance of the following kinds of observations:

1. Monitoring of the Mg II profile, Ca II K profile, He I profiles and the H alpha profile with the signal-generating detectors in different phases of the 1.571-day period and in different phases of the long-term cycle.

2. Attempts to detect a possible magnetic field of o And, and - in the case of detection - measuring its variations over the 1.571-day period.

3. Continuing photoelectric observations of the star, including the IR and UV light curves of the 1.571-day period, which could help in further restriction of possible models.

4. Optical spectroscopy should answer two questions:

a. whether or not the metallic shell spectrum and the H alpha emission occur always at maximum of the hydrogen shell or whether they behave in a different manner, and

b. whether the occurrence of the shell phases is indeed a periodic, or only a cyclic phenomenon.

5. Polarimetric observations over the 1.571-day cycle.

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