FIRST RESULTS OF AN INTERNATIONAL MULTISITE MULTITECHNIQUE CAMPAIGN ON omicron AND

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Omicron Andromedae is a multiple system of at least four stars : a B ↔Be star (component A), a spectroscopic binary (components B1-B2) and a close companion (component a). According to several studies (see Hill et al. 1988, 1989) :

- the distance between A and the B1-B2 system decreased from 0.39" in 1975 to 0.25" in 1987 (McAlister and Hartkopf 1988)

- the few previous speckle measurements of component a have shown the possibility of a 3.7 years orbit around A, according to the 1975 to 1984 observations (mean distance 0.05"). The calculations with this 3.7 yr orbit lead to the prediction of a maximum distance of 0.77" at 1992.738, i.e. at the end of september 1992, with a North-South orientation.

But a strong contradiction appears : given the spectroscopic distance (188 parsecs), this orbit would lead to a mass of 180 M⊙ for the A-a system; or if we adopt a mass of 7 M⊙ for A, we deduce an orbital period of 14 years for A-a, which cannot fit the speckle positions.

From a photometric point of view, the B ↔ Be (with an eventual shell phase) ↔ B switching occurs every 4 to 9 years (with a 8.5 years average), and can be described as follows :

- when the star is at its light minimum (Be phase, lasting from 2 to 7 years), it displays a double-wave light curve of 1.6 day period, with a 0.1 mag amplitude in the visible.

- it has been recently shown (Sareyan et al., 1992) that this 1.6 day period still exists when the star is in its "normal" B phase (the star being then bluer), but with a 0.01 mag amplitude, i.e. very difficult to detect with such a long period.

We decided of a campaign on this star with several techniques, in order to solve the contradictions mentioned above, and also to get a better understanding of this rather complex system, i.e. investigating the relationship

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between the data obtained by photometry (activity + rotation or pulsation) and spectroscopy (photospheric line profiles, activity in the Balmer series), and trying to determine if any coincidence (coupling) exists between the Be $\leftrightarrow$ Be shell phase of the star "A" and the proximity of "a" (which also means a better orbit determination for the latter).

Observations have been planned in China, France, Italy, Mexico, Russia, Switzerland, and USA. Bad weather conditions did not allow photometric observations in Europe. A few preliminary results can be pointed out :

- strong night-to-night variations occur in the HeI λ4471 and MgII λ4481 line profiles, probably not entirely due to the B1-B2 binarity.

- the center of the Hα line undergoes some small variations with a time constant of the same order that the 1.6 day photometric period. It is important to stress here that spectroscopic observations made two months before show a similar aspect, while in august 1991, Hα appeared on interferometric data with a strong emission on both sides of the central absorption.

- the speckle interferometry carried out in Russia with the 6 meter telescope (Aug.10th and Oct.6th) shows that the B1-B2 distance to component A has decreased to 0.187 - 0.186" in 1992, while the component a - provided its detection is confirmed - could be at a distance around 0.02 to 0.04" only. So, we already know that the 3.7 yr period is very probably wrong, as no close companion has been detected at the predicted distance of 0.077".

Provisional conclusions :

Due to the large amount of photometric data collected, we will probably be able to derive our own ephemeris on which the photospheric lines behavior will be "phased", i.e. giving a strong constraint on any future explanation and model. Particularly, the small variations which affect the Hα line center have to be interpreted (in terms of variable activity or rotation of an active feature ?)

The speckle observations show that the whole system, as a multiple star, has to be entirely reconsidered (masses and orbital periods).

As the campaign did not coincide with a B to Be transition phase (still unpredictable), we have no idea about the time constants involved in such a process, and we have no measurements of the phase lag between the beginning of the larger photometric variations and the beginning of the Be phase, when emission appears. This will deserve further studies.

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