

MAIN-SEQUENCE BROADENING IN THE DOUBLE CLUSTER

h AND χ PERSEI*

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Abstract. Precise photometric observations of stars in the double cluster *h* and χ Persei reveal a large spread in the colours and magnitudes of the upper Main-Sequence; half of the stars are variables that are Be stars or related stars. The reported age difference between both clusters is found to be spurious. Rotation apparently affects both the intrinsic and the observed colours of the early-type stars in *h* and χ Persei. This result questions the validity of photometric calibrations that heavily rely on *h* and χ Persei or similar clusters.

During a long-term observing campaign (1979–1987) at the Hochalpine Forschungsstation Jungfraujoch (altitude 3580 m) the brightest stars of the double-cluster *h* and χ Persei have been observed many times in the photometric system of the Geneva Observatory.

Analysis of the precise photometric data shows that half of the stars are variables on time-scales of months to years with superposed short time variations (Figure 1). It appears also that they are probably all Be-stars or related objects. As no β -Cephei star was found, the suggestion that clusters have either Be-stars or β -Cephei stars is endorsed (Waelkens *et al.*, 1989).

In the dereddened colour-magnitude diagrams, there is a large intrinsic scatter of the Main Sequences of both clusters. The scatter is greater than can be expected from, e.g., binarity and may well be related with the high rotational velocities. Rotation influences the observed colour of a star according the angle of vision (pole on/equator on) (Collins, 1987); rotation may also affect its evolution (Maeder, 1987).

When both diagrams are superposed, no systematic difference can be found (Figure 2). We have to conclude that:

- The age and distance differences between both clusters, as reported in the literature (Tapia *et al.*, 1984) are not confirmed.
- It is hazardous to construct photometric calibrations of stellar parameters from data of *h* and χ Persei.

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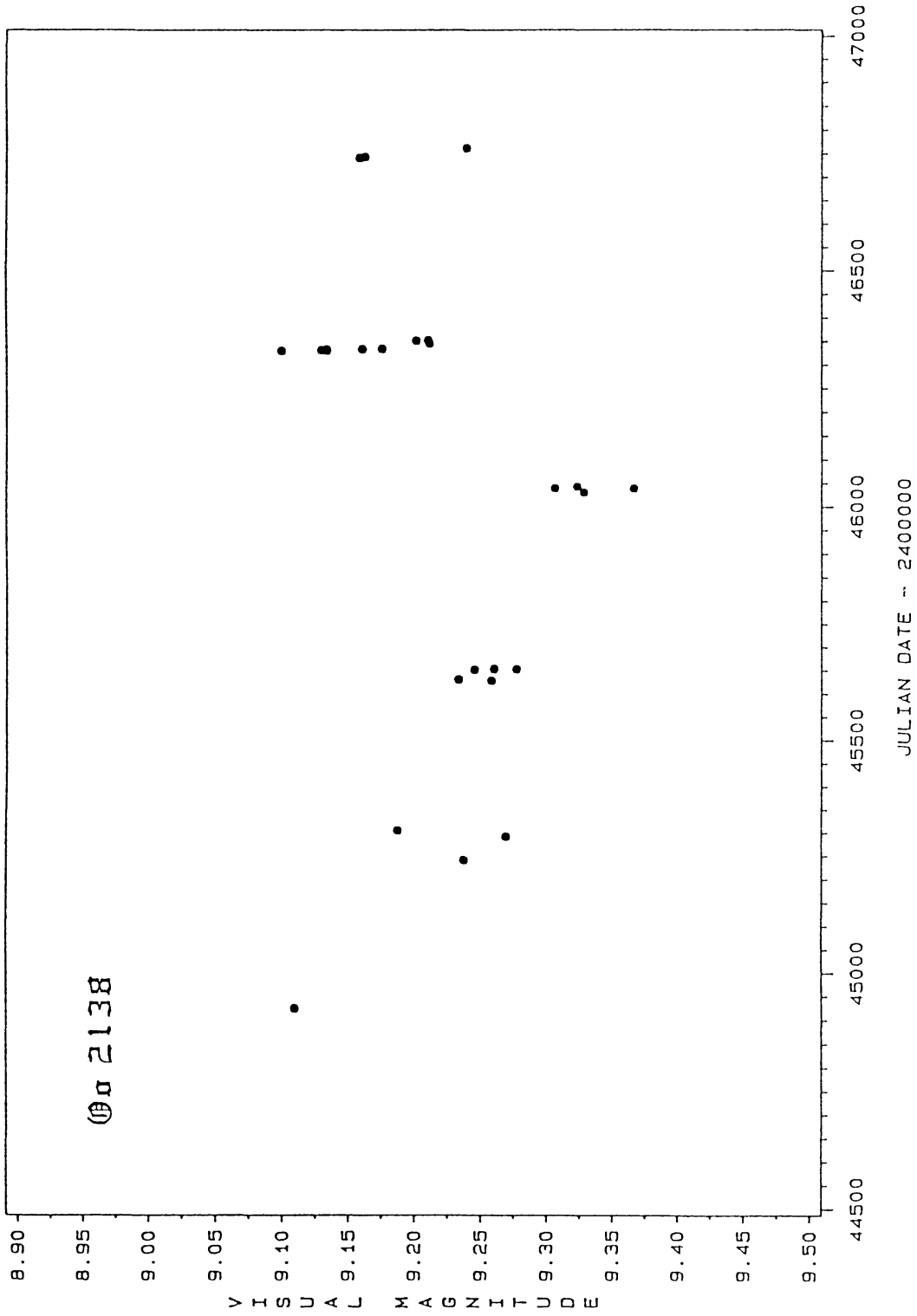


Fig. 1. Brightness variations of the Be star Oo 2138.

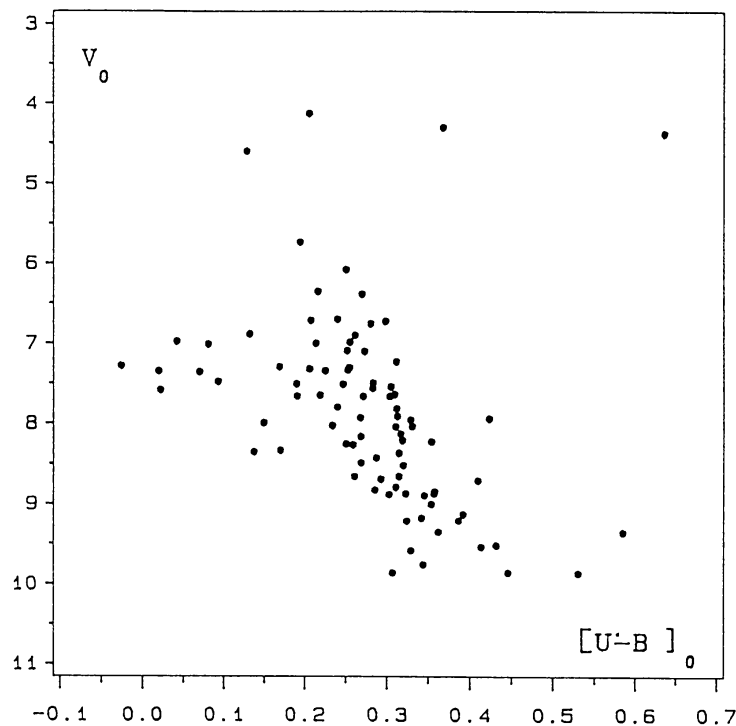


Fig. 2. The dereddened colour-magnitude diagram for the general region of h and χ Persei.

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