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On the Variability of Supergiant Stars

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1. Introduction

The Ia-type supergiants of spectral type B to G are probably all variable in radial velocity and luminosity; in addition, on the average, the amplitude of the variations increases with increasing intrinsic luminosity and are larger for the earliest and latest spectral types (Abt, 1957; Maeder & Rufener, 1972; Burki et al., 1978; Grenon, 1993). The variations are not strictly periodic, but can be frequently described by a *characteristic time* T_c, i.e., some kind of 'most probable period' (e.g., Sterken, 1977; Rufener et al., 1978; Percy et al., 1979; van Genderen et al., 1992).

It is possible to define a T_c-luminosity-colour relation for the supergiant stars (Maeder & Rufener, 1972; Burki, 1978). However, this relation exhibits a large dispersion, due to the imprecise luminosity and colour determinations for these stars and, essentially, to the fact that each supergiant can show very different T_c values. Good determinations of T_c require very long-term, continuous, photometric monitorings.

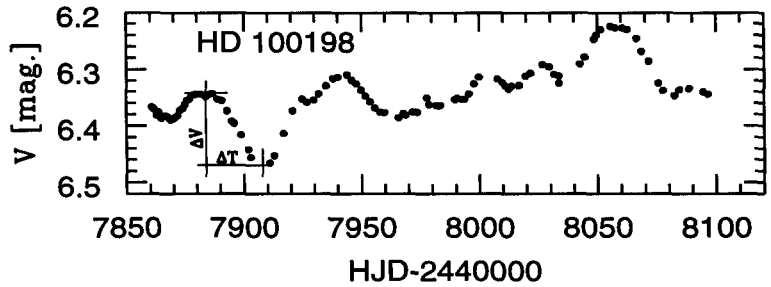

Figure 1. A portion of the photometric observations on HD 100198

2. A new description of the supergiant variability

A small group of bright, circumpolar, southern supergiant stars has been selected for a continuous monitoring from the Geneva station at the E.S.O. La Silla Observatory. A first result of this monitoring was the discovery that V810 Centauri (G0Ia) is a double-mode Cepheid-like pulsator, in addition to its supergiant behaviour (Burki, 1994). We present here the results of the preliminary analysis on HD 93737 (A0Ia/ab), HD 100198 (A3Ia) and HD 100261 (F7Ia/ab). It is

clearly apparent in Figure 1 that, taking into account the high-precision (better than 5 millimag.) and the very good temporal coverage of the data, very faint variations can be described. These data allow us to adopt a new description of the supergiant variability : on the light curve, each increasing or decreasing portion is characterized by ΔV, the luminosity variation, and by ΔT, the duration of this variation. Note that this method was already used by Burki et al. (1982) to describe the variability of the extreme supergiant ζ^1 Sco. In Figure 2 are plotted the data ΔV vs. ΔT. On the basis of this small sample, we can tentatively postulate that **the slope $\Delta V/\Delta T$ decreases from B to G spectral type**. In addition, at a given spectral type, **the maximum value of ΔV** (and, thus, also of ΔT) **increases with increasing intrinsic luminosity**.

A more complete analysis, based on a larger sample of supergiants observed by us in the Geneva photometric system or by various other authors, is in progress.

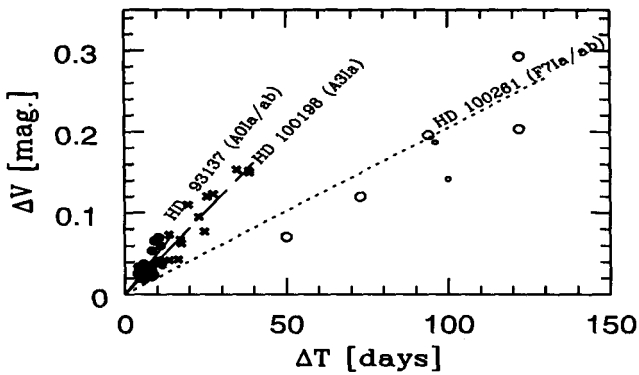

Figure 2. Relation between the luminosity variations ΔV and the corresponding time intervals ΔT for three supergiants

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