

The Cape Rapidly Oscillating Ap Star Survey

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Abstract. The Cape rapidly oscillating Ap star survey is a systematic search for rapidly oscillating Ap stars in the southern hemisphere. To date, 12 new roAp stars have been discovered. This paper describes the current state of the survey.

1. The Cape Survey

magnetic chemically peculiar A-type stars which pulsate non-radially with periods in the range 6–15 min and peak-to-peak photometric Johnson *B* amplitudes ≤ 16 mmag. The observed properties of these stars are reviewed in detail by Martinez & Kurtz elsewhere in these proceedings. Since May of 1990 Don Kurtz and I have searched for roAp stars systematically using the telescopes of the South African Astronomical Observatory at Sutherland. Candidates were drawn mostly from the Michigan Spectral Catalogue, which covers the declination range $-12^\circ \leq \delta \leq -90^\circ$, with the balance being drawn from other sources in an attempt to extend the survey to the equator. To date, *uvby β* observations of 563 southern Ap stars have been obtained. The goal of these observations is to allow us to establish the photometric limits of the roAp phenomenon and to produce a catalogue of Strömgren photometry for all the cool southern Ap stars. New roAp stars are detected and studied using non-differential high-speed photometry. The technique and its potential pitfalls have been discussed in detail by Martinez (1993a). As of this writing 147 candidates have been observed in this mode at least once. Each star is observed for 1–2 hr in Johnson *B* light and the resulting light curve is Fourier analysed to search for coherent oscillation frequencies. The observations are repeated on several different nights to sample different (unknown) rotation phases and thereby to increase the likelihood of obtaining observations during a phase when one of the pulsation poles dominates the visible hemisphere. Most of our candidates do not yet have satisfactory phase coverage. For a discussion of the null results of the survey, refer to the paper by Martinez & Kurtz (1994b).

been highly successful. Prior to the start of this survey, only 14 roAp stars, discovered over a period of 12 years, were known. During its first four years, the Cape Survey yielded 12 confirmed new roAp stars (Martinez et al. 1991, 1994a; Kurtz & Martinez 1994). Figure 1 shows a preliminary $[c_1]$ versus $(b - y)$ diagram for the Cape Survey Ap SrCrEu stars. The dots represent the stars for which Cape Survey *uvby β* photometry exists. The filled circles represent the roAp stars. The open circles are stars with *uvby β* photometry for which

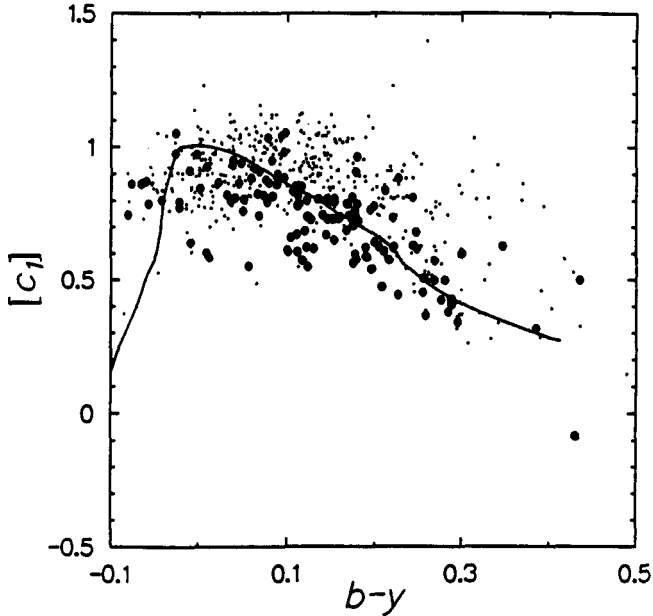


Figure 1. The $[c_1]$ versus $(b - y)$ diagram for the Cape Survey stars.

we obtained null results during searches for rapid oscillations. The solid line is the empirical main sequence relation for the chemically normal B-, A- and F-type stars. The distribution of open circles in Figure 1 shows that the Cape Survey has accomplished its objective of searching for rapid oscillations in the Ap SrCrEu stars over a wide range of temperature and luminosity. We also see that the roAp stars are confined to the coolest Ap SrCrEu stars and, for a given $(b - y)$, they are confined to the smaller values of $[c_1]$. Martinez (1993b) examines and discusses various two-colour diagrams for the roAp stars in more detail and deduces the following photometric limits for the roAp phenomenon: $2.69 \leq \beta \leq 2.88$, $0.08 \leq (b - y) \leq 0.31$, $0.19 \leq m_1 \leq 0.33$, $-0.12 \leq \delta m_1 \leq 0.02$, $0.46 \leq c_1 \leq 0.88$ and $-0.31 \leq \delta c_1 \leq 0.04$.

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