

## The Nainital-Cape Survey: contributions to asteroseismology of CP stars

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### Abstract

We present a progress report on the Nainital-Cape Survey. Pulsations of the  $\delta$  Scuti type have been discovered in the chemically peculiar A-type stars HD 13038, HD 13079, HD 98851, HD 102480, HD 113878 and HD 118660. HD 12098 has been discovered to be a roAp star. We have also detected evidence for roAp-like 6.1-minute oscillations in the Am star HD 207561.

### The Nainital-Cape Survey

The “Nainital-Cape Survey” was initiated in 1997 to search for pulsations in chemically peculiar stars in the Northern Hemisphere. This is a collaboration involving the Aryabhata Research Institute of Observational Sciences (ARIES), Nainital; the Indian Space Research Organization, and the South African Astronomical Observatory. The strategy adopted for the survey was to select candidates having Strömgren indices similar to those of the known variable Ap and Am stars (Martinez et al. 2001). Photometric observations were carried out from ARIES using a three-channel fast photometer attached to the 1.0-m Sampurnanand telescope. The time-series photometric observations consist of continuous 10-s integrations obtained through a Johnson B filter and a photometric aperture of 30″. The data reduction process comprises removing bad data points, correction for coincident counting losses, subtraction of the interpolated sky background and correction for the mean atmospheric extinction. The reduced time-series data are then Fourier-analysed to reveal their component frequencies.

Table 1 lists eight newly discovered variables. The evolved Am stars HD 98851 and HD 102480 exhibit pulsations with alternating high and low maxima, with a period ratio of  $\sim 2:1$ . HD 12098 was discovered to be a roAp star pulsating with a period of 7.6 min. We have also found evidence of possible roAp oscillations with a period of 6.1 min in the star HD 207561. More details on these objects and the null results of the survey can be found in the papers by Martinez et al. (2001) and Joshi et al. (2006), as well as in the other references cited here.

**Acknowledgments.** SJ acknowledges CSIR (No: TG/2235/06-HRD) and DST (No. SR/PF/839/2006-2007), Government of India, for providing a travel grant to attend the Vienna Workshop on the Future of Asteroseismology. P. Martinez acknowledges support from the South African DST and NRF for this joint project.

Table 1: Pulsating variables newly discovered in the course of the Nainital-Cape survey.

Star HD	$P_1$ (min)	$P_2$ (min)	Comments	References
12098	7.6	-	roAp star	Girish et al. 2001
13038	28.0	34.0	$\delta$ Scuti star	Martinez et al. 2001
13079	73.2	-	$\delta$ Scuti star	Martinez et al. 2001
98851	81.0	162.0	Alternating high- and low-maxima	Joshi et al. 2003
102480	156.0	84.0	Alternating high- and low-maxima	Joshi et al. 2003
113878	138.6	-	$\delta$ Scuti star	Joshi et al. 2006
118660	60.0	151.2	Multi-periodic	Joshi et al. 2006
207561	6.1?	-	Possible roAp star	Joshi et al. 2006

## References

- Girish V., Seetha S., Martinez P., et al., 2001, A&A, 380, 142  
 Joshi S., Mary D. L., Martinez P., et al., 2006, A&A, 455, 303  
 Joshi S., Girish V., Sagar R., et al., 2003, MNRAS, 344, 431  
 Martinez P., Kurtz D. W., Ashoka B. N., et al., 2001, A&A, 371, 1048