

## NOTES

### Fishing for Delta Scuti stars in the Hipparcos photometric database

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#### Abstract

Our group has recently used a form of autocorrelation analysis to identify and study short-period variability in A and B type stars, using Hipparcos epoch photometry (Percy and Wilson 2000, Percy et al. 2002). Our method calculates, for all pairs of measurements (m,t), the difference in magnitude and the difference in time. The delta m's are binned in time, and averaged, and then plotted against the average delta t's. Minima occur at integral multiples of the period. Maxima occur halfway between. Our method determines the cycle-to-cycle behaviour of the star, averaged over all the data.

The Hipparcos epoch photometry measurements are distributed in non-random fashion. Measurements are made 0.0143 days apart, then 0.0746, then 0.0143 and so forth, for several hours. These "clusters" are separated by 20-30 days. Jerzykiewicz and Pamyatnykh (2000) have discussed the aliasing properties of Hipparcos measurements, as they apply to Fourier analysis of Delta Scuti stars. Our algorithm is quite different from Fourier analysis, but the distribution of the measurements produces gaps in our delta m versus delta t plots, between 0.0143 and 0.0746 days, between 0.1032 and 0.1635 days etc. These gaps make it difficult to interpret data on Delta Scuti stars, since they have periods of this order.

We began by analyzing Hipparcos epoch photometry of a sample of known Delta Scuti stars with a range of mean magnitude, amplitude, period, and degree of multiperiodicity. Factors which made detection difficult were: amplitude

less than 0.03; mean magnitude fainter than 8.0; period less than 0.10 days; and appreciable multiperiodicity. We then examined a sample of 72 stars with spectral type A5-F2, parallaxes larger than 10 mas (to eliminate supergiants), and "unsolved variables" according to the Hipparcos Catalogue. We found five possible Delta Scuti star candidates: HIP 1073, 9807, 30878, 63041 and 65208, and several marginal candidates. There were also two stars with longer periods: HIP 31075 and 63951. Among these, we wish to call attention to three interesting stars. Intensive ground-based photometry of these would be useful to confirm their variability.

HIP 30878 (HD 45191, V455 Aur,  $V = 7.25$ , F2) is an eclipsing binary of the Algol type. From light curve and autocorrelation analysis, we suspect that it may be a Delta Scuti star with a period of 0.11 days and a full amplitude of 0.01 magnitude.

HIP 31075 (HD 46169,  $V = 7.66$ , F0V), from light curve and autocorrelation analysis, has a suspected period of 0.55 days and a full amplitude of 0.02.

HIP 63951 (HD 113867,  $V = 6.83$ , F0), from light curve and autocorrelation analysis, has a period of 1.1 days and a full amplitude of 0.02. The period in the Hipparcos Catalogue is 1.0731 days, which we confirm.

## References

- Jerzykiewicz, M., Pamyatnykh, A. 2000, *PASP* 112, 776  
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