SHORT-TERM AMPLITUDE VARIATION OF
FM COM (=HR 4684)

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Abstract. Using unpublished data obtained in 1982 at Mexico and Turkey combined with Hungarian observations the process of amplitude variation of the frequency at 18.5 c/d is shown. The time scale of the amplitude increase is less than 100 days.

For a long time a basic problem is in the study of Delta Scuti stars what is their characteristic behaviour. Three possibilities were suggested: i) they pulsate with constant periods and amplitudes, ii) the periods are constant but they show amplitude modulation, iii) mode switching may exist.

Most of Delta Scuti stars with large amplitude and the well-analysed low amplitude $78\theta^2$ Tau (Breger et al. 1989, Kovács and Paparó 1989) belong to case i). The periods and amplitudes are constant over years.

The case iii) may represented by only one star, 21 Mon (Stobie et al. 1977) where completely different frequency sets were found with two years difference. The reanalysis done by Kurtz (1980) could not change this result.

Concerning to case ii), lately a definite amplitude variation was found by Breger et al. (1990) for 4 CVn where the time scale covers years or decades. Short time scale amplitude variation was reported in θ Tuc by Stobie and Shobbrook (1976), however, the reanalysis done by Kurtz (1980) raised up the beating of frequencies as an alternative solution.

HR 4684 was reported by Paparó and Kovács (1984) to have a very complicated spectrum which seems to change on a very short time scale, however, this finding based on six nights of observation from one site was not convincingly proved. Fortunately HR 4684 was also observed in Mexico and Turkey in 1982. The unpublished four Turkish and four Mexican observing runs excellently match in time to the Hungarian observations. 14 nights obtained at three different site over 90 days (coverage is 2.8%) gave the possibility to investigate the amplitude variation on short time scale. (The detailed analysis will be published elsewhere). The most compact dataset (60 days, coverage is 3.3%) was separated into four slightly overlapping tracks. The amplitude spectrum of the separated tracks could be seen in Figure 1.
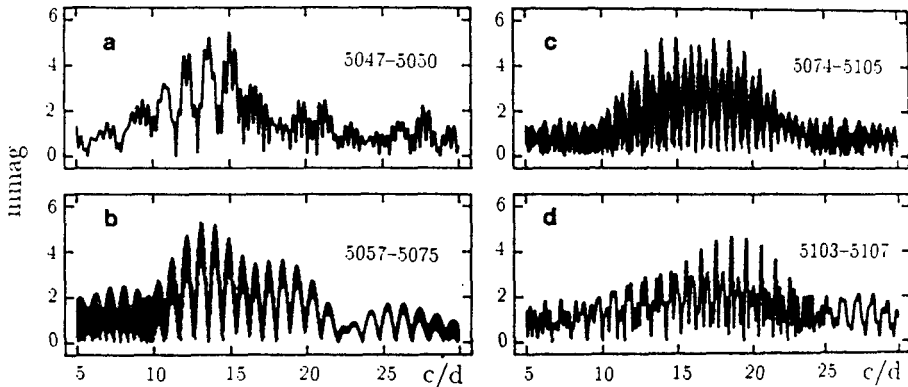
Fig. 1.   Amplitude spectrums of HR 4684

In the panels from a) to d) a continuous increase could be noticed in the amplitude of the frequency at 18.5 c/d. The first panel (a) based altogether on four nights of observation (coverage is 24%) from Turkey, Mexico and Hungry shows the dominant frequency at 15.08 c/d. Practically there is no sign of the frequency at 18.5 c/d. The second panel (b) based on Turkish and Mexican observations (three nights, coverage is 3%) shows how the amplitude of 18.5 c/d frequency is increasing but the amplitude is still less than the amplitude of 15.08 c/d. In the third panel (c) using two Mexican and two Hungarian observations (coverage is 2.6%) the amplitude of both frequencies are the same. In the last panel (d) using four Hungarian observations (coverage is 16%) the dominant frequency is at 18.5 c/d. The amplitude of the frequency at 15.08 c/d decreased to the half of the previous value.

Regarded the rather good coverage of the first and last panels and the advantages coming from multisite observations the short time scale amplitude variation in HR 4684 during 1982 seems to be well-established. The amplitude variation of a single frequency as an explanation, instead of beating of closely spaced frequencies, is base on the detailed analysis of different years.

Looking at the long-term amplitude variation of 4 CVn and the short-term amplitude variation in HR 4684 the question is raised: what is the

theoretical time scale of amplitude variation in Delta Scuti stars? As it was kindly checked by W. Dziembowski during the meeting the time scale may be less than a year or may cover years or decades. It means, both the long-term and short-term amplitude variations could be explained by the present state of the theory.

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