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HR 981 - A NEW USPC

As part of a survey for USPC's south of declination -60° , we observed the F0 giant HR 981 (= HD 20313) on 1981 December 4. ι Hyi (=HR 1025=HD 21024) and ν Men (= HR 1456 = HD 29116) were chosen as comparison and check star, respectively. Figure 1 illustrates the light curve obtained, Fourier analysis of the short span of data indicated a period around 0.066 day and a visual light range ≈ 0.02 magnitude. The solid line in Figure 1 is a reconstructed light curve using this period only; the average difference between comparison and check stars is given by a dashed line. Fourier analysis of the magnitude differences between comparison and check stars indicated that the observed period was only present for HR 981 and could not be attributed to atmospheric conditions or observing procedures.

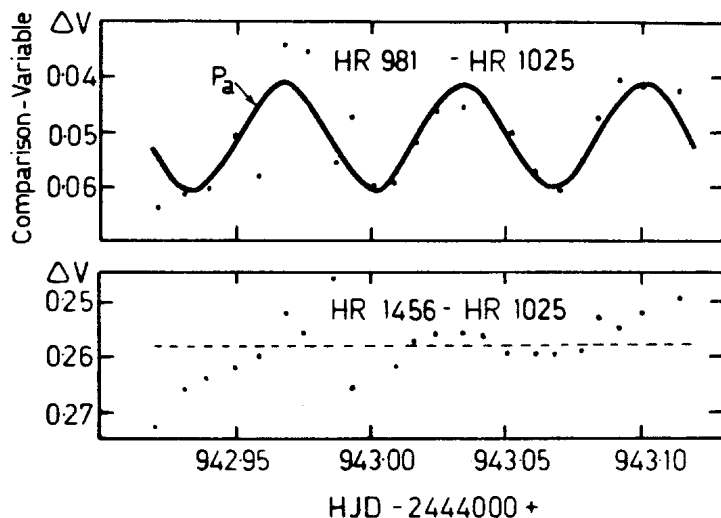


Figure 1

Because of the large scatter in the magnitude differences between check

star and comparison star, particularly at the beginning of the observing session, HR 981 was reobserved on 1982 November 21 and again on 1982 December 12 using ϵ Hy1 as a comparison star and HD 20927 (= DM -79^o 98) as a check star; light curves and data are given in Figures 2 and 3 where solid lines represent reconstructed light curves and the dashed lines indicate the means magnitude difference between comparison and check stars.

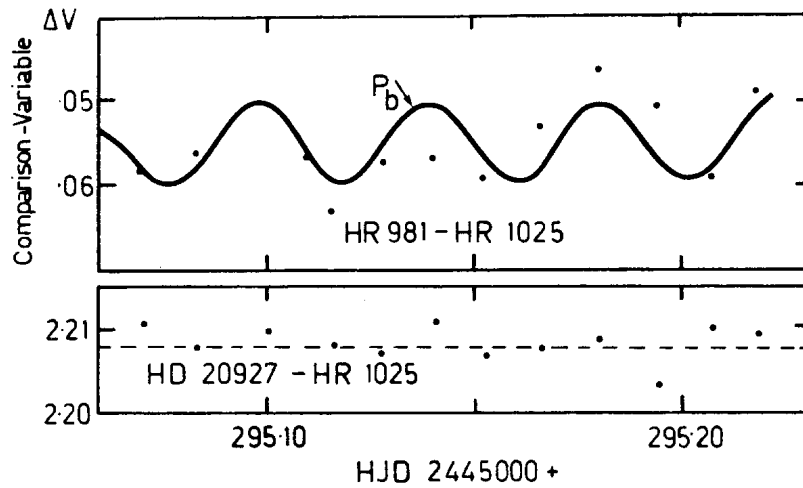


Figure 2

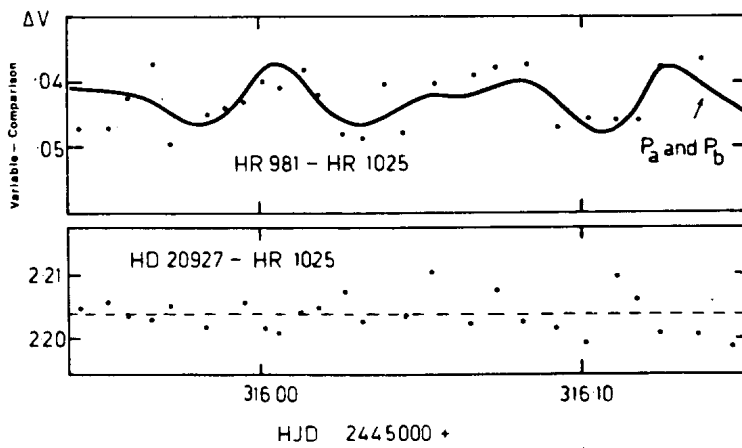


Figure 3

A period of $P_b = 0.041 \pm 0.001$ day was present on all three nights and the period $P_a = 0.065 \pm 0.001$ day was isolated for the two longer observing sessions, the observing session on 1982 November 21 being too short to ascertain this longer period. The amplitudes are not well determined due to insufficient data and small signal to noise ratio, however P_b appears to have an amplitude of 0.003 magnitude and P_a has about twice the value. The calculated period ratio of $P_b/P_a = 0.63 \pm 0.03$ indicates pulsation in the fundamental mode and second overtone. (See Petersen, 1976, where P_2/P_0 is given as 0.61 or Breger, 1979, where $P_2/P_0 = 0.62$). This explanation as to the modes of pulsation observed in HR 981 is reinforced by agreement between $P_0 \approx 0.07$ d calculated using the PLC relation of Breger (1979) with M_v and $b-y$ given in Table I, and $P_a = 0.065$ day observed for this star. HR 981 is a known binary; because of the separation of the components the combined light of HR 981A and B was measured on all nights. Table I gives the average uvby β data for both components of HR 981 as listed by Hauck and Mermilliod (1980) along with their luminosities and effective temperatures calculated from these data.

Table I

	HR 981A	HR 981B
V	5.68	8.06
b-y	0.166	0.284
m_1	0.190	0.159
c_1	0.839	0.463
β	2.765	2.668
M_v	1.79	3.45
T_e	7530 K	6640 K
$(b-y)_0$	0.165	0.289
$[m_1]$	0.219	0.21
$[c_1]$	0.805	0.406

The observed variations can be attributed to HR 981A, as its luminosity and effective temperature place it within the USPC instability region. It is worth noting that HR 981B is too late in spectral type to be a USPC and would have to pulsate with an amplitude ≥ 0.2 magnitude to produce the observed variation of the combined light of HR 981A and B.

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