TABLE 1

LOG OF THE OBSERVING SEASONS

Epoch	Cluster	Initial date year mo day	Final date year mo day	Observers
2009 June	NGC 6811, NGC 6830	2009 06 24	2010 06 29	jhp, hg, arl
2010 August	NGC 6811	2010 08 03	2010 08 06	jhp, ss, er, ae

Observers: jhp, J. H. Peña; hg, H. García; arl, A. Rentería; ss, S. Skinner; er, E. Romero; ae, A. Espinosa.

after) and assuming a metallicity of $Z = 0.019$. They determined the distance modulus and color excess as 10.59 ± 0.09 and 0.12 ± 0.05, respectively.

To the best of our knowledge, no δ Scuti variable stars have been reported in NGC 6830 to date.

According to the compilation of data of open clusters in Paunzen & Mermilliod (2007, WEBDA), NGC 6811 has a distance [pc] of 1215; a reddening [mag] of 0.160; a distance modulus [mag] of 10.92; a log age 8.799 and no data on metallicity reported. NGC 6830 has the following: distance [pc] 1639; reddening [mag] 0.501; distance modulus [mag] 12.63; log age 7.572 with no determined metallicity.

2. OBSERVATIONS

These were all taken at the Observatorio Astronómico Nacional, Mexico in two different seasons, those of 2009 and 2010. The dates are listed in Table 1. The 1.5 m telescope to which a spectrophotometer was attached was utilized at all times. The first observing season was carried out over six nights from June–July 2009. The ID charts utilized were those of WEBDA. When the NGC 6811 data were reduced, there were several stars whose photometry showed large discrepancies with the literature. In view of this and due to the fact that several δ Scuti stars were recently discovered in this cluster (Luo et al. 2009), a second observing season was planned in 2010 to measure all of these stars in the $uvby - \beta$ system.

2.1. *Data acquisition*

The following procedure was utilized during all nights: each measurement consisted of at least five ten-second integrations of each star and one ten-second integration of the sky for the $uvby$ filters and the narrow and wide filters that define Hβ. Individual uncertainties were determined by calculating the standard deviations of the fluxes in each filter for each star. The percent error in each measurement is, of course, a function of both the spectral type and the brightness of each star, but they were observed long enough to secure sufficient photons to get a S/N ratio of accuracy of $N/\sqrt{(N)}$ of 0.01 mag in most cases. Each night a series of standard stars was also observed to transform the data into the standard system. The reduction procedure was done with the numerical packages NABAPHOT (Arellano-Ferro & Parrao 1988) which reduce the data into a standard system, although some data were also taken from the *Astronomical Almanac* (2006) for the standard bright stars. The chosen system was that defined by the standard values of Olsen (1983) and the transformation equations are those defined by Grönbech, Olsen, & Strömgren (1976) and by Crawford & Mander (1966). In these equations, the coefficients D, F, H and L are the slope coefficients for $(b - y)$, m_1, c_1 and β, respectively. The coefficients B, J and I are the color terms of V, m_1, and c_1. The averaged transformation coefficients of each season determined from the mean of all nights are listed in Table 2 along with their standard deviations. Errors of the season were evaluated by means of the standard stars observed. These uncertainties were calculated through the differences in magnitude and colors, for (V, $b-y$, m_1, c_1 and β) as (0.020, 0.017, 0.011, 0.031, 0.011) respectively, which provide a numerical evaluation of our uncertainties. Emphasis is made on the large range of the standard stars in the magnitude and color values: V:(5.4, 8.7); $(b - y)$:(0.02, 0.80); m_1:(0.09, 0.67); c_1:(0.06, 1.12) and β:(2.53, 2.89).

The transformation equations used in the work have the following forms in which 'inst' stands for instrumental values and 'std' for photometric values in the standard system:

$$
\begin{aligned}
V &= \mathrm{A} + \mathrm{B}\ (b-y)(\mathrm{inst}) + y\ (\mathrm{inst}),\\
(b-y)\ (\mathrm{std}) &= \mathrm{C} + \mathrm{D}\ (b-y)(\mathrm{inst}),\\
m_1(\mathrm{std}) &= \mathrm{E} + \mathrm{F}\ m_1(\mathrm{inst}) + \mathrm{J}\ (b-y)(\mathrm{inst}),\\
c_1(\mathrm{std}) &= \mathrm{G} + \mathrm{H}\ c_1(\mathrm{inst}) + \mathrm{I}\ (b-y)(\mathrm{inst}),\\
\beta\ (\mathrm{std}) &= \mathrm{K} + \mathrm{L}\ \beta\ (\mathrm{inst}).
\end{aligned}
$$