Revista Mexicana de Astronomía y Astrofísica, **47**, 309–321 (2011)

uvby − *β* PHOTOELECTRIC PHOTOMETRY OF THE OPEN CLUSTERS NGC 6811 AND NGC 6830[1]

J. H. Peña,[2] L. Fox Machado,[3] H. García,[4] A. Rentería,[2] S. Skinner,[2,5] A. Espinosa,[2] and E. Romero[2]

Received 2010 October 27; accepted 2011 June 15

RESUMEN

A partir de la fotometría fotoeléctrica *uvby* − *β* de los cúmulos abiertos NGC 6811 (75 estrellas) y NGC 6830 (19 estrellas) realizamos la determinación de distancias y, por ende, la pertenencia de las estrellas a cada cúmulo. Asimismo, se determinaron la edad y el enrojecimiento de cada uno. Dado que recientemente se han determinado estrellas variables para el primero, realizamos un estudio de dichas variables.

ABSTRACT

From *uvby* − *β* photometry of the open clusters NGC 6811 (75 stars), and NGC 6830 (19 stars) we were able to determine membership of the stars to each cluster, and fix the age and reddening for each. Since several short period stars have recently been found, we have carried out a study of these variables.

Key Words: open clusters and associations: individual (NGC 6811, NGC 6830) — techniques: photometric

1. INTRODUCTION

The study of open clusters and their short period variable stars is fundamental in stellar evolution. Because the cluster members are formed in almost the same physical conditions, they share similar stellar properties, such as age and chemical composition. The assumption of common age, metallicity and distance imposes strong constraints when modeling an ensemble of short period pulsators belonging to open clusters (e.g., Fox Machado et al. 2001, 2006). Thus, observational studies involving variable stars in open clusters have attracted more and more attention (e.g., Fox Machado et al. 2002; Li et al. 2002, 2004).

A series of papers (see Peña & Peniche 1994; Peña et al. 1998, 2003; Peña, Fox Machado, & Garrido 2007) study the physical nature of the short period variable stars in open clusters by means of Strömgren photometry, since, once their membership to the cluster has been established, their physical quantities can be unambiguously derived. In particular, the determination of physical parameters of cluster member stars from *uvby* − *β* photometry can be done through a comparison with theoretical models (Lester, Gray, & Kurucz 1986, hereinafter LGK86).

As a continuation of our study, we now present observations of the open clusters NGC 6811 and NGC 6830. Both clusters have no previous published *uvby* − *β* data.

Very recently, Luo et al. (2009) carried out a search for variable stars in the direction of NGC 6811 with CCD photometry in the B, and V bands. They detected a total of sixteen variable stars. Among these variables, twelve were catalogued as δ Scuti stars, while no variability type was assigned to the remaining stars. They claim that the twelve δ Scuti stars are all very likely members of the cluster, which makes this cluster an interesting target for asteroseismological studies. Moreover, NGC 6811 has been selected as a asteroseismic target of the Kepler space mission (Borucki et al. 1997). Therefore, deriving accurate physical parameters for the pulsating star members is very important.

For NGC 6811 Luo et al. (2009) estimated an age of $\log(t) = 8.76 \pm 0.009$ from theoretical isochrone fitting to the color magnitude diagram (CMD here-

[1]Based on observations collected at the San Pedro Mártir Observatory, Mexico.

[2]Instituto de Astronomía, Universidad Nacional Autónoma de México, Mexico.

[3]Observatorio Astronómico Nacional, Instituto de Astronomía, Ensenada, Mexico.

[4]Observatorio Astronómico de la Universidad Nacional Autónoma de Nicaragua, Nicaragua.

[5]Universidad Nacional de Panamá, Panama.