

field (around 100 MG on surface) and a low accretion rate. To study the accretion, from the mass-donor star to the white dwarf, we obtained time-resolved spectroscopy using the Goodman spectrograph at the SOAR telescope in observing runs distributed around the first semester of 2012. We found the object in different brightness states. In the low state, we gathered data with two spectral resolutions (219 km/s and 170 km/s). In a brighter state, the spectral resolution was ≈ 170 km/s. The low (high) spectral resolution data cover the spectral region from 360 to 760 nm (435 to 700 nm). The continuum varies in both states and the cyclotron humps are visible at some orbital phases. The low-state spectra show Balmer emission lines superimposed on absorption features from the mass-donor star. The bright-state spectra show strong Balmer, HeI, and HeII emission lines. The Balmer and HeII lines are not single Gaussians: in bright state the lines are broader and have three components; in low state, the lines are narrower and two components are distinguished in some phases. Doppler tomography of the low state reveals that line emission arises mainly from a region near the white dwarf. The orbital dependence of the cyclotron emission was modeled using the Cyclops code, which adopts a 3D representation of the accretion column.

¹ Divisão de Astrofísica, Instituto Nacional de Pesquisas Espaciais, Brazil (claudia.rodrigues@inpe.br).

² Universidade Federal de Sergipe, Brazil.

³ Universidade do Vale do Paraíba, Brazil.

⁴ Universidade Federal de Santa Catarina, Brazil.

⁵ Humboldt State University, USA.

HIGH-RESOLUTION SPECTROSCOPIC OF
RED GIANTS STARS IN NGC 2360

J. V. Sales Silva¹ and C. B. Pereira¹

Open clusters are excellent laboratories to test our knowledge of the formation and evolution of the two components of the disk (thick and thin disk), and stellar structure and evolution, since the stars present the same age and distance reducing the uncertainties associated with field stars of the Galaxy. NGC 2360 is an open cluster with 0.85 Gyr, with galactocentric distance equal to 9.28 Kpc and height equal to -30 pc. We determine to 15 stars in the NGC 2360 using high resolution spectroscopy the atmospheric parameters and the chemical composition for Fe, Ni, Cr, Ca, Mg, Si, Ti, Na, Al, Ba, Y, Zr, La,

Ce and Nd with measures of equivalent widths of absorption lines, and spectral synthesis for C, O and N. The spectra of 14 stars were obtained with FEROS at the 2.2m ESO telescopes at La Silla (Chile). Only one star was observed with UVES/VLT at Paranal Observatory. Atmospheric parameters and abundances were determined using the LTE atmosphere models of Kurucz and the spectral analysis code MOOG. The abundance of alpha and iron-peak elements of NGC 2360 are typical disk abundances. We also observed a slight overabundance of the elements generated by the s-process in NGC 2360 with respect to field stars of the disk. The overabundance of the elements generated by the s-process occurs in young open clusters and may be linked to high-efficiency of these nucleosynthesis in low-mass stars ($< 1.5M_{\odot}$). However, this high-efficiency has not been explained by the stellar evolutionary models. Additional observations and high resolution spectroscopic analysis of intermediate-age open clusters (like NGC 2360) are necessary to confirm the slight overabundances of s-process elements with relation to field stars of the disk and old open clusters.

¹ Observatório Nacional, Rua José Cristino, 77. 20921-400, São Cristóvão, Rio de Janeiro-RJ, Brazil (joaovictor, claudio@on.br).

DISCRIMINATING LOCAL GROUP
EMBEDDED STAR CLUSTERS FROM OLDER
ONES USING NEAR-IR PHOTOMETRIC
INDEXES

J. F. C. Santos Jr.¹, H. Dottori², and P. Grosbøl³

Several grand-design spiral galaxies show a bimodal distribution of their system of star clusters and star forming complexes in *JHK* diagrams. The $(J - H)$ vs $(H - K_s)$ diagram revealed that embedded clusters, still immersed in their parental clouds of gas and dust, have in general a redder $(H - K_s)$ colour than older clusters, whose gas and dust have already been ejected. In addition, the reddening-free index $Q_d = (H - K_s) - 0.884 (J - H)$ was shown to correlate with age for the young clusters and thus provided an effective way to differentiate the embedded clusters from the older ones. In the present work, the aforementioned photometric indices were explored for star cluster systems in the Local Group. In particular, we investigate the effectiveness of the Q_d index in sorting out clusters of different ages at their early evolutionary stages. Surface photometry

on 2MASS images was carried out for populous clusters younger than approximately 100 Myr and whose ages are available. The integrated magnitudes and colors extracted from the surface photometry showed the same bimodal distribution in JHK diagrams as that found for more distant galaxies, suggesting that the phenomenon is universal. We confirm the index Q_d as a powerful tool to distinguish clusters younger than about 7 Myr from older clusters.

¹ Instituto de Ciências Exatas, Universidade Federal de Minas Gerais, Av. Antônio Carlos 6627, 31270-901 Belo Horizonte, MG, Brazil (jsantos@fisica.ufmg.br).

² Instituto de Física, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves 9500, 91501-970 Porto Alegre, RS, Brazil (dottori@ufrgs.br).

³ European Southern Observatory, Karl-Scharzschid-Str. 2, 85478 Garching, Germany (pgrosbol@eso.org).

MAPPING OF THE PHYSICOCHEMICAL CONDITIONS OF THE PLANETARY NEBULA MENZEL 1

P. Santos¹ and H. Monteiro¹

We present a study of the physicochemical conditions of the planetary nebula Menzel 1 using the method of spatially resolved spectrophotometric mapping. The data used in this study were collected in the Cerro Tololo Inter-American Observatory (CTIO) 0.9 m telescope. Observations were made with traditional long-slit spectroscopy with exposures taken for multiple parallel positions along the object in order to map it. The separation of the 4" slits were of 4". Initially, a data cube was created with the spectra obtained for each position of the slit. We used MPFIT - a software package that aims to find parameters that best fit the data to a function - to fit gaussians to the emission lines observed in each pixel of the spatial direction, for each slit in the data cube. We then reconstructed the image of the nebula for each a given emission line extracted from the data cube, interpolating between observed slit positions. With these maps, we obtained the interstellar extinction from the $H\alpha/H\beta$ ratio pixel by pixel. We obtained the density map from the [SII]671.7nm/673.1nm ratio and the temperature map from the [NII](654.8+658.4)nm/575.5nm ratio. Using the code NEAT (Nebular Empirical Analysis Tool), the maps of the chemical abundance were calculated from the flux maps. These maps provide a spatially resolved overview of the physicochemical conditions found in this object. From the maps,

we calculated mean values for the main diagnostics, which compared well with values from the literature, showing that we retrieved results from observations without spatial resolution. This method allows the study of planetary nebulae in more detail than conventional methods.

¹ Instituto de Física e Química, Universidade Federal de Itajubá (psantos.phyas@gmail.com; hektor.monteiro@gmail.com).

MODELING BLUE HORIZONTAL BRANCH STARS

R. G. Santos¹ and L. P. Martins¹

The stars of the Blue Horizontal Branch (BHB) are characterized by having being through most of their evolutionary process and lost part of their external layers, leaving only a thin layer of hydrogen and a burning Helium nucleus. This makes these stars very blue and hot, although old. They are present in many stellar population systems (e.g. stellar clusters and elliptical galaxies), and their presence can induce errors in the age determination of these objects using integrated spectra. The stellar population analysis technique using integrated spectra is a very powerful tool nowadays, however stellar population models do not account for the BHB stars. Because of that, the presence of these stars induces to the determination of younger ages than expected for these systems. In this project we will create synthetic spectra for the BHB stars that can be incorporated to the stellar population models to be used in spectral synthesis. Here we present a study of the atmospheric parameters of these stars that will be used to create the synthetic spectra.

¹ Núcleo de Astrofísica Teórica, Universidade Cruzeiro do Sul, Campus Liberdade, Rua Galvão Bueno, 868, Liberdade, São Paulo, Brasil (rafaboner@terra.com.br).

ACCRETION DISC MAPPING OF THE SHORTEST PERIOD ECLIPSING BINARY SDSS J0926+36

W. Schlindwein¹ and R. Baptista¹