Our studies in the optical band showed that the cloud is surrounded by a MF which is well aligned with the projected small axis of the cloud. Our H-band data show in general the same tendency in the inner parts of the MDC. The comparison between the V and H bands allow us to conclude that the same type of grains are polarizing the light throughout the cloud at least up to Av $\sim$ 8-9, and that these are the same as those in the general ISM. Utilizing the dispersion of the polarization vectors, we estimated the MF intensity (0.02-0.16 mG) across the cloud. We compared the magnetic and gravitational energies and concluded that Musca is a subcritical cloud. From the structure function of the polarization at the H band, we obtain 0.21-0.29 pc for the range of correlation lengths of the MF in the cloud, comparable to the size of the optical condensations.

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THE EXTINCTION ON THE SOUTHERN GALACTIC DISK AS SEEN FROM THE VVV SURVEY: A RAYLEIGH-JEANS EXTINCTION MAP

M. Soto[1,2], R. Barbá[2], V. Firpo[2,3], and A. Roman-Lopes[2]

We report on the development of an extinction map for the Southern Galactic disk based on the combination of Near-Infrared (NIR) observations of the ESO public survey VISTA Variables in the Milky Way (VVV), complemented with GLIMPSE and 2MASS data. The 520 deg^2 observed by VVV in 5 near infrared bands (J, H, K_s, Y, Z), and multiple epochs, are a wealth of information which are important to address fundamental questions about the structure and formation history of the Milky Way. The region surveyed by this work, the 152 VVV tiles/fields of the Southern Galactic disk, overlaps with the 2MASS and GLIMPSE surveys, and thus allows the sources surveyed to have multiband photometry ranging from the near to mid-infrared wavelengths. Our results, using the Rayleigh-Jeans Color Excess method (RJCE), have allowed us to obtain an extinction map with a pixel size of 1'×1', which is consistent with other maps developed recently. Furthermore, our results show a systematic underestimation of extinction by previous work based on 2MASS NIR data alone.

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THE DISCREPANT KINEMATICS OF RECOMBINATION AND COLLISIONALLY EXCITED LINES IN NGC 7009 AS A FUNCTION OF IONIZATION STRUCTURE

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We have analyzed the kinematics of emission of the planetary nebula NGC 7009 from long slit spectroscopy from the UVES spectrograph at the VLT of ESO. In particular we are interested in comparing lines excited by recombination and collisions with electrons to determine whether similarities or differences could be useful in elucidating the well-known abundance discrepancy derived from them.We construct position–velocity maps for recombination, fluorescence, charge transfer, and collisionally excited lines.We find a plasma component emitting in the C II, N II, O II, and Ne II recombination lines whose kinematics are discrepant: they are incompatible with the ionization structure derived from all other evidence and the kinematics derived from all of these lines are unexpectedly very similar. We found direct evidence for a recombination contribution to [N II] λ5755. Once taken into account, the electron temperatures from [N II], [O III], and [Ne III] agree at a given position and velocity. The electron densities derived from [O II] and [Ar IV] are consistent with direct imaging and the distribution of hydrogen emission. The kinematics of the C II, N II, O II, and Ne II lines does not coincide with the kinematics of the [O III] and [Ne III] forbidden emission, indicating that there is an additional plasma component to the recombination emission that arises from a different volume from that giving rise to the forbidden emission from the parent ions within NGC 7009. Thus, the chemical abundances derived from either type of line are correct only for the plasma component from which they arise. Apart from [N II] λ5755, we find no anomaly with the forbidden lines usually used to determine chemical abundances in ionized nebulae, so the abundances derived from them should be reliable for the medium from which they arise.

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STAR FORMATION

3D SIMULATIONS OF THE BEEHIVE PROPLYD

J. A. Feitosa[1], M. J. Vasconcelos[1], and A. H. Cerqueira[1]

Some star formation regions, like the Orion nebula, have stars of different masses, from massive stars, responsible for strong ionizing winds and HII regions, to low-mass stars, which spend a long time in the protostellar phase, and are frequently associated with protostellar disks and jets. Massive O or B stars emit a great deal of UV radiation, able to dissociate the hydrogen molecule (FUV radiation, energies between 6-13 eV), to ionize the atomic hydrogen (EUV radiation, energies greater than 13.6 eV) and heat the gas. Around these stars, a large and hot ($10^4 K$) region is formed, known as HII region. T-Tauri stars inside HII regions produce a type of young stellar object, a proplyd, described with accuracy in O'Dell et al. (1993). Proplyds exhibit a cometary shape from which we can distinguish a central low-mass star with an accretion disk, an ionization front, a photodissociation region and, sometimes, an external bow shock and a protostellar jet. Its morphological characteristics depends on the distance between the low-mass star and the source of the ionizing radiation. The Beehive, a giant proplyd in Orion Nebula, has attracted attention due to its exotic system of rings coaxial to the HH540 jet's axis. Bally et al. (2005) suggested that the rings are perturbations due to the crossing of the ionization front by the jet. In this work, we test this hypothesis making 3D hydrodynamic numerical simulations over an adaptive grid, using the Yguazú-A code (Raga et al., 2000), properly adapted for the Beehive conditions. Our results show that the jet causes a perturbation in the ionization front of the proplyd, but is necessary to adjust carefully some parameters of the jet like its velocity and ejection frequency in order to have the results matching the observations.

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THE NATURE OF X-RAY SOURCES ASSOCIATED TO YOUNG CLUSTERS AROUND SH2-296

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Aiming to unravel the star formation activity in the Canis Major R1 (CMaR1), we have studied the young (< 5 Myr) clusters associated to the arc-shaped ionized nebula Sh2-296. Based on our X-ray data complemented by optical and near-IR data, we discovered, near to GU CMa, a stellar cluster that is older by at least a few Myr than the previously known cluster, around Z CMa, where star formation is still very active. Multi-object optical spectroscopy of our X-ray sources nearby Z CMa was performed with *Gemini* telescopes to confirm the existence of a mixed population from both older and younger clusters around the edge of Sh2-296. In the present work we show the results for optical counterparts candidates of 45 X-ray sources. Spectral type determination was based on comparison with standard spectra library and fitting the continuum and TiO bands. Typical features of young stars were inspected to confirm the nature of the sample that is mainly classified as T Tauri stars (TTs), since their spectra show the Li I line, one of the indicators of youth. The equivalent width of $H\alpha$ measured at 10% of the total flux was used to separate Classical TTs (CTTs) from weak-line TTs (WTTs). Among 51 optical counterparts candidates, 38 are young stars: 24% of them are classified as CTTs and 76% are WTTs. However the present results correspond to a small fraction ($\sim$15%) of the entire sample of X-ray sources we have detected. Aiming a more representative set of spectra, additional GMOS observations have been performed, as well as another ongoing project (see Santos-Silva et al.) dedicated to studying of the X-ray properties.

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