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INFRARED STUDY OF NEW STAR CLUSTER CANDIDATES ASSOCIATED TO DUSTY GLOBULES

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We present results from a study of a sample of small star clusters associated to dusty globules and bright-rimmed clouds that have been observed under ESO/Chile public infrared survey *Vista Variables in the Vía Láctea (VVV)*. In this short communication, we analyse the near-infrared properties of a set of four small clusters candidates associated to dark clouds. This sample of clusters associated to dusty globules are selected from the new VVV stellar cluster candidates developed by members of La Serena VVV Group (Barbá et al. 2014). Firstly, we are producing color-color and color-magnitude diagrams for both, cluster candidates and surrounding areas for comparison through PSF photometry. The cluster positions are determined from the morphology on the images and also from the comparison of the observed luminosity function for the cluster candidates and the surrounding star fields. Now, we are working in the procedures to establish the full sample of clusters to be analyzed and methods for subtraction of the star field contamination. These clusters associated to dusty globules are simple laboratories to study the star formation relatively free of the influence of large star-forming regions and populous clusters, and they will be compared with those clusters associated to bright-rimmed globules, which are influenced by the energetic action of nearby O and B massive stars.

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THE INNER DISKS OF CLASSICAL T TAURI STARS IN NGC 2264

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NGC 2264 is a young ($\sim$ 3 Myr) stellar cluster that was observed twice by the CoRoT satellite, the first time for 23 days in 2008 and the second during 40 days in 2011. Simultaneous with the 2011 CoRoT observations, a multi-wavelength campaign was organized that included 30 days of Spitzer observations at 3.6 and 4.5 microns, 3.5 days of Chandra data, VLT FLAMES spectroscopy and U band photometry from Megacam (CFHT). We obtained simultaneous high precision light curves in the optical and near IR for more than 500 cluster members, about 200 of which are classical T Tauri stars. As shown in the first CoRoT campaign, a fraction of the accreting systems exhibit optical light curves with deep minima that vary substantially in width and depth in a rotational timescale. These light curves are interpreted as due to an inner disk warp that eclipses the star as the system rotates, like observed in AA Tau, a well studied CTTS seen at high inclination. This warp is thought to be created by the star-disk interaction mediated by a stellar magnetic field inclined with respect to the stellar rotation axis. The observed variability indicates the star-disk interaction is dynamic and the occulting material is inhomogeneous and located close to the co-rotation radius of the star-disk system. We present the photometric and spectroscopic analysis of the AA Tau-like CTTSs observed in NGC 2264. Initial light curve model results indicate that an inner disk warp located near the co-rotation radius can indeed explain the observed variability and that, if the variability is attributed to extinction alone, the properties of the dust in the inner disk are substantially different from the ISM.

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MILLIMETER AND FAR-IR OBSERVATIONS OF THE IRDC G341.24-0.27

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Infrared Dark Clouds (IRDCs) are the cold T $<$ 25 K) and dense ($> 10^5$ cm^{-3}) regions, with a scale of 1 – 10 pc and a mass of $10\times^{2-5}$M$_\odot$. Cores within the IRDCs may be in different phases, from a quiescent to an active one. Quiescent cores represent the earliest protostellar (starless) core phase without infrared signatures of star formation, commonly observed at

far IR wavelengths, while active cores have extended and enhanced 4.5μm emission.

In this work, we analyze CO(2-1), 13CO(2-1), and CO(2-1) lines, and mid- and far-infrared data towards the EGOS (Extended Green Objects) G341.23-0.27 and G341.22-0.26(a), projected onto the IRDC G341.24-0.27.

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FINDING PROTO-SPECTROSCOPIC BINARIES: PRECISE MULTI-EPOCH RADIAL VELOCITIES OF 7 PROTOSTARS IN ρ OPHIUCHUS

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Stars in the solar neighborhood are mostly found in multiple systems. While the existence of stellar companions at visual distances can be easily explained as a normal outcome of the star formation process itself, it is still unclear how spectroscopic companions are actually formed. If they are a by-product of the initial fragmentation of molecular clouds, or resultant from dynamical evolution within pristine multiple systems is still an open question in star formation. To uncover a young spectroscopic binary would be therefore an invaluable clue for understanding the mechanisms and the time scales involved in their formation. Aiming at finding such young spectroscopic companions, we present a near-IR high resolution (R $\sim$ 60000) multi-epoch radial velocity survey of 7 young stellar objects in the star forming region ρ Ophiuchus. The radial velocities of each source were derived using a 2-D cross-correlation function designed to deliver the radial velocity of the target relative to the zero-point established by the earth's atmosphere. We found that the spectra of the protostars in our sample agree reasonably well with predicted stellar photospheric profiles indicating that the radial velocities uncovered are of stellar nature. Three of the targets analyzed give us hints that the first proto-spectroscopic binaries might have been found. If confirmed, it will bring an important piece into the (binary) star-formation puzzle, namely, that multiplicity at sub-AU scale starts (or not) at birth. Our preliminary binary fraction of $\sim$71% is also in line with the notion that multiplicity is very high at young ages and therefore it might be a product of star-formation.

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STAR AND PLANET FORMATION IN THE ERA OF THE SUBMILLIMETER OBSERVATORIES SMA/ALMA

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I present the recent advances and challenges on the star and planet formation studies in era of the submillimeter observatories: the Submillimeter Array (SMA) and the Atacama Large Millimeter/Submillimeter Array (ALMA). These observatories now provide angular resolutions similar to those obtained in the optical regimen allowing to study the obscured innermost parts of the circumstellar disks where the planet and star formation are taken place. When ALMA is finished, its sensivity and high angular resolution might reveal planets around closeby young stars just in the process of formation. This will open a new venue for the understanding on the origin of our own solar system.

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STARS & STELLAR SYSTEMS

THE BIOSUN PROJECT: AN ASTROBIOLOGICAL APPROACH TO STUDY THE ORIGIN OF LIFE

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During the early ages of the Earth the magnetic activity of the young Sun was much stronger than that of the present Sun, in particular for radiation emitted below 1700 Å. Such enhanced radiation fluxes could play a role in the evolution of planetary atmospheres, their surface conditions and in the origin and evolution of life. Solar stellar analogs could provide information about the characteristics of the young Sun, and therefore this radiation environment.

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