Dear Colleagues,

It is my pleasure to present you the 167th issue of the Magellanic Clouds Newsletter. There is a lot of work on the properties of the interstellar medium and star formation, but also on clusters, evolved stars and supernova remnants.

I’m sure you’ll find Michel Dennefeld’s article about the history of discovery of the Magellanic Clouds fascinating, and Alexander Rosenbusch’s reviews of novae also refers to those found in the Magellanic Clouds.

The IAU General Assembly is less than a year ahead, so the announcement of one of the focus meetings, on massive stars and star clusters, is probably just the first of more to come. Let’s hope we’ll be able to meet in person, rather through our digital renditions.

If you have – or know of – a picture for the front cover, something beautiful or just unusual, just let me know and we’ll try to share it that way.

Stay safe and sane, and keep watching the Clouds!

The next issue is planned to be distributed on the 1st of December.

Editorially Yours,
Jacco van Loon
Anomalous extinction towards NGC 1938

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Intrigued by the extended red giant clump (RC) stretching across the color–magnitude diagram of the stars in a $50 \times 50$ pc$^2$ region of the Large Magellanic Cloud (LMC) containing the clusters NGC 1938 and NGC 1939, we have studied the stellar populations to learn about the properties of the interstellar medium (ISM) in this area. The extended RC is caused by a large and uneven amount of extinction across the field. Its slope reveals anomalous extinction properties, with $A_V/E(B-V) \simeq 4.3$, indicating the presence of an additional gray component in the optical contributing about 30% of the total extinction in the field and requiring big grains to be about twice as abundant as in the diffuse ISM.

This appears to be consistent with the number of big grains injected into the surrounding ISM by the about 70 SN II explosions estimated to have occurred during the lifetime of the $\sim 120$ Myr old NGC 1938. Although this cluster appears relatively small today and would be hard to detect beyond the distance of M 31, with an estimated initial mass of $\sim 4800 M_\odot$, NGC 1938 appears to have seriously altered the extinction properties in a wide area. This has important implications for the interpretation of luminosities and masses of star-forming galaxies both nearby and in the early universe.

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Strömgren metallicities for intermediate-age and old star clusters

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We report results that show that the straightforwardly star cluster metallicities obtained from Strömgren $vby$ photometry is age-dependent and need to be corrected for further use. This outcome arises from the comparison of [Fe/H] values derived from Strömgren photometry with those metallicities published in the literature for 26 Large and Small Magellanic Cloud star clusters, whose ages range from $\sim 1$ Gyr up to the known oldest globular clusters’ ages in these galaxies. While deriving mean star cluster metallicities we carried out a thorough selection of red giant branch candidates to comply with the Strömgren metallicity calibration validity regime. We paid attention to the effect of contamination by field stars, particularly of those that lie inside the star clusters’ radii, distributed along the star cluster red giant branches, and with [Fe/H] values covering a similar range as that for the selected stars. We found that the measured Strömgren metallicities are systematically more metal-poor than the published ones and that a quadratically age-varying function reproduces the relative metallicity values with an overall uncertainty of $\sim 0.05$ dex.

We finally performed a similar comparison relying on a fully independent approach, that consisted in using theoretical red giant branches of old globular clusters spanning [Fe/H] values from $-2.0$ up to 0.0 dex as standard ones. We then superimposed on to them the red giant branches of star clusters with ages in the range 1.0–12.5 Gyr and estimated by interpolation their associated metallicities. The derived theoretical relative metallicities follow a similar trend as a function of the star clusters’ ages than that found from observations of star clusters.

Accepted for publication in Astronomy and Astrophysics
Energy conservation in the thin layer approximation – II. The asymmetric classic case for supernovæ remnants

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Here we extend the conservation of energy in the framework of the thin layer approximation to the asymmetrical case. Four types of interstellar medium are analysed, in which the density follows an inverse square profile, a power law profile, an exponential profile and a toroidal profile. An analytical solution for the radius as a function of time and the polar angle in spherical coordinates is derived in the case of the inverse square profile. The analytical and numerical results are applied to two supernova remnants: SN 1987A and SN 1006. The back reaction due to the radiative losses is evaluated in the case of the inverse square profile for the surrounding medium. Two models for the image formation are presented, which explain the triple ring visible in SN 1987A and the jet feature of SN 1006.

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AstroSat view of LMC X-2: evolution of broad band X-ray spectral properties along a complete Z-track

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In this paper, we report the first results of the extragalactic Z-source LMC X-2 obtained using the ~ 140 ks observations with Large Area X-ray Proportional Counter (LAXPC) and Soft X-ray Telescope (SXT) onboard AstroSat. The HID created with the LAXPC data revealed a complete Z-pattern of the source, showing all the three branches. We studied the evolution of the broadband X-ray spectra in the energy range of 0.5–20.0 keV along the Z-track, a first such study of this source. The X-ray spectra of the different parts of the Z-pattern were well described by an absorbed Comptonized component. An absence of the accretion disc component suggests that the disc is most probably obscured by a Comptonized region. The best fit electron temperature ($kT_e$) was found to be in the range of 1.7–2.1 keV and optical depth ($\tau$) was found to be in the range of 13.2–17.5. The optical depth ($\tau$) increased as the source moved from the normal/flaring branch (NB/FB) vertex to the upper part of the FB, suggesting a possible outflow triggered by a strong radiation pressure. The power density spectra (PDS) of HB and NB could be fitted with a pure power-law of index $\alpha \sim 1.68$ and 0.83 respectively. We also found a weak evidence of QPO (2.8 $\sigma$) in the FB. The intrinsic luminosity of the source varied between $(1.03–1.79) \times 10^{38}$ ergs s$^{-1}$. We discuss our results by comparing with other Z-sources and the previous observations of LMCX-2.

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Towards a multi-tracer timeline of star formation in the LMC – I. Deriving the lifetimes of H i clouds

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The time-scales associated with the various stages of the star formation process remain poorly constrained. This
includes the earliest phases of star formation, during which molecular clouds condense out of the atomic interstellar medium. We present the first in a series of papers with the ultimate goal of compiling the first multi-tracer timeline of star formation, through a comprehensive set of evolutionary phases from atomic gas clouds to unembedded young stellar populations. In this paper, we present an empirical determination of the lifetime of atomic clouds using the Uncertainty Principle for Star Formation formalism, based on the de-correlation of Hα and H i emission as a function of spatial scale. We find an atomic gas cloud lifetime of $48^{+13}_{-8}$ Myr. This timescale is consistent with the predicted average atomic cloud lifetime in the LMC (based on galactic dynamics) that is dominated by the gravitational collapse of the mid-plane ISM. We also determine the overlap time-scale for which both H i and Hα emission are present to be very short ($t_{\text{over}} < 1.7$ Myr), consistent with zero, indicating that there is a near-to-complete phase change of the gas to a molecular form in an intermediary stage between H i clouds and H ii regions. We utilise the time-scales derived in this work to place empirically determined limits on the time-scale of molecular cloud formation. By performing the same analysis with and without the 30 Doradus region included, we find that the most extreme star forming environment in the LMC has little effect on the measured average atomic gas cloud lifetime. By measuring the lifetime of the atomic gas clouds, we place strong constraints on the physics that drives the formation of molecular clouds and establish a solid foundation for the development of a multi-tracer timeline of star formation in the LMC.

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Imagery and UV spectroscopy of the LMC supernova remnant N103 B using HST

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We present HST/WFC3 multiband imagery of N103 B, the remnant of a Type Ia supernova in the Large Magellanic Cloud, as well as HST/COS ultraviolet spectroscopy of the brightest radiatively shocked region. The images show a wide range of morphology and relative emission-line intensities, from smooth Balmer-line dominated collisionless shocks due to the primary blast wave, to clumpy radiative shock filaments due to secondary shocks in density enhancements. The COS data show strong FUV line emission despite a moderately high extinction along this line of sight. We use the COS data with previous optical spectra to constrain the shock conditions and refine the abundance analysis, finding abundances typical of the local interstellar medium within the uncertainties. Under an assumption that the material being shocked was shed from the pre-supernova system, this finding places constraints on any significant enrichment in that material, and thus on the non-degenerate star in what was presumably a single-degenerate Type Ia supernova.

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ALMA CO observations of $\gamma$-ray supernova remnant N132 D in the Large Magellanic Cloud: possible evidence for shocked molecular clouds illuminated by cosmic-ray protons

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N132 D is the brightest $\gamma$-ray supernova remnant (SNR) in the Large Magellanic Cloud (LMC). We carried out $^{12}$CO($J = 1-0, 3-2$) observations toward the SNR using the Atacama Large Millimeter/submillimeter Array (ALMA) and Atacama Submillimeter Telescope Experiment. We find diffuse CO emission not only at the southern edge of the SNR as previously known, but also inside the X-ray shell. We spatially resolved nine molecular clouds using ALMA with an angular resolution of 5"$, corresponding to a spatial resolution of $\sim 1$ pc at the distance of the LMC. Typical cloud sizes and masses are $\sim 2.0$ pc and $\sim 100$ M$_{\odot}$, respectively. High-intensity ratios of CO $J = 3-2 / 1-0 > 1.5$ are seen toward the molecular clouds, indicating that shock-heating has occurred. Spatially resolved X-ray spectroscopy reveals that thermal X-rays in the center of N132 D are produced not only behind a molecular cloud, but also in front of it. Considering the absence of a thermal component associated with the forward shock towards one molecular cloud located along the line of sight to the center of the remnant, this suggests that this particular cloud is engulfed by shock waves and is positioned on the near side of remnant. If the hadronic process is the dominant contributor to the $\gamma$-ray emission, the shock-engulfed clouds play a role as targets for cosmic-rays. We estimate the total energy of cosmic-ray protons accelerated in N132 D to be $\sim 0.5-3.8 \times 10^{49}$ erg as a conservative lower limit, which is similar to that observed in Galactic gamma-ray SNRs.

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The intrinsic reddening of the Magellanic Clouds as traced by background galaxies – II. The Small Magellanic Cloud

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We present a map of the total intrinsic reddening across \(\approx 34 \, \text{deg}^2\) of the Small Magellanic Cloud (SMC) derived using optical (ugriz) and near-infrared (IR; YJKs) spectral energy distributions (SEDs) of background galaxies. The reddening map is created using a subsample of 29,274 galaxies with low levels of intrinsic reddening based on the lephare \(\chi^2\) minimisation SED-fitting routine. We find statistically significant enhanced levels of reddening associated with the main body of the SMC compared with regions in the outskirts [\(\Delta E(B - V) \approx 0.3 \, \text{mag}\)]. A comparison with literature reddening maps of the SMC shows that, after correcting for differences in the volume of the SMC sampled, there is good agreement between our results and maps created using young stars. In contrast, we find significant discrepancies between our results and maps created using old stars or based on longer wavelength far-IR dust emission that could stem from biased samples in the former and uncertainties in the far-IR emissivity and the optical properties of the dust grains in the latter. This study represents one of the first large-scale categorisations of extragalactic sources behind the SMC and as such we provide the lephare outputs for our full sample of \(\approx 500,000\) sources.

Accepted for publication in MNRAS

DeGaS-MC: Dense Gas Survey in the Magellanic Clouds – I. An APEX survey of HCO$^+$ and HCN(2–1) toward the LMC and SMC

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Understanding the star-forming processes is key to understanding the evolution of galaxies. Investigating star formation requires precise knowledge of the properties of the dense molecular gas complexes where stars form and a quantification of how they are affected by the physical conditions to which they are exposed. The proximity, low metallicity, and wide range of star formation activity of the Large and Small Magellanic Clouds (LMC and SMC) make them prime laboratories to study how local physical conditions impact the dense gas reservoirs and their star formation efficiency. The aim of the Dense Gas Survey for the Magellanic Clouds (DeGaS-MC) project is to expand our knowledge of the relation between dense gas properties and star formation activity by targeting the LMC and SMC observed in the HCO$^+$ (2–1) and HCN(2–1) transitions. We carried out a pointing survey targeting two lines toward about 30 LMC and SMC molecular clouds using the SEPIA instrument installed on the Atacama Pathfinder EXperiment (APEX) telescope. We performed a follow-up mapping campaign of the emission in the same transition in 13 star-forming regions. This first paper provides line characteristic catalogs and integrated line-intensity maps of the sources. HCO$^+$ (2–1) is detected in 20 and HCN(2–1) in 8 of the 29 pointings observed. The dense gas velocity pattern follows the line-of-sight velocity field derived from the stellar population. The three SMC sources targeted during the mapping campaign were unfortunately not detected in our mapping campaign but both lines are detected toward the LMC 30 Dor, N44, N105, N113, N159 W, N159 E, and N214 regions. The HCN emission is less extended than the HCO$^+$ emission and is restricted to the densest regions. The HCO$^+$ (2–1)/HCN(2–1) brightness temperature ratios range from 1 to 7, which is consistent with the large ratios commonly observed in low-metallicity environments. A larger number of young stellar objects are found at high HCO$^+$ intensities and lower HCO$^+$/HCN flux ratios, and thus toward denser lines of sight. The dense gas luminosities correlate with the star formation rate traced by the total infrared luminosity over the two orders of magnitude covered by our observations, although substantial region-to-region variations are observed.

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The R 136 star cluster dissected with Hubble Space Telescope/STIS – II. Physical properties of the most massive stars in R 136

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We present an optical analysis of 55 members of R 136, the central cluster in the Tarantula Nebula of the Large Magellanic Cloud. Our sample was observed with STIS aboard the Hubble Space Telescope, is complete down to about 40 M☉, and includes 7 very massive stars with masses over 100 M☉. We performed a spectroscopic analysis to derive their physical properties. Using evolutionary models we find that the initial mass function (IMF) of massive stars in R 136 is suggestive of being top-heavy with a power-law exponent $\gamma \approx 2 \pm 0.3$, but steeper exponents cannot be excluded. The age of R 136 lies between 1 and 2 Myr with a median age of around 1.6 Myr. Stars more luminous than $\log L/L_\odot = 6.3$ are helium enriched and their evolution is dominated by mass loss, but rotational mixing or some other form of mixing could be still required to explain the helium composition at the surface. Stars more massive than 40 M☉ have larger spectroscopic than evolutionary masses. The slope of the wind–luminosity relation assuming unclumped stellar winds is 2.14 ± 0.13 which is steeper than usually obtained (≈ 1.8). The ionising ($\log Q_0 [\text{ph/s}] = 51.4$) and mechanical ($\log L_{\text{SW}} [\text{erg/s}] = 39.1$) output of R 136 is dominated by the most massive stars (> 100 M☉). R 136 contributes around a quarter of the ionising flux and around a fifth of the mechanical feedback to the overall budget of the Tarantula Nebula. For a census of massive stars of the Tarantula Nebula region we combined our results with the VLT-FLAMES Tarantula Survey plus other spectroscopic studies. We observe a lack of evolved Wolf–Rayet stars and luminous blue and red supergiants.

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Deuterated polycyclic aromatic hydrocarbons in the interstellar medium: the C–D band strengths of mono-deuterated species

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Deuterium (D) is one of the light elements created in the big bang. As the Galaxy evolves, the D/H abundance in the interstellar medium (ISM) decreases from its primordial value due to “astration”. However, the observed gas-phase D/H abundances of some sightlines in the local Galactic ISM are substantially lower than the expected reduction by astration. The missing D could have been depleted onto polycyclic aromatic hydrocarbon (PAH) molecules which are ubiquitous and abundant in interstellar regions. To quantitatively explore the hypothesis of PAHs as a possible reservoir of interstellar D, we compute quantum-chemically the infrared vibrational spectra of mono-deuterated PAHs and their cations. We find that, as expected, when H in PAHs is replaced by D, the C–H stretching and bending modes at 3.3, 8.6 and 11.3 μm shift to longer wavelengths at ∼4.4, 11.4 and 15.4 μm, respectively, by a factor of ∼√13/7, the difference in reduced mass between the C–H and C–D oscillators. We derive from the computed spectra the mean intrinsic band strengths of the 3.3 μm C–H stretch and 4.4 μm C–D stretch to be ⟨A3.3⟩ ≈ 13.4 km mol⁻¹ and ⟨A4.4⟩ ≈ 7.4 km mol⁻¹ for neutral deuterated PAHs which would dominate the interstellar emission at 3.3 and 4.4 μm. By comparing the computationally-derived mean band-strength ratio of ⟨A4.4/A3.3⟩ ≈ 0.56 for neutral PAHs with the mean ratio of the observed intensities of ⟨I4.4/I3.3⟩ ≈ 0.019, we find that the degree of deuteration (i.e. the fraction of peripheral atoms attached to C atoms in the form of D) is ∼2.4%, corresponding to a D-enrichment of a factor of ∼1200 with respect to the interstellar D/H abundance.

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On the absorption properties of metallic needles

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Needle-like metallic particles have been suggested to explain a wide variety of astrophysical phenomena, ranging from the mid-infrared interstellar extinction to the thermalization of starlight to generate the cosmic microwave background. These suggestions rely on the amplitude and the wavelength dependence of the absorption cross sections of metallic needles. On the absence of an exact solution to the absorption properties of metallic needles, their absorption cross sections are often derived from the antenna approximation. However, it is shown here that the antenna approximation is not an appropriate representation since it violates the Kramers–Kronig relation. Stimulated by the recent discovery of iron whiskers in asteroid Itokawa and graphite whiskers in carbonaceous chondrites, we call for rigorous calculations of the absorption cross sections of metallic needle-like particles, presumably with the discrete dipole approximation. We also call for experimental studies of the formation and growth mechanisms of metallic needle-like particles as well as experimental measurements of the absorption cross sections of metallic needles of various aspect ratios over a wide wavelength range to bound theoretical calculations.

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The VISCACHA survey – II. Structure of star clusters in the Magellanic Clouds periphery


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We provide a homogeneous set of structural parameters of 83 star clusters located at the periphery of the Small Magellanic Cloud (SMC) and the Large Magellanic Cloud (LMC). The clusters’ stellar density and surface brightness profiles were built from deep, AO assisted optical images, and uniform analysis techniques. The structural parameters were obtained from King & Elson et al. model fittings. Integrated magnitudes and masses (for a subsample) are also provided. The sample contains mostly low surface brightness clusters with distances between 4.5 and 6.5 kpc and between 1 and 6.5 kpc from the LMC and SMC centres, respectively. We analysed their spatial distribution and structural properties, comparing them with those of inner clusters. Half-light and Jacobi radii were estimated, allowing an evaluation of the Roche volume tidal filling. We found that: (i) for our sample of LMC clusters, the tidal radii are, on average, larger than those of inner clusters from previous studies; (ii) the core radii dispersion tends to be greater for LMC clusters located towards the SouthWest, with position angles of ~200° and ~5° from the LMC centre, i.e. those LMC clusters nearer to the SMC; (iii) the core radius evolution for clusters with known age is similar to that of inner clusters; (iv) SMC clusters with galactocentric distances closer than 4 kpc are overfilling; (v) the recent Clouds collision did not leave marks on the LMC clusters’ structure that our analysis could reveal.

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Runaway OB stars in the Small Magellanic Cloud: dynamical versus supernova ejections

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Runaway OB stars are ejected from their parent clusters via two mechanisms, both involving multiple stars: the dynamical ejection scenario (DES) and the binary supernova scenario (BSS). We constrain the relative contributions from these two ejection mechanisms in the Small Magellanic Cloud (SMC) using data for 304 field OB stars from the spatially complete, Runaways and Isolated O-Type Star Spectroscopic Survey of the SMC (RIOTS4). We obtain stellar masses and projected rotational velocities $v\sin i$ for the sample using RIOTS4 spectra, and use transverse velocities $v_{\text{loc}}$ from Gaia DR2 proper motions. Kinematic analyses of the masses, $v\sin i$, non-compact binaries, high-mass X-ray binaries, and Oe/Be stars largely support predictions for the statistical properties of the DES and BSS populations. We find that dynamical ejections dominate over supernova ejections by a factor of $\sim 2$–$3$ in the SMC, and our results suggest a high frequency of DES runaways and binary ejections. Objects seen as BSS runaways also include two-step ejections of binaries that are re-accelerated by SN kicks. We find that two-step runaways likely dominate the BSS runaway population. Our results further imply that any contribution from in-situ field OB star formation is small. Finally, our data strongly support the post-mass-transfer model for the origin of classical Oe/Be stars, providing a simple explanation for the bimodality in the $v\sin i$ distribution and high, near-critical, Oe/Be rotation velocities. The close correspondence of Oe/Be stars with BSS predictions implies that the emission-line disks are long-lived.

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Resolved star formation in the metal poor star-forming region Magellanic Bridge C

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Magellanic Bridge C (MB-C) is a metal-poor ($\sim 1/5$ $Z_\odot$) low-density star-forming region located 59 kpc away in the Magellanic Bridge, offering a resolved view of the star formation process in conditions different to the Galaxy. From Atacama Large Millimetre Array CO(1–0) observations, we detect molecular clumps associated to candidate young stellar objects (YSOs), pre-main sequence (PMS) stars, and filamentary structure identified in far-infrared imaging. YSOs and PMS stars form in molecular gas having densities between 17–200 $M_\odot$ pc$^{-2}$, and have ages between $\lesssim 0.1$–3 Myr. YSO candidates in MB-C have lower extinction than their Galactic counterparts. Otherwise, our results suggest that the properties and morphologies of molecular clumps, YSOs, and PMS stars in MB-C present no patent differences with respect to their Galactic counterparts, tentatively alluding that the bottleneck to forming stars in regions similar to MB-C is the conversion of atomic gas to molecular.

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Constraining the thermally pulsing asymptotic giant branch phase with resolved stellar populations in the Large Magellanic Cloud

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Reliable models of the thermally pulsing asymptotic giant branch (TP-AGB) phase are of critical importance across astrophysics, including our interpretation of the spectral energy distribution of galaxies, cosmic dust production, and enrichment of the interstellar medium. With the aim of improving sets of stellar isochrones that include a detailed description of the TP-AGB phase, we extend our recent calibration of the AGB population in the Small Magellanic Cloud (SMC) to the more metal-rich Large Magellanic Cloud (LMC). We model the LMC stellar populations with the TRILEGAL code, using the spatially resolved star formation history derived from the VISTA survey. We characterize the efficiency of the third dredge-up by matching the star counts and the Ks-band luminosity functions of the AGB stars identified in the LMC. In line with previous findings, we confirm that, compared to the SMC, the third dredge-up in AGB stars of the LMC is somewhat less efficient, as a consequence of the higher metallicity. The predicted range of initial mass of C-rich stars is between \( M_i \approx 1.7 \) and \( 3 M_\odot \) at \( Z_i = 0.008 \). We show how the inclusion of new opacity data in the carbon star spectra will improve the performance of our models. We discuss the predicted lifetimes, integrated luminosities, and mass-loss rate distributions of the calibrated models. The results of our calibration are included in updated stellar isochrones publicly available.

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A search for in-situ field OB star formation in the Small Magellanic Cloud

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Whether any OB stars form in isolation is a question central to theories of massive star formation. To address this, we search for tiny, sparse clusters around 210 field OB stars from the Runaways and Isolated O-Type Star Spectroscopic Survey of the SMC (RIOTS4), using friends-of-friends (FOF) and nearest neighbors (NN) algorithms. We also stack the target fields to evaluate the presence of an aggregate density enhancement. Using several statistical tests, we compare these observations with three random-field datasets, and we also compare the known runaways to non-runaways. We find that the local environments of non-runaways show higher aggregate central densities than for runaways, implying the presence of some "tips-of-iceberg" (TIB) clusters. We find that the frequency of these tiny clusters is low, ∼4–5% of our sample. This fraction is much lower than some previous estimates, but is consistent with field OB stars being almost entirely runaway and walkaway stars. The lack of TIB clusters implies that such objects either evaporate on short timescales, or do not form, implying a higher cluster lower-mass limit and consistent with a relationship between maximum stellar mass and the mass of the cluster. On the other hand, we also cannot rule out that some OB stars may form in highly isolated conditions. Our results set strong constraints on the formation of massive stars in relative isolation.

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Review Papers

Review of light curves of novae in the modified scales – I. Recurrent novae

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We reviewed the light curves of 10 recurrent novae in the modified scales of the "logarithmic of time, amplitude of outburst". A unified rule was established to normalize the time scale. Confirmation of the known result: in a series of recurrent outbursts, the light curve of nova retains its shape, was realized by distinguishing three groups amongst these 10 known recurrent novae. The C IAql and T Pyx groups contain by one additional member: V2847 Oph and IM Nor, respectively. The V745 Sco group includes two more novae: V394 CrA and V3890 Sgr. Outside of the groups there were four RNs: T CrB, RS Oph and U Sco with well-presented light curves; each nova has its own uniqueness.

After comparing the light curves of galactic novae with the light curves of some novae of the Large and Small Magellanic Clouds (LMC and SMC), we selected several candidates for recurrent novae in addition to 3 known recurrent novae in these galaxies. Their belonging to a certain group or the likeness of a specific galactic nova was specified. Assuming that the physical characteristics of the nova in the group coincide, we estimated the absolute magnitudes of the galactic novae: C IAql and V2847 Oph have absolute magnitudes $M_V = -7^{m}5$, IM Nor and T Pyx – $M_V = -7^{m}2$, $-7^{m}3$.
V3890 Sgr – $M_V = -7.9$, U Sco – $M_I = -9^m 0$. These estimates of the absolute magnitudes of galactic recurrent novae differ from the published data within the error limits.

The preservation of the shape of the light curves of recurrent novae in the sequence of outbursts and the existence of groups of recurrent novae provide the basis for a similar review of the light curves of classical novae.

A comparison of the summarized light curves of recurrent novae with the light curves of some low-amplitude classical novae allowed us amongst the last to distinguish the list of 26 candidates in recurrent novae. Three of them are known from lists of other authors. An interesting example is the V1017 Sgr, which erupted in 1919 as a nova of the T Pyx type, and which often also shows less bright outbursts classified as dwarf nova outbursts.

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Review of light curves of novae in the modified scales – II. Classical novae

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The presentation of the light curves of the novae on the logarithmic scale of the radius of the shell ejected during the outburst and in the scale of the amplitude of the outburst simplified the review of the light curves of all the known, about 500, classical novae of our Galaxy and the Large and Small Magellanic Clouds. As a result, the modified light curves about of 250 classical novae were grouped into 7 typical groups with subgroups defined by the light curves of prototypes. Less than 70 galactic novae remained outside the groups as they have not sufficient photometric data; more than 20 novae were previously included in the list of candidates for recurrent novae.

The largest group is the DQ Her group with V1280 Sco as the main prototype. This is novae with three or four variants of a dust condensation. Less frequently the dust condensations occurs in other groups. Beside with this group adjoins a small group of novae with the prototype of GQ Mus, a bright source of X-ray during an outburst.

CP Pup, CP Lac, V1974 Cyg, and V1493 Aql are prototypes for 4 groups with close tilts of the initial brightness decline phase of the light curves. The group with the prototype RR Pic, including the HR Del subgroup, has a prolonged state of maximal brightness with the presence of several brightness variations before the final decline phase.

The relationship of groups of novae, or form of the light curve, with processes in the circumstellar and circum-binary system environment is discussed. The material ejected during an outburst forms expanding shells of a generally ellipsoidal shape. In the Lac, Pup, and Cyg groups, the shells do not show a pronounced regular structure, except for their ellipsoidal shape. Shells of novae with a dust condensation (the DQHer group) have an ellipsoidal shape with an equatorial belt. The unique shell of CK Vul, Nova Vul1670, gives an idea about the possible shape of the shells of other members in the V1493Sql group. The prototypes RR Pic and HR Del have a very bright belt. The trend in a change of the shell shape: from an ellipsoid with a bright belt to a structure-less ellipsoid, can be traced in the well-known "absolute maximal magnitude, rate of brightness decline" or the MMRD relation from the faint its end to the bright end.

Modified light curves of recurrent novae are inside the zone of classical novae. Some classical novae, such as the V838 Her, can be examples of the transition from recurrent novae to classical ones.

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A history of the Magellanic Clouds and the European exploration of the southern hemisphere

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The Magellanic Clouds were known before Magellan’s voyage exactly 500 years ago, and were not given that name by Magellan himself or his chronicler Antonio Pigafetta. They were, of course, already known by local populations in South America, such as the Mapuche and Tupi-Guaranís. The Portuguese called them Clouds of the Cape, and scientific circles had long used the name of Nubecula Minor and Major. We trace how and when the name Magellanic Clouds came into common usage by following the history of exploration of the southern hemisphere and the southern sky by European explorers – which ultimately led to the founding of ESO.

Published in the ESO Messenger (in slightly abbreviated form)

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Announcement

IAU GA Focus Meeting 4
UV Insights to Massive Stars and Young Stellar Clusters

Focus Meeting 4 to be held during the XXXIst General Assembly of the International Astronomical Union

Busan, Republic of Korea, August 16–27, 2021

This Focus Meeting will bring together astronomers who study resolved massive stars, the integrated light of stellar clusters, and their effects on their host galaxies, combining state-of-the-art rest-frame UV spectra and photometric observations with models. This meeting will have a significant interdisciplinary component, focusing on the interplay between massive stars and their host galaxies (e.g., the consequences of environment on the formation and evolution of massive stars and clusters, and their subsequent feedback in terms of ionizing photon production, mass-loss due to winds, and properties of the ISM). The topics and the timing of the meeting are largely driven by the data release of the HST ULLYSES and CLASSY surveys. The former is a complete spectroscopic UV survey of individual massive, metal-poor stars in the Local Group, and the latter provides integrated high-resolution UV spectra of young massive star clusters in the nearby universe.

See also https://busan2021fm4.org/