III VISCACHA Meeting, July 3-8, 2022
Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil

Sunday, July 3

Time	Speaker	Title	
16:00		Registration (at the Bristol hotel reception)	
18:00		Welcome cocktail "A Fazendinha restaurant"	

Monday, July 4

Time	Speaker	Title	
9:00		Registration (at the venue ICEx-UFMG)	
9:30	João Santos Jr. and authorities	Opening session	
10:00	Bruno Dias	**The VISCACHA survey: overview and perspectives**	
10:30		coffee break	
11:00	Raphael Oliveira	**Ages, metallicities and structure of stellar clusters in the Magellanic Bridge**	
11:30	João Francisco Gardin	**Structure of Magellanic Clouds Star Cluster Using a New Method to Estimate the Completeness of the Stars**	
12:00	João Pedro Rocha	**vdecont: A statistical decontamination tool for the Viscacha team.**	
12:30		lunch (not included)	
14:00		**workshop: sprint VISCACHA**	
15:30		coffee break	
16:00		**workshop: sprint VISCACHA**	
17:30		end of the day	

Tuesday, July 5

Time	Speaker	Title	
9:30	Francisco Maia	**VISCACHA DR2**	
10:00	Julya Tonon	**Verificação de qualidade e segmentação de imagens astronômicas automatizadas em python**	
10:30		coffee break	
11:00	Celeste Parisi	**The spectroscopic follow up of the VISCACHA Survey and the Calcium Triplet Technique**	
11:30	André Figueiredo	**Be stars populations in Magellanic Clouds young clusters**	
12:00		**round table discussions**	
12:30		lunch (not included)	
14:00		**workshop: sprint VISCACHA**	
15:30		coffee break	
16:00		**workshop: sprint VISCACHA**	
17:30		end of the day	
19:00		Conference dinner (not included) "La Palma restaurant"	

Wednesday, July 6

Time	Speaker	Title	
9:30	Jimena Rodriguez	**Internal structure of the Viscacha DRI clusters**	
10:00	Jose Hernandez-Jimenez	**Tidal Interactions between the LMC Main Body and its outermost Star Clusters**	
10:30		coffee break	
11:00	Angeles Perez-Villegas	**Star cluster dynamics**	
11:30	Stefano Souza	**Multiple populations in VISCACHA star clusters**	
12:00		**round table discussions**	
12:30		lunch (not included)	
14:00		**workshop: sprint VISCACHA**	
15:30		coffee break	
16:00	Bruno Dias	Summary of this part. Next steps.	
16:30		End of first part of the meeting	

Thursday, July 7

Time	Speaker	Title	
9:30		**Workshop: data analysis, photometry for local grad students**	**workshop: sprint VISCACHA**
10:30		coffee break	
11:00		**Workshop: data analysis, photometry for local grad students**	**workshop: sprint VISCACHA**
12:00		Free afternoon: city tour (check details and sign-in with Mateus Angelo and João Francisco Gardin)	

Friday, July 8

Time	Speaker	Title	
9:30		**Workshop: data analysis, photometry for local grad students**	**workshop: sprint VISCACHA**
10:30		coffee break	
11:00		**Workshop: data analysis, photometry for local grad students**	**workshop: sprint VISCACHA**
12:30		lunch (not included)	
14:00		**workshop: sprint VISCACHA**	
15:00	**Bruno Dias**	**workshop: sprint VISCACHA**	**Public talk at DF-ICEX**
17:00		End of the second part of the meeting	

Legend

		Talks
		Working groups
		External public activities

Abstracts

Francisco Maia	VISCACHA DR2	I will present the status of the VISCACHA data release II and the current efforts to streamline the decontamination of the star clusters.
Julya Tonon	VERIFICAÇÃO DE QUALIDADE E SEGMENTAÇÃO DE IMAGENS ASTRONÔMICAS AUTOMATIZADAS EM PYTHON	Nas últimas décadas, a astronomia entrou na era do 'Big Data', e a enorme quantidade de dados sendo produzidos das instalações em solo e espaciais já não podem mais ser avaliadas individualmente por observadores humanos. Assim, para se garantir que um determinado conjunto de imagens adquiridas é de qualidade suficiente para a análise científica, métodos objetivos e automatizados de controle de qualidade de dados são necessários. Em particular, ao empregar observações obtidas por instalações em solo, sujeitas a condições atmosféricas variáveis, tarefas de controle de qualidade de dados astronômicos precisam ser capazes de identificar com robustez efeitos que degradam a qualidade das imagens de forma a prover um diagnóstico objetivo e rápido acerca de sua utilidade científica. Neste trabalho iremos apresentar uma tarefa em Python totalmente automatizada, voltada para a verificação de qualidade ao longo de imagens astronômicas obtidas com os telescópios SOAR e CFHT. Os produtos desta tarefa incluem: i) mapas ao longo da imagem da emissão do céu e suas flutuações; ii) um catálogo contendo a segmentação fotométrica dos objetos celestes na imagem; iii) propriedades morfológicas de cada objeto segmentado. Estes produtos serão complementados por estatísticas destas propriedades e então usados para inferir a qualidade da imagem e rejeitar possíveis artefatos cósmicos ou instrumentais na imagem.
Alexandre Roman Lopes	Opening the treasury box: GMOS-N observations of Massive stars in the Andromeda galaxy	Massive stars (MS) are key actors in the energy balance and chemical evolution of galaxies. One of the most fundamental yet still non-answered question in astrophysics is related to the formation and evolution of MS, as the basic processes leading to their formation still remain unknown, probably because they evolve much fast, and also are very short lived objects. During a long time the O3 stars were considered as the most massive hydrogen core burning stellar objects in the local universe. However this has changed as we now know that some hydrogen-rich nitrogen sequence WR stars are in reality extremely massive and luminous main-sequence stars, which because the proximity to the Eddington limit, present emission-line spectra even at their early beginning on the main-sequence evolutionary phase, making them the most massive early-type stars in the local universe. Only a few VMS still in their hydrogen core burning phase are known, with the majority of them being found in the very young star-burst clusters R136 and NGC 3603. In this presentation I will present the results obtained from GMOS-IFU observations of a group of stars in the Andromeda Galaxy, which could be the descendants of some of the most massive MS stars in the local universe.
Bruno Dias	The VISCACHA survey: overview and perspectives	In this talk I will highlight the main results already published by our collaboration and other ongoing projects. I will also list some lessons learned until now, and point towards the future establishing goals for the next year.
Jimena Rodriguez	Internal structure of the Viscacha DRI clusters	The analysis of the internal structure of star clusters can provide us important information about their formation and dynamic evolution. Using data from the DRI of VISCACHA survey, we studied the spatial distribution of the stars in clusters located at the peripheries of the Large Magellanic Cloud and the Small Magellanic Cloud. We characterized their internal structure through the construction of the corresponding minimum spanning trees. In each case, we used m, s and Q parameters to distinguish between radial symmetry, homogeneous or substructured distributions. The dependence of the obtained parameters with field stellar contamination and with the different characteristics of the clusters, such as their dynamical ages and spatial distribution, was also investigated.
Raphael A. P. Oliveira	Ages, metallicities and structure of stellar clusters in the Magellanic Bridge	The Magellanic Bridge is the tidally-stripped structure located between the Large and Small Magellanic Clouds, the closest pair of satellite galaxies to the Milky Way. Its stellar content consists of hundreds of stellar clusters and associations, which can help to determine the origin and evolution of the Magellanic Clouds-Milky Way system, and of the Bridge itself. According to recent models, the Bridge was formed during a collision between the Clouds some 200 Myr ago, which would imply kinematic signatures, as well as age and metallicity gradients along its extension. The present work combines deep photometric data from VISCACHA and SMASH surveys in order to explore this question, by homogeneously deriving the ages, metallicities, distances, structural parameters and mass distribution of the clusters and associations, with modern statistical tools such as machine learning and Markov chain Monte Carlo. I will present the results for some Bridge objects with both surveys, along with a first approach to age and metallicity gradients.
Celeste Parisi	The spectroscopic follow up of the VISCACHA Survey and the Calcium Triplet Technique	The GMOS-Gemini trinational spectroscopic follow up of the VISCACHA Survey, between Chile, Brazil and Argentina, has taken advantages of the efficiency of the Calcium Triplet Technique for the accurate SMC cluster metallicity determinations. In this talk I will describe the most relevant aspects of this technique, in particular the calibration developed for the purposes of the project, and the current state of the observations and analysis. On the other hand, I will summarize the main results that we have obtained so far related to the chemical evolution of the SMC.
João Pedro dos Santos Rocha	vdecont: A statistical decontamination tool for the Viscacha team.	The statistical decontamination of photometric catalogs are a crucial part in performing more precise isochrone fits, and therefore more precise parameter determinations. Nonetheless the decontamination process using standard techniques rely on some subjective judgment using the physical understanding of the system, which means: intense manual interaction from the analyst demanding a considerable amount of time. Because of that, this task end up being a bottleneck for carrying out cluster analysis in a large sample like the one's the Viscacha collaborations proposed to do. In this talk I will present a solution to help alleviate this bottleneck: the vdecont code, which is a tool developed in Python to help performing the statistical decontamination of stellar clusters. This tool has special support to deal with the Viscacha IDR1 data, and its aim is to facilitate the decontamination process by the Viscacha team, allowing for more autonomy among the collaborators and giving a speed up to the rate at which this process can be executed.
João Francisco Gardin de Carvalho	Structure of Magellanic Clouds Star Cluster Using a New Method to Estimate the Completeness of the Stars	In this work we determined the astrophysical parameters for a small amount of clusters located in the outermost regions of the Large Magellanic Cloud and the Small Magellanic Cloud. Utilizing data collected at the SOAR telescope in Chile, through the VISCACHA survey, our analysis started with the determination of the completeness of stars in the clusters regions. We developed a method to derive the completeness using only the catalog of stars for ground based observations, not utilizing the images as traditionally is done, therefore reducing computational time in the analysis when compared with the traditional method. Using the completeness corrected data in each region, we built radial density profiles, fit the King model to them and determined the structural parameters of the clusters. The results we found were compatible with the literature for most clusters analyzed. We obtained discrepant results for the SL576 cluster when compared with the literature. For this cluster we further discovered that a saturated area in the image caused a loss of stars in that area thus leading to underestimated values of completeness for the vicinity of those stars. Despite this result, our method proved to work well in the overall sample. We also present and explore ways to improve and enhance our method trying to make it more reliable for overall use. The next step is to apply our method in a greater sample of clusters such as the complete sample from the VISCACHA survey.

ANDRE LUIZ FIGUEIREDO	Be stars populations in Magellanic Clouds young clusters	Fast rotation is a fundamental ingredient for the existence of Be stars. To date, three proposed scenarios try to explain the spin-up mechanism and the existence of Be stars: i) Be stars are born as fast rotators; ii) the spin-up would occur during the evolution of a binary system; or iii) they would start as slow rotators, increasing their rotation as the stars evolve. The first two scenarios imply that Be stars are already fast rotators at the beginning of their lives, while the last one suggests that the fraction of Be stars increases with time. Even though all scenarios may play a role in the origin of Be stars, discriminating the relative prevalence of each scenario is a key step towards a fuller understanding of the evolution of massive stars. Be stars can be a key to understand split main sequence and extended Main Sequence turnoffs observed in young clusters. Even though several works tried to address this problem, through measurements of the fraction of Be stars over the B population for clusters of different ages, methodological issues make it difficult to state definite conclusions. More consolidated results found a dependence between Be stars fraction with metallicity and age. On going work (Figueiredo et al., in prep.) additionally suggests that the typical Be stars duty cycle is ~1. 6 higher for lower-Z environments of the Magellanic Clouds. In an effort to answer open questions about the Be star population our group has applied and sucelly granted time in the SOAR telescope. In the first round it was observed the photometry of NGC 330, NGC 1850, NGC 1847 and NGC 1971 (the last two clusters also have spectroscopic data). It will present the methodology developed to analyze this data and its main result of this data set is the determination of Be stars fraction.
Jose Hernandez-Jimenez	Tidal Interactions between the LMC Main Body and its outermost Star Clusters	Tidal effects in hot dynamical systems, such as elliptical galaxies and stellar clusters, are well different from cold systems (e.g, spiral galaxies); since unlike the latter systems, the encounter time of galactic interactions involving hot systems could be shorter than their internal dynamical times. In particular, this could be the scenario for the outermost star clusters of the Small Magellanic Cloud (SMC), in which the effective time of interaction with the main body of SMC could be shorter than their internal dynamical times. In this presentation, we will show the results of the analysis of the tidal effects on the AM3 Cluster. We found that its core is displaced with respect to outer parts of the cluster by a Delta RA= -2.6 arcsec and Delta DEC= 0.2 arcsec, corresponding to a physical distance of 0.8 pc. The core offset could explain the observed asymmetry between West and East profiles of main sequence stars. In addition, preliminary results of a candidate orbit for AM3 will be presented. This dynamical analysis is important to probe if the impulse approximation for the tidal effects may explain the off-centered core of AM3. Finally, we will discuss a similar analysis for other star clusters in the periphery of SMC.
Angeles Perez-Villegas	Star cluster dynamics	TBD	
Stefano Souza	Multiple populations in VISCACHA star clusters	TBD	