EUROPEAN SOUTHERN OBSERVATORY

Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

VISITING ASTRONOMERS SECTION • Karl-Schwarzschild-Straße 2 • D-85748 Garching bei München • e-mail: visas@eso.org • Tel.: +49-89-32 00 64 73

APPLICATION FOR OBSERVING TIME LARGE PROGRAMME PERIOD: **79B**

Important Notice:

By submitting this proposal, the PI takes full responsibility for the content of the proposal, in particular with regard to the names of COIs and the agreement to act according to the ESO policy and regulations, should observing time be granted

1. Title Category: **B–1**

VISTA VARIABLES IN THE VIA LACTEA (VVV)

2. Abstract / Total Time Requested

Total Amount of Time: Total Number of Semesters:

We propose a public IR variability survey of the Milky Way bulge and an adjacent section of the mid-plane where star formation activity is high. This would take 1920 hours, covering $\sim 10^9$ point sources within an area of 520 sq deg, including 33 known globular clusters and ~ 350 open clusters. The final products will be a deep IR atlas in 5 passbands and a catalogue of $\sim 10^6$ variable point sources. These will produce a 3-D map of the surveyed region (unlike single-epoch surveys that only give 2-D maps) using well-understood primary distance indicators such as RR Lyrae stars. The survey will yield important information on the ages of the populations. The observations will be combined with data from MACHO, OGLE, EROS, VST, SPITZER, HST, CHANDRA, INTEGRAL, and ALMA for a complete understanding of the variable sources in the inner Milky Way. Several important implications for the history of the Milky Way, for globular cluster evolution, for the population census of the bulge and center, and for pulsation theory would follow from this survey. The full VVV Public Survey proposal is submitted to the ESO PSP.

3.

Run	Period	Instrument	Time	Month	Moon	Seeing	Sky Trans.	Obs.Mode
A	79	VIRCAM	125h	jun	n	$\leq 0.8''$	CLR	s
B	79	VIRCAM	105h	may	n	$\leq 0.8''$	CLR	s
C	81	VIRCAM	30h	jun	n	$\leq 0.8''$	CLR	s
D	81	VIRCAM	20h	may	n	$\leq 0.8''$	CLR	s
E	83	VIRCAM	250h	may	n	$\leq 0.8''$	CLR	s
E/alt	83	VIRCAM	250h	may	n	$\leq 1.2''$	THN	s
F	83	VIRCAM	300h	jun	n	$\leq 0.8''$	CLR	s
F/alt	83	VIRCAM	300h	jun	n	$\leq 1.2''$	THN	s
G	83	VIRCAM	200h	jul	n	$\leq 0.8''$	CLR	s
G/alt	83	VIRCAM	200h	jul	n	$\leq 1.2''$	THN	s
H	85	VIRCAM	150h	apr	n	$\leq 0.8''$	CLR	s
H/alt	85	VIRCAM	150h	apr	n	$\leq 1.2''$	THN	s

Following runs moved to box 3a, last page...

4. Principal Investigator: D. Minniti (Univ Catolica, RCH, dante@astro.puc.cl)

CoI(s): P. Lucas (Univ Hertfordshire, UK), J. Emerson (Queen Mary Univ London, UK), VVV Collaboration (Chile/ESO/UK, RCH)

5. Description of the proposed programme

A) Scientific Rationale: Submitted to the PSP.

B) Immediate Objective: Submitted to the PSP.

C) Telescope Justification: Submitted to the PSP.

D) Observing Mode Justification (visitor or service): Submitted to the PSP.

6. Experience of the applicants with telescopes, instruments and data reduction

Submitted to the PSP.

7. Resources available to the team, such as: computing facilities, research assistants, etc.

Submitted to the PSP.

8. Special remarks:

The full proposal was submitted to the PSP.

9. Justification of requested observing time and lunar phase

Lunar Phase Justification: Submitted to the PSP.

Time Justification: (including seeing overhead) Submitted to the PSP.

Calibration Request: Standard Calibration

Convert to a normal programme? No

10. Report on the use of ESO facilities during the last 2 years

– 075.B-0414: "The Age and Formation Mechanism of the Galactic Bar", FLAMES observations successful, 2 papers published. – 076.C-0122: "Millimagnitude Photometry as an Acid Test for Transiting Exoplanets", VIMOS and SOFI observations successful, one paper published, one in preparation. – 177.C-0666: "The mass radius relation for transiting exoplanets, brown dwarfs, and M dwarfs", FLAMES and FORS observations acquired in April-June 2006 successful, data analyzed. – 077.C-0405: "The Binary Brown Dwarf LHS 102BC: Orbits and Masses", NACO observations successful, data analyzed, first results presented at AAS in Jun 2006.

11. Applicant's publications related to the subject of this application during the last 2 years

K. Sahu, S. Casertano, H. Bond, J., Valenti, E. Smith, **D., Minniti, M. Zoccali,** et al. "Extasolar Transiting Planetary Candidates in the Galactic Bulge", Nature, in press (2006 Oct 5 issue)

M. Zoccali, A. Lecureur, **B. Barbuy,** V. Hill, A. Renzini, **D. Minniti**, Y. Momany, A. Gomez, S. Ortolani "Oxygen abundances in the Galactic Bulge: evidence for fast chemical enrichment", 2006, A&A, 457, L1

A. Alves-Brito, **B. Barbuy, Zoccali, M.; Minniti, D.,** Ortolani, S.; Hill, V., Renzini, A.; Pasquini, L., Bica, E., Rich, M., & J. Melendez, "VLT-UVES abundance analysis of four giants in NGC 6553", 2006, A&A, in press (astro-ph/0609128)

J. Borissova, V. D. Ivanov, D. Minniti, D. Geisler, "Discovery of new Milky Way star cluster candidates in the 2 MASS point source catalog. V", 2006, A&A, 455, 923

J. Borissova, D. Minniti, M. Rejkuba, D. Alves, "Properties of RR Lyrae stars in the Inner Regions of the Large Magellanic Cloud. II. The extended sample", 2006, A&A, in press (astro-ph/0609209)

B. Barbuy, M. Zoccali, S. Ortolani, Y. Momany, **D. Minniti**, V. Hill, A. Renzini, R. M. Rich, E. Bica, L. Pasquini, & R. K. S. Yadav, "VLT-UVES Analysis of two giants in the bulge metal-poor globular cluster HP-1", 2006, A&A, 449, 349

D. E. McLaughlin, J. Anderson, G. Meylan, K. Gebhardt, C. Pryor, **D. Minniti**, & S. Phinney, "HST Proper Motions and Stellar Dynamics in the Core of the Globular cluster 47 Tucanae", 2006, ApJS, 166, 249

W. Gieren, G. Pietrzynski, K. Nalewajko, I. Soszynski, F. Bresolin, R. P. Kudritzki, **D. Minniti**, & A. Romanowski, "The Araucaria Project. An accurate distance to the Local Group galaxy NGC 6822 from near-infrared photometry of Cepheid variables", 2006, ApJ, 647, 1056

J. M. Fernández, **D. Minniti, G. Pietrzynski, W. Gieren, M. T. Ruiz, M. Zoccali,** A. Udalski, & T. Szeifert, "Millimagnitude Optical Photometry for the Transiting Planetary Candidate OGLE-TR-109", 2006, ApJ, 647, 587

A. Sollima, **J. Borissova, M. Catelan,** H. A. Smith, **D. Minniti**, C. Cacciari, & F. R. Ferraro, "New Metallicities of RR Lyrae Stars in ω Centauri: Evidence for a Non He-Enhanced Metal-Intermediate Population", 2006, ApJ, 640, L43

12. List of targets proposed in this programme

Run	Target/Field	α(J2000)	δ(J2000)	ToT	Mag.	Diam.	Additional info	Reference star
A	MW bulge	18	-30	125	11-20 (Ks)	300 deg	RA 17h to 19h, DEC -40 to -20	
B	MW plane	15	-50	105	11-20 (Ks)	220 deg	RA 12h to 17h, DEC -65 to -35	
C	MW bulge	18	-30	30	11-20 (Ks)	300 deg	RA 12h to 17h, DEC -65 to -35	
D	MW plane	15	-50	20	11-20 (Ks)	220 deg	RA 12h to 17h, DEC -65 to -35	
E	MW bulge	18	-30	250	11-20 (Ks)	300 deg	RA 12h to 17h, DEC -65 to -35	
F	MW bulge	18	-30	300	11-20 (Ks)	300 deg	RA 12h to 17h, DEC -65 to -35	
G	MW bulge	18	-30	200	11-20 (Ks)	300 deg	RA 12h to 17h, DEC -65 to -35	
H	MW plane	15	-50	150	11-20 (Ks)	220 deg	RA 12h to 17h, DEC -65 to -35	
I	MW plane	15	-50	250	11-20 (Ks)	220 deg	RA 12h to 17h, DEC -65 to -35	
J	MW plane	15	-50	150	11-20 (Ks)	220 deg	RA 12h to 17h, DEC -65 to -35	
K	MW bulge	18	-30	200	11-20 (Ks)	300 deg	RA 17h to 19h, DEC -40 to -20	
L	MW plane	15	-50	140	11-20 (Ks)	220 deg	RA 12h to 17h, DEC -65 to -35	

Target Notes: Submitted to the PSP.

12b. ESO Archive - Are the data requested by this proposal in the ESO Archive (http://archive.eso.org)? If yes, explain why the need for new data.

Submitted to the PSP.

13. Scheduling requirements

14. Instrument configuration

Period	Instrument	Run ID	Parameter	Value or list
79	VIRCAM	A	IMG	ESO filters: ZYJHKs
79	VIRCAM	B	IMG	ESO filters: ZYJHKs
81	VIRCAM	C	IMG	ESO filters: ZYJHKs
81	VIRCAM	D	IMG	ESO filters: ZYJHKs
83	VIRCAM	E	IMG	ESO filters: Ks
83	VIRCAM	F	IMG	ESO filters: Ks
83	VIRCAM	G	IMG	ESO filters: Ks
85	VIRCAM	H	IMG	ESO filters: Ks
85	VIRCAM	I	IMG	ESO filters: Ks
85	VIRCAM	J	IMG	ESO filters: Ks
87	VIRCAM	K	IMG	ESO filters: ZYJHKs
87	VIRCAM	L	IMG	ESO filters: ZYJHKs

3a. Run	Period	Instrument	Time	Month	Moon	Seeing	Sky Trans.	Obs.Mode
	...continuing from box 3, first page.							
I	85	VIRCAM	250h	may	n	$\leq 0.8''$	CLR	s
I/alt	85	VIRCAM	250h	may	n	$\leq 1.2''$	THN	s
J	85	VIRCAM	150h	jun	n	$\leq 0.8''$	CLR	s
J/alt	85	VIRCAM	150h	jun	n	$\leq 1.2''$	THN	s
K	87	VIRCAM	200h	jun	n	$\leq 0.8''$	CLR	s
L	87	VIRCAM	140h	may	n	$\leq 0.8''$	CLR	s