Workshop “Stellar Clusters & Associations + Gould Belt + Gaia” REG Working Groups

SC&A WG Report

Emilio J. Alfaro

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- Stellar Cluster & Associations: A RIA Workshop on Gaia
- Gaia-ESO Multi-Object Spectroscopy Project

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Granada, Spain. 23rd - 27th. May 2011 http://sca.iaa.es

Stellar Clusters & Associations

A RIA workshop on Gaia

L O C:
·Aparicio-Villegas, T.
·Costado, M. T.
·Delgado, A.J.
·Gallego, A.T. (Chair)
·Garzón, F.
·Maíz Apellániz, J.
·Sánchez Doreste, N.
·Sánchez-Gil, M.C.
·Schödel, R.
·Sota, A.
·Vicente, B.

S O C:
·Alfaro, E. J. (Chair)
·Carraro, G.
·Elmegreen, B.
·González Delgado, R.
·Jordi, C.
·Lada, E.
·Lanzaffame, A.
·Maíz Apellániz, J.
·Paunzen, E.
·Zapatero, M. R.

List of Topics

Gaia Status & Performance. *T. Prusti*
Cluster Formation. *P. Kroupa*
Embedded Clusters. *J. Alves*
Initial Mass Function. *K. Covey*
Cluster Systems in other Galaxies. *S. Larsen*
Spatial and Kinematic Distributions of Stellar Clusters. *S. Goodwin*
Disruption and Destruction Mechanisms. *N. Bastian*
Massive Stars. *I. Negueruela*
Low Mass Stars, Brown Dwarfs and Cluster Exoplanets. *D. Barrado-Navascués*
Stellar Structure & Evolution. *F. van Leeuwen*
The Formation of the Milky Way. *J. Peñarrubia*
Evolution of the Galactic Disk. *G. Gilmore*
Structure of the Halo. *A. Sarajedini*
Spectroscopic & Photometric Surveys. *S. Feltzing*
Synergy with Other Space Missions. *P. André*

Open Discussions

Birth, Evolution and Death of Stellar Clusters. *R. de Grijs*
Long Term Surveys preparing and following GAIA. What do we need? *Sofia Randich*

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Gaia Status & Performances (T. Prusti)

Star Formation & Initial Mass Function

- **Cluster Formation** (P. Kroupa)
- **Embedded Clusters** (J. Alves)
- **Initial Mass Function** (K. Covey)

Dynamical Evolution of Stellar Clusters

- **Cluster Systems in other Galaxies** (S. Larsen)
- **Spatial and Kinematic Distributions of Stellar Clusters** (S. Goodwin)
- **Disruption and Destruction Mechanisms** (N. Bastian)

Stellar Populations in Clusters

- **Massive Stars** (I. Negueruela)
- **Low Mass Stars, Brown Dwarfs and Cluster Exoplanets** (D. Barrado-Navascués)
- **Stellar Structure & Evolution** (F. van Leeuwen)

Star Clusters as Probes of Galactic Structure

- **The Formation of the Milky Way** (J. Peñarrubia)
- **Evolution of the Galactic Disk** (G. Gilmore)
- **Structure of the Halo** (A. Sarajedini) (NA)

Surveys Pre and Post Gaia

- **Spectroscopic & Photometric Surveys** (S. Feltzing)
- **Synergy with Other Space Missions** (P. André)

Open Discussions: "Tertulias"

- **"Birth, Evolution and Death of Stellar Clusters"** (Chairperson: Richard de Grijs)
- **"Long Term Surveys preparing and following GAIA. What do we need?"** (Chairperson: Sofia Randich)

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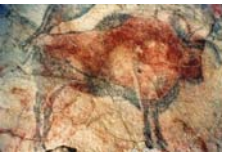
Some trending topics (blowing on the wind):

- Most stars are born in Clusters (Lada & Lada 2003) but ..., NOT ALL (Bastian 2011)



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- If you want to know everything about High-Mass stars, “cherchez” the Clusters (Negueruela 2011)

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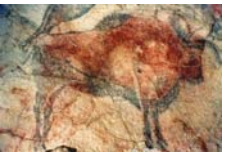
- How does a brown-dwarf form? Star Sisters or Daughters (Barrado-Navascués 2011)



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The answer .... TODAY??

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  The answer .... TODAY??

- For most of the other questions, the answer is expected to come from Gaia

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A more developed and detailed version on these topics is coming soon (before the end of the year):

"Stellar Clusters & Associations: A RIA Workshop on Gaia"
Eds. E. J. Alfaro, T. Gallego & M. R. Zapatero
"E-Book, 2011"

It will be available from http://ssg.iaa.es/ , also visible from NASA-ADS

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A press-room at:

http://ssg.iaa.es/content/noticias

or directly from YouTube:

http://www.youtube.com/user/iaaudc?blend=21&ob=5#g/c/BDB7E6E9BDAE2752

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The Gaia-ESO Survey

G. F. Gilmore & S. Randich + over 250 collaborators

Merging and re-fixing of two previous proposals leads separately by the two CoPIs

Gaia-ESO is a public spectroscopic survey, targeting 10^5 stars, sampling all major components of the Milky Way, from halo to star forming regions, providing the first homogeneous overview of the distributions of kinematics and elemental abundances.

VLT-FLAMES-GIRAFFE-UVES (3000 hours, 6 semesters, 3 years)

In other words Galactic Components + Stellar Clusters

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The Gaia-ESO Survey

Information: http://great.ast.cam.ac.uk/GESwiki

Just for Stellar Clusters:

First Task: Selection of Clusters & Target Stars

Involved WGs:

WG1(Membership Analysis)

WG2(Auxiliary Data for Cluster Target Selection)

WG4(Cluster Stars Target Selection)

WG6(OB & fposs generation)

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The Gaia-ESO Survey

Stellar Cluster Working Plan

- WG4 pre-selects the clusters with a minimum check on available information (master lists are already available). Some "overbooking" is necessary in this phase. - WG4 defines the categories of stars to be observed with Giraffe and UVES, respectively, along with the setups. - WG2 finds all existing data on the individual stars in the clusters, cross-checking different photometric data, references, and the like. - WG1 determines membership probabilities for all stars in each cluster. - WG4 defines priorities for the targets (e.g. , stars to be observed with UVES or Giraffe) producing a "pre-positioning" file. - WG6 does the actual fiber allocation, iterating with the other groups if necessary.

At least part of participants to WG4 will participate also to WGs 1, 2, and 6 to ensure maximum homogeneity and efficiency in the selection procedures.

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CLUSTERS FOR P88

Cluster	Dsun	Material	target stars
intermediate/old			
NGC2516	0.3 kpc	UlrikeHeiter, Rob Jeffries	NGC2516_readme.txt UVES: >20 MS - NGC2516_UVES_coord_UBV.txt, Gir: V=10-17, A-K (pm & RV), NGC2516_WDs.txt
Tr 20	3.3 kpc	A. Bragaglia (see some info & plots)	CMD (Platais+2008) ; 2 pointings; UVES: 14 RC, Gir: V=15.5-17, F0-G5
young & far			
NGC 3293	2.3 kpc	Giraffe pointings	OBA stars, HR03,05A,06,14A gratings
young & close			
gamma2 Vel	350 pc	BVI Jeffries 2009MNRAS.393..538J	
Cha I	160 pc		
NGC2264	760 pc		

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CLUSTERS for P89

See here the distribution in Ra,Dec for the proposed clusters of all ages. P89 starts April 1, 2012 (RA at midnight ~12hr) and ends September 30, 2012 (RA at midnight~0 hr)

Intermediate age & old

Cluster	RA	Dec	l,b	Dsun (pc)	Rgc (kpc)	E(B-V)	age (Gyr)	[Fe/H]	V(RC)	diam (')	target stars	Notes	Priority
NGC3532	11 05 33	-58 43 48	289.571, 1.347	486	7.85	0.037	0.30	+0.04 +-0.06 (4 stars)	8.0	50	<15 RC/RGB	BVRI on 1sq.deg (Clem+11); HRS 5 giants (Smiljanic+09); RVs (11 st., Mermilliod+09; 34 st. Gonzalez&Lapasset 02); p.m. (468 st. King78; 8 st. Baumgardt+00) ; also hot stars, White dwarfs NGC3532_WDs.txt	1
NGC4815	12 57 59	-64 57 36	303.625, -2.097	3079	6.79	0.808	0.23	-	13.9	5	~14 RC	BV (Carraro&Ortolani94 ~12'x12'); deep VI (Prisinzano+01, ~9'x9')	1
Trumpler23	16 00 50	-53 31 23	328.861, -0.468	2200	6.22	0.85	1.00	-	15.0	9	~14 RC/RGB	VI (Carraro+06, the only photometry available, 17.7'x8.9')	2
Ruprecht134	17 52 43	-29 33 00	0.270, -1.643	3400	4.6	0.50	1.0	-	15.5	5	<14RC	BV (Carraro+06, 13.5'x13.5', radius~5')	1
NGC6633	18 27 15	+06 30 30	36.011, 8.328	376	7.7	0.182	0.4	-0.08 +-0.12 (8 meas. of 4 stars)	8.0	>20'	8 RGB	BVI many source of photometry in a total field of 1.3x1.3 deg, at least 5 pointing are necessary : also hot stars. Known white dwarfs NGC6633_WDs.txt	1
Berkeley81	19 01 36	-00 31 00	34.505, -2.068	3000	5.78	1.0	1.0	-	16.5	<10'	~30 RC/RGB	BVI BV (Sagar+98, 6'x6' fov): RV for 3+2 stars (Warren&Cole09: [Fe/H]=-0.15)	2
Berkeley44	19 17 12	+19 33 00	53.212, 3.354	1800	7.07	1.3	1.4	-	16.5	>12 RC/RGB	2	BVI Janes & Hoq (2011, 13.3'x13.3' fov) ; also BV Carraro+06 (10'x10' fov)	2
NGC6705/M11	18 51 05	-06 16 12	27.307, -2.776	1877	6.39	0.426	0.2	+0.13 +-0.13 (6 meas. of 5 stars)	12.0	>20'	>40	BVI TBC ; BVI WFI (30'x30' fov) ; also hot stars	1
NGC2509	08 00 48	-19 03 06	237.840, 5.848	2900	10.3	0.06	1.2	-	13	5	TBD	VI (Carraro&Costa07, 13'.5x13.5', not centered)	1
NGC6802	19 30 36	+20 15 34	55.326, 0.916	-	7.4	0.84	0.74	-	14.75	5	~15 RC stars	BVI (Janes & Hoq 2011, 13.3'x13.3' fov)	1

Other possible (backup) intermediate/old clusters for P89

Cluster	RA	Dec	l,b	Dsun	Rgc	E(B-V)	logAge	[Fe/H]	V(RC)	diam	target stars	Notes	Priority
NGC6583	18 15 49	-22 08 12	9.283, -2.534	2040	7.28	0.51	1.0	-	12.5	1	TBD	VI (Carraro+05, 13'.7x8.9')	2
King25	19 24 30	+13 42 00	48.865, -0.935	-	7.8	1.52	0.47	-	14.3	5	5 RC stars	BVI (Janes & Hoq 2011, 13.3'x13.3' fov)	3
NGC6005	15 55 48	-57 26 12	325.780, -2.986	2690	5.97	0.45	1.2	-	14.0	5	<14 RC	BVI (Piatti+98, 4'x4')	3

Rgc based on Rgc,sun=8 kpc from Galactic center ; **parameters** above from WEBDA (except NGC2509, since they are clearly wrong, and King25 which had none)
Find here a table from Paunzen & Netopil (2006)

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YOUNG CLUSTERS

Cluster	RA(2000)	Dec(2000)	l	b	Dsun	E(B-V)	age	Notes
	hh mm ss	dd mm ss	deg	deg	pc	mag	Myr	
lambda Ori	05 35 08	+09 56 03	195.052	-11.995	400		2-7	
NGC2547	08 10 25.7	-49 10 03	264.465	-8.597	455	0.041	28.5	
IC2391	08 40 32	-53 02 00	270.362	-6.839	175	0.008	50	
IC2602	10 42 58	-64 24 00	289.601	-4.906	161	0.024	32	
NGC3766	11 36 14	-61 36 30	294.117	-0.030	1745	0.175	14.0	also hot stars
IC2944	11 37 53	-63 21 00	294.849	-1.654	1800	0.320	6.5	also hot stars
rho Oph	16 25 35	-23 26 50	353.686	17.687	120	--	0.3-1	
IC4665	17 46 18	05 43 00	30.619	17.082	360±14	0.174	36±9	
NGC6530	18 04 31	-24 21 30	6.083	-1.331	1250	0.333	2-3	also hot stars
NGC6611	18 18 48	-13 48 24	16.954	0.793	1750	0.782	1-3	also hot stars

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Current Situation:

1.After some teleconfs, people manifested their interest on different clusters.

2.There are some persons leading the data compilation for some particular clusters. They also will propose the target stars.

3.No input from WG2 has been received yet.

4.Our group is currently working on some aspects connected with:

Compilation of data (Magalí Valdepérez)

Analysis of available Proper Motion Catalogs (Belén Vicente)

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Tasks to do:

1.To distribute the Clusters among different teams for membership estimation based on: kinematics and photometry
2.To Provide an unified format (TBD)
3.What to do? Waiting for input data from WG2 or compiling our own data collection (Our group took this way)
4.People here and engaged with WG1 (before or sometime named WG16) should meet to establish some guidelines.

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Grupos “Cúmulos Estelares + El Cinturón de Gould”

Lunes, 19 de setiembre, de 16h a 19h

Presentaciones:

Emilio J. Alfaro “Informe sobre el Grupo de Trabajo ‘Cúmulos Estelares’ de la REG” 15 minutos

David Montes: “Grupos Móviles: Una revisión actual” 25 minutos

David Barrado (representando a Nuria Huélamo et al.): “Estrellas Jóvenes de Baja Masa: GAIA y Estudios Complementarios” 15 minutos

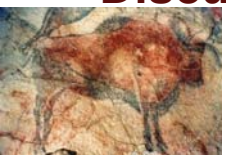
Lola Balaguer: "Astrometría pre-Gaia de la Corona de Cúmulos Abiertos" 15 minutos

F. Jiménez-Estebán: “A Proper Motion Study of the Lupus Clouds using Virtual Observatory Tools” 15 minutos

Mayte Costado: “Población Estelar de Cúmulos con Estrellas de Alta Masa” 15 minutos

Jesús Maíz-Apellániz: “Estrellas de Alta Masa” 15 minutos

Discusión; Modera Emilio Alfaro



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