

Large Public Spectroscopic Survey (LPSS) proposal planning meeting.
Firenze, Dec. 6-7, 2010

- **Aims of the meeting:** getting ready to write a competitive and convincing proposal, in case the cluster Lol is approved.
- **Issues to be discussed:**
 - target selection (both clusters and stars) and characterization
 - survey strategy (set-ups, exposure times, S/N, priorities, use of ESO archive, etc.)
 - settle data management and survey management structure
 - define data products and their distribution

All these issues were addressed in the Lol, but a more detailed and definitive planning is required.

- **Participants:** Sofia Randich SR, Emilio Alfaro EA, Ronny Blomme RB, Angela Bragaglia AB, Katia Biazzo KB, Francesco Damiani FD (Dec. 6), Janet Drew JD, Ulrike Heiter UH, Laura Magrini LM, Giusi Micela GM, Ignacio Negueruela IN, Francesco Palla FP(Dec. 6), Elena Pancino EP (Dec. 7), Rodolfo Smiljanic RS, Alessandro Spagna AS, Antonella Vallenari AV (Dec. 7)
- **Formal presentations:**

Dec. 6

SR:

- (1) Welcome;
- (2) Review of the motivations for a ground based spectroscopic survey of open clusters and of the scientific content of the letter of intent;
- (3) News from ESO about the Lol selection process;
- (4) Aims of this meeting.

GM: Young Clusters: sample selection and strategy

IN: Massive/Young Clusters

RB: Massive Clusters

AB: Intermediate age and old clusters

EA: Kinematics of "supervirial" clusters

SR: Review of the survey strategy and data management

Dec. 7

JD: Running a public survey: thoughts and experience

EP: Organizational scheme of the "other" Lol

- **Discussion:**

During the two days, following the formal presentations, different issues were discussed. Summary of the discussion is provided below:

1. TARGET SELECTION.

A. Young Clusters.

In the Lol 40 clusters with ages < 100 Myr were proposed, 10 of them being massive clusters. Limiting distance was 1.5 kpc, with exception of the very massive clusters that would be observed up to larger distances.

GM and FD suggested to select a final sample of 30 clusters with age < 100 Myr: 15 with age < 10 Myr and 15 with age > 10 Myr.

The clusters should span a large parameter range (age, distance, stellar content, metallicity). This latter point was stressed several times during the discussion. Preliminary selection: starting from the Dias catalogue, complemented by the Lada & Lada catalogue, considering clusters with $\delta < +21$, $d < 2$ kpc. 179 clusters to be reduced to 60, based on inspection of available information and then to the final 30.

First selection of 60 clusters should be before Jan. 15 2011. If Lol is approved detailed survey of literature and archives; membership; coverage of par. space; fine tuning with simulations of fibre allocation.

EA suggested an alternative approach:

- i) select clusters with high probability of being in a supervirial regime (based on a R_{cl} vs. age diagram);
- ii) link the cluster selection to main scientific goal, i.e., the study of the cluster structure and kinematics and comparison with simulations, as a tool to finally understand cluster formation mechanisms.

After discussing pros and cons of the two approaches, it was decided that GM and EA would interact to converge on a cluster selection strategy which should be a 'compendium' of both. Namely, clusters selection should be tied to science goals, but at the same time a representative and large sample should be selected, covering the different cluster characteristics.

Distance limit: we stick to 1.5 kpc (as from Lol), adding perhaps a few clusters between 1.5 and 2 kpc, if they are particularly interesting. Based on the plot of v_{tang} vs. distance, and given that we aim to be complete down to at least the early-M dwarf regime in these clusters, SR stressed that it makes no sense to include farther clusters, with exception of the very massive ones where we would target early-type stars (see below). AS suggested to perform the final cluster selection (clusters and members within a cluster) using a selection function. The suggestion was taken --> AS will interact with GM and EA.

A discussion on cluster membership was also held, started by a question by UH. For the young clusters, a lot of ancillary information is available (like e.g., lithium).

AS stressed that, when possible, proper motion can be used for nearby cluster (< 1000 pc) from all sky proper motion catalogue. AS will cross-check the list of young clusters vs. the catalogue in order to help defining the membership.

B. Young Massive Clusters (defined as those having several x 1000 Msun)

IN and RB stressed that massive clusters are necessary to complete the young cluster parameter space and to address complementary science. A sample of interesting clusters was proposed based on different criteria:

- i.) massive stars already observed with FLAMES (in the LPSS we would focus on the lower mass population)
- ii.) very young clusters and somewhat older ones (~100-200 Myr range): selection
- iii.) cluster density vs. cluster radius diagram (see Pfalzner 2009).

The massive cluster sample will be complementary to the other samples proposed in the survey. --> IN and RB will interact with both GM and EA, and AB in order to define the final sample.

C. Intermediate and Old Cluster

AB presented the preliminary selection of old (> 500 Myr) clusters along with their characteristics. The sample should be comparable to what we have now (~70 clusters)

SR noted that, thanks to high resolution metallicity measurements currently available, the radial gradient is not so badly defined. Thus we should provide in the proposal a very strong and convincing justification for the need of additional 40-50 clusters. Along the same lines, EA asked what would be the improvement introduced by the new clusters to be observed during the LPSS. A discussion on these points started. It was agreed that we should stress that, besides an homogeneous dataset, we need good statistics: in particular, it was decided that we should divide the parameter space in bins, and aim to have a good statistical coverage of each bin. Parameters to be considered are: age, Galactocentric distance, metallicity, orbits. AB will work on this, considering already available data plus data present (and usable) in the ESO archive. SR will contact Giovanni Carraro to ask whether he can derive orbits of [part] of the sample.

Similarly to the young cluster sample, criteria for membership were discussed. AS will interact with AB to cross-check for available proper motions.

2. TARGETS WITHIN CLUSTERS AND PRIORITIES

Young clusters

Main goal for these clusters is the determination of radial velocities (RV). Lithium and accretion represent important additional goals.

- Giraffe fibres will be allocated to cluster candidates down to the M dwarf regime. Limiting magnitude for Giraffe is $R \sim 19$. At this mag. we aim to have a S/N ~10.
- UVES fibres will be allocated to late-G/K-type stars to be used for abundance determination.

Priority in placing fibres will be given to Giraffe. For each cluster we aim to a complete (down to the lim. mag.) coverage of known candidates. Also, we aim to reach a RV accuracy of the order of 0.3 km/s.

****We have not discussed early-type stars in the OB associations -TBD****

Young massive clusters

Main goal is the determination of radial velocities of early-type stars and stellar parameters (not provided by Gaia).

Accuracy in RV will be much worse than for low mass stars (of the order of 5 km/s).

Higher S/N needed (how much?)

- Giraffe fibres will be used for O-type stars
- UVES for B-type stars.

****Priorities? Limiting magnitudes? We have not discussed this****

Intermediate age (100-500 Myr) and old clusters

Main goal will be:

1. radial velocities for members of the intermediate-age clusters and
2. abundances for the old ones.
3. In both cases, spectra are also needed to identify atmospheric features due to processes that could alter the position of the stars in the C-M diagram. To this aim:
 - main sequence stars will be observed with Giraffe (and possibly with UVES in the closest clusters where Gaia will provide even higher accuracy in v_{tang} and better accuracy in RV is also needed)
 - while supergiants or clump giants will be observed with UVES.

Completeness: Main sequence stars: in the intermediate age clusters we need to be complete, from the A-type stars down to the M dwarf regime for the closest ones (this in order to address themes 1 and 2 in the Lol).

****What about the old clusters? What about WDs? We have not discussed this**.**

Clump giants: all known candidates.

Priority will be given to Giraffe fibres in the intermediate-age clusters and to UVES fibres in the old ones.

Limiting magnitude: $V/R = 19$ for Giraffe; $V = 16.5$ for UVES.

3. SET-UPS

Choice of set-ups obviously depends on science and main goals. The choice of UVES set-ups is straightforward. The choice of Giraffe set-ups is rather obvious for young clusters (including massive ones), but not so obvious for the intermediate and old clusters.

In any case, it was agreed that we should not limit the number of requested set-ups, if they are needed, based on science.

Proposed set-ups are:

UVES:

- UVES CD#3, 580 for young, intermediate-age and old clusters
- UVES CD#3, 520 for early type stars

Giraffe:

- Young clusters: HR15N and HR21. Both gratings for all clusters?
- Young massive clusters: HR03, 05, 06, 14
- Intermediate age and old clusters: HR15N and/or HR09 and/or HR12 and/or HR21.

In order to make the final choice, SR will put the list of possible Giraffe gratings on the wiki and everyone will add pros & cons for each of them.

4. DATA ANALYSIS

SR reviewed the work packages (WPs) included in the Lol. During the following discussion the above points were raised:

- 'complementary data' should be 'auxiliary data' and should include retrieval of data needed to characterize the targets. JD stressed that truly complementary data might also be important
- some (most) of the WPs should split into at least two different WPs: e.g., sample selection and characterization: young and old; auxiliary data (young and old); survey strategy (young, old); abundances (TBD); models (stellar ev., chemical ev., N-body sim.). Some subdivision are obvious, other are less obvious and will also depend on participation. It was decided to have kick-off teleconfs for each of the WPs: participation is open to all interested people. SR will set a doodle poll and send email to all the Cols of the Lol. The teleconfs might be done using 'Adobe Connect' (see instructions by UH). An example of possible splitting of the WP on 'Final sample selection and characterization' into sub-WPs has been proposed by UH; (see <http://camd08.ast.cam.ac.uk/Greatwiki/UlrikeHeiter/Test>);
- meaning of the 'statistical tool' and 'link to Gaia' WPs were better defined;
- it was decided that, whenever possible, the data reduction and analysis should be distributed and performed using two different methods. For example, for the RVs RB mentioned that, within CU6, he is working on simulations to get RVs from Gaia. Thus, it would be good that RVs (at least for a subset of them) are obtained using both Ronny's algorithm and Rob Jeffries' one. Similar arguments apply to the abundance analysis, although this is more complex, since the analysis involves a larger number of steps (e.g., measurements of EWs, choice of model atmosphere, atomic parameters, abundance code, etc.). The abundance analysis WP should extensively discuss this and possibly make preliminary tests and comparisons.

5. DATA AND SURVEY MANAGEMENT

JD presented a few slides summarizing previous experience with public surveys and a few personal thoughts. Main messages for the proposal to be submitted to the OPC:

- must be science oriented
- focus on top level aims

- not give too many 'technicalities' and details; (this was the case for VST and VISTA. It might not apply to the spectroscopic survey. Not clear yet how the selection of the final proposals will be done);
- avoid complicated looking data products
- ensure homogeneity of data analysis
- 'exploit' enthusiastic students
- identify at early stages interests and responsibilities
- have a good pipelining
- have regular meetings
- have a good website: public face and identity
- keep everything simple

EP reviewed the management structure of the GREAT-MW Lol. The management plan might seem in a more advanced stage than in our case, but, at variance with us, they have not yet identified responsible persons.

Also, not clear relationship between Steering Committee and Science Team. It was agreed that, given the different aims and requirements, we cannot simply 'copy' their management structure.

SR presented a preliminary flow chart for a possible management structure of our surveys. Main comments during the discussion:

- most WPs should communicate only with the 'Data products and distribution' WP; no direct data flow between WPs;
- separate (also with colours) pre-proposal work-packages from post-proposal WPs;
- use different colours for the different tasks (e.g., sample selection, data distribution, analysis, models)
- put on the right-hand side the tasks related to the analysis;
- add the observations

SR will produce an updated version of the flow chart and circulate it among the participants of this meeting. When the final version is approved, it will be circulated to all Cols.

WPs coordinators: all the responsables already identified at the Lol stage were confirmed, although AB mentioned that she was 'uneasy' with the coordination of the data reduction WP. The responsables will coordinate the kick-off teleconfs.

The survey will be coordinated by a Steering Committee, where all the WPs coordinators will sit. SR will be the chair of the Steering Committee.

6. DATA PRODUCTS

They will be distributed using VO and WEBDA-like tools (see email by E. Paunzen). Raw spectra will be made available by ESO (in the ESO archive) soon after the observations.

Advanced products will be those already identified in the Lol and will be made available by us (plus ESO)?

7. MERGING WITH THE OTHER GAIA LOI

JD stressed that the possibility that ESO asks us to merge with the GREAT-MW LoI into a unique proposal is real. Not clear though, how the merging would occur. ESO will provide guidance? The PIs will be invited to a meeting at ESO where the merging will be discussed? We should be ready to identify our top priorities. It was however decided that we do not need to shape a 'merging case' now. In case we are invited (forced?) to merge, we will have one (or more) teleconf(s) on this. In the meantime, everyone should keep thinking about possible merging and must be prepared for that discussion.

8. LARGE PROGRAMME(S)

Following a question by UH, it was agreed that in case our LPSS is not approved, we will split it into one or (more likely) few large programme(s).

9. LIST OF ACTIONS

A1-SR: send an updated version of the flow chart Dec. 31, 2010

A2-SR: put final report on wiki, along with presentations Jan. 5, 2011

A3-SR: send final report to all Cols, along with invitation to attend the teleconfs, and link to doodle poll Jan. 5, 2011

A4-SR: put list of gratings on the wiki Jan. 3, 2011

A5-All: send comments on the flow chart Jan. 5, 2011

A6-All: send comments on the list of gratings Jan. 10, 2011

A7-GM, FD, EA, AS + IN, RB: young cluster sample (including massive ones) selection (including a written text on the criteria) Jan. 15, 2011

A8-SR: contact Carraro for information on the orbits Dec. 31, 2010

A9-AB, EP, LM, AS: intermediate age and old cluster selection (including a written text on the criteria) Jan. 15, 2011

A10-WPs coordinators: teleconfs Jan. 20, 2011