

February 2024 Hector Busyweek

Julia's notes on the discussion sessions.

See the slides for all the talks on the busyweek wiki.

See also the updated progress in the list of tasks linked on the busyweek page, that describes all the work achieved.

Discussion of next steps in the pipeline

Still to be done:

- detailed analysis of stellar pops and stellar kinematics
- need to connect all the kinematics together.

Gabby's code takes too long to run on the machine she uses, for it to process all our data.

Once it is included into the full Hector pipeline then it all needs to be run on a more powerful machine. ADACS proposal could be used to speed up Gabby's code.

Susie and Jesse will be focussing on the stellar kinematics in detail, but for now the stellar kinematics from Gabby's code can be used. Susie's code should be plugged into Gabby's code. Susie's stellar kinematics should be ready by the next busyweek.

Susie is also looking in more detail at the line spread function. More likely we will just use a gaussian sigma as a function of wavelength and position on the CCD. But depending on the LSF, we may need something more detailed.

Need structural params for all galaxies, and we have structural params (ellipticity etc.) for the clusters. We need to check on that for the WAVES regions. Sam will check with UWA team if they have done PROFIT fitting for the WAVES regions.

Discussion on early Hector papers:

The 3 early paper topics in the observing proposals are (see proposals for details):

1. Ram pressure stripped galaxies
 2. Wind galaxies
 3. Low mass dwarfs
- Matt's team wants to check exactly what we now have in data, to be sure they are ready for a first paper, but the first paper may be Gabby's code plus a couple of the Hector ram pressure stripped galaxies demonstrating the code. Matt is over excited by a new ram pressure stripped galaxy in Hector that Gabby showed (that is not the one in the 2024A proposal)...and another identified in the busyweek by Oguzhan!
 - The winds paper from Madusha - she needs the emission line output of Gabby's code and the classifications from Henry's code - she has talked with both of them this week.
 - The low-mass galaxies work: Sree is planning a paper that needs the good imaging. Pratyush has contacted the UWA team for their full large region fits images, and those are being sent on disk to him then to Sam to go on data central. These are not the cutouts. The cutouts that Sam has done for observing are from the LEGA-C survey imaging. On the LEGA-C survey site it allows you to download multiband images in any region. Sree has identified that there should be ~300 galaxies suitable for her project. She could download the images from LEGA-C for those, but also the Hector team should get a full set downloaded onto the wiki. Sree also needs the stellar

kinematics but can use Gabby's kinematics for the moment while waiting for Susie's better stellar kinematics. Sree also needs the structural parameters - PA, ellipticity, sersic index (See above, Sam is going to contact the UWA group to see if these have been fit by them already with PROFIT. We already have these for the clusters.). Sree needs the high spectral resolution (hence only the dwarfs observed with Spector) to understand the bend in the M-Sigma relation. Low S/N and low resolution could cause this, or it could be a physical effect.

- KASI group (Joon Hyeop) has a paper on the wiki focussed on dwarfs, looking at the AGN population. He will talk this week with Gabby about the emission line outputs and Henry about the AGN spaxel classifications from his code.

Those are the currently identified papers relating to the early science topics. I encouraged all others to post their papers on the wiki for any other topics too.

Sukyong presented the NewCluster simulations

-These new high resolution cluster simulations will be immensely useful for Hector because now the physical scales are much smaller than disks.

Strategic planning for redshifts for input catalogue

Background: Hector needs redshifts to fill out our input catalogue in the regions where there are not deep and complete redshift surveys already. Originally TAIPAN and waves were to provide these but with the changes to those projects we have been using 2dF to take redshifts ahead of the semesters we observe Hector targets. Once we finish the existing regions in the South (G23, H01, H03) we will need to have redshifts for the next regions opened up.

- WAVES will not start observing until mid-2025 at the earliest, and redshifts will take a year longer.
- Timeframe for 4HS is the same.
- Sam's talk earlier plots: We have about 2 years of observing left in the H01, H03 and cluster fields before we have to open up a new field. It would take about 6 clear good nights (so ~12 applied for nights) with 2dF to complete the z's for another H0x field.
- So far we have observed the survey for ~1.25 years, and excluding the objects observed without the red camera, we have completed the percentages in the table in Sam's talk. We have done 50% of the H03 field but much less of the other fields. Once H03 is done, there are clusters at that time including some with 0% current obs. (total of more than the H03 field so plenty to go on with). Therefore, at least another 1.25 years until H03 is done then another year still after that. So we don't need to open up new regions and hence need new z's until the end of 2025 at the earliest. However, due to the timelines and uncertainties we can't then just wait for WAVES.
- We will have a lack of targets in ~June once A3667 and A3716 are completed in about a year. Therefore would have to ask for scheduling not around then.

Considering the next regions we would open up:

- There are many regions in the South outside of our current regions (H01, H03, G23) that have > 80% completeness in redshift. The observing nights required to do the 2dF redshift survey for a new H0x region to high completeness from this 80% is 6 good clear nights and hence ~12 applied for nights. These nights will come out of Hector time and hence, while that may be necessary, we want to be as efficient as possible.

- There are only about 10 Hector-qualifying targets per field of 2dF targets. This is not efficient. We should implement colour cuts to improve 2dF efficiency in the H0x regions as we were doing in clusters. ACTION: Stefania (and Sam).
- The incompleteness will be biased e.g. towards blue things, and away from low stellar mass galaxies. We either need to account for that or fill in those extra redshifts. WAVES will not realistically be providing any redshifts before 2026 and even then it is not clear which sky regions and completeness will be done. 4HS is same timeline. One way to continue the Hector Survey without further input redshifts in the meantime will be to select the highest over-density regions from the 80% complete regions because those will be multi-pass. We can then cover them first with existing redshifts but then come back to those regions for an extra pass/es later in the survey once the remaining redshifts are done with WAVES. ACTION: Overplot the tile circles onto the plot that Sam showed in his talk of the redshift completeness in the South. Then we can evaluate the size of regions for which this approach may work and how much more Hector Survey time that would buy us before we need new z's. TS WG to simulate tiling the overdense regions in South that are 80% complete.
- ACTION: Determine what completeness in the redshift survey is actually required, by considering the distribution of targets that are covered in colour and stellar mass parameter space compared to a complete sample, then considering the impact on key science.
- Hector has a fundamental limitation in completeness for low mass galaxies that we cannot get around: Getting completeness in the low mass galaxies for the hector input sample is essentially impossible outside of the GAMA regions because:-
 - The GAMA regions get down to a depth sufficient to detect the low-mass galaxies, but we have no hope of achieving that depth in the Hector 2dF survey because it would take too long.
 - In the GAMA G12,15,23 regions we will have a good complete sample of dwarfs.
 - Elsewhere in the WAVES regions, we would need WAVES because 4HS does not get deep enough (see plot in Ned's talk showing 4HS coloured points and GAMA grey points), but the timeframe for WAVES is such that the only way we could get completeness in our dwarfs selection is in the high density regions where we can observe the 80% of targets already in our catalogue and due to the multi-pass required in the high density regions we can then go back to those regions to complete the dwarfs and other "20%" galaxies once we have the WAVES catalogue.
 - Hector will also have completeness in the foreground dwarf galaxies in the cluster regions.
 - There is nothing further we can do to get completeness in the regions outside of GAMA and the clusters, so we have to live with that and take account of the selection function.
 - In summary the Hector survey will have best completeness for the low mass galaxies in the GAMA and cluster regions and then possibly, if we plan carefully, we may have other high density regions that will have completeness in the dwarfs.