

Posudek práce

předložené na Matematicko-fyzikální fakultě
Univerzity Karlovy

- posudek vedoucího posudek oponenta
 bakalářské práce diplomové práce

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Název práce: Exploring Galaxy Evolution in the Virgo Cluster

Studijní program a obor: Physics, Astronomy and Astrophysics

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Jméno a tituly vedoucího: Dr Rhys Taylor

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Odborná úroveň práce:

- vynikající velmi dobrá průměrná podprůměrná nevyhovující

Věcné chyby:

- téměř žádné vzhledem k rozsahu přiměřený počet méně podstatné četné závažné

Výsledky:

- originální původní i převzaté netriviální kompilace citované z literatury opsané

Rozsah práce:

- veliký standardní dostatečný nedostatečný

Grafická, jazyková a formální úroveň:

- vynikající velmi dobrá průměrná podprůměrná nevyhovující

Tiskové chyby:

- téměř žádné vzhledem k rozsahu a tématu přiměřený počet četné

Celková úroveň práce:

- vynikající velmi dobrá průměrná podprůměrná nevyhovující

Slovní vyjádření, komentáře a připomínky vedoucího:

This thesis presents HI observations of a region in the Virgo cluster from the Wide-field Arecibo Virgo Environment Survey (WAVES), comparing the results with another region examined by the similar Arecibo Galaxy Environment Survey (AGES). As well as the HI sample, it also presents an optically-selected sample from the Sloan Digital Sky Survey (SDSS) and the NASA Extragalactic Database (NED). HI properties of the galaxies are quantified and combined with the SDSS optical data. This gives a very thorough investigation of the data obtained and allows for detailed comparisons with the AGES sample. The procedures used to identify the galaxy samples and obtain the measurements are described in considerable depth. Great care is taken to ensure the accuracy of the data and a myriad of comparisons are made between the AGES and WAVES regions, examining how the gas content and galaxy evolution differ between the two.

The thesis is arranged in a logical sequence which clearly sets out the results in the broader context of Virgo cluster studies. Methodologies used are carefully and reproducibly described while limitations and weaknesses of the available data and techniques are acknowledged, and some possible improvements for future studies are suggested. Full tables of all the quantitative results obtained are presented. Statistical findings are assessed by both visual and numerical comparisons. The conclusions are clearly and concisely set out, and uncertainties and alternative interpretations are discussed. Figures are nicely presented and the appendices of the spectra and contour plots for all galaxies are a valuable addition.

Overall, I summarise the thesis as follows :

Strengths :

- Comprehensive catalogues of all results, providing an excellent basis for future analyses.
- A solid background discussion of the context of gas loss in the Virgo cluster with detailed comparisons to other regions, including why optically dark structures seem more prevalent in the AGES than WAVES region.
- The conclusions give a good summary of the numerous results, while the discussion throughout is careful to note alternative interpretations (for example, most but not all measurements suggest the WAVES region is more evolved than the AGES area). Conclusions are considered from multiple perspectives and are wide-ranging with a good scientific breadth : how gas loss is operating in the different regions of the cluster (based on HI detected fraction as well as deficiency, with deficiency trends considered in a multitude of different ways); how relaxed the cluster environment is (assessed by the velocity distribution, HI deficiency distribution, and prevalence of dark structures); why gas fractions vary between galaxies of different morphologies in the different parts of the cluster.
- The section on stacking is painstakingly detailed, with an exhaustive number of different combinations of spectra considered. Both raw *rms* and physical mass sensitivity are considered, and the methodology demonstrated to be viable, thus making the non-detection an interesting genuine result (if only incremental compared to previous findings).

Weaknesses :

- More discussion on theoretical expectations, especially comparisons with predictions for which galaxies are expected to be currently losing gas, would have been helpful. Similarly while the VCS 9 system is described in detail, more discussion on the unusual gas structures visible in some of the other galaxies would be good as some of these may be potentially important and novel findings.

- Although the uncertainty in distances is likely not something that can currently be improved, more discussion about the impact of this on the results would be valuable – e.g. how much the deficiency results would change for any plausible alternative distances.

Případné otázky při obhajobě a náměty do diskuze:

I don't have a specific question. Some discussion of what further analysis is possible would be useful : how else the data can be processed to assess the conclusions, what other multi-wavelength data might be available to contribute to the findings.

Práci

doporučuji

nedoporučuji

uznat jako diplomovou.

Navrhuji hodnocení stupněm:

výborně velmi dobře dobře neprospěl/a

Místo, datum a podpis vedoucího/oponenta: Praha, 03/06/2025