

Investigating Some Key Parameters Influencing Star Formation Rate Indicators in Spiral Galaxies:

An Analysis Based on H-ATLAS DR1 Data
Boitumelo Gaolape, Dr Rhodri Evans

Botswana International University of Science and Technology

Introduction

Understanding Star Formation in Galaxies:

- Fundamental to unravelling the mysteries of galaxy evolution.
- Spiral galaxies provide an ideal setting due to diverse morphologies and ongoing stellar birth.
- Focus on star formation rates (SFRs) in 853 spiral galaxies.

Methods

- Utilize CIGALE Spectral Energy Distribution fitting model.

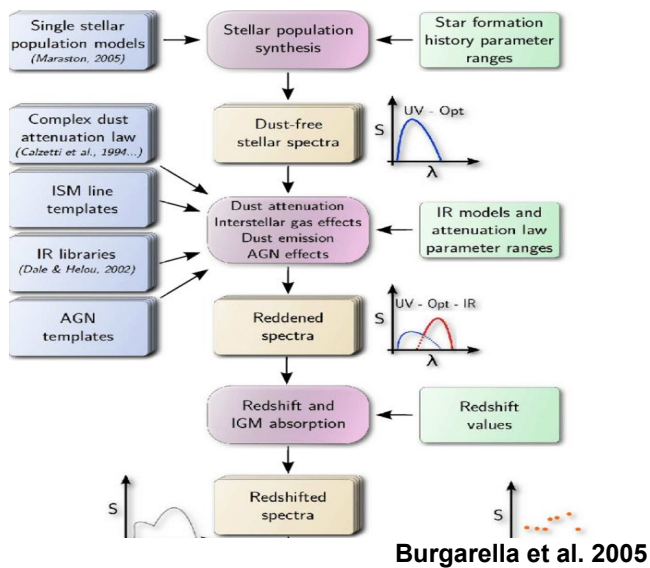


Figure 1: CIGALE operation workflow

Results and Analysis

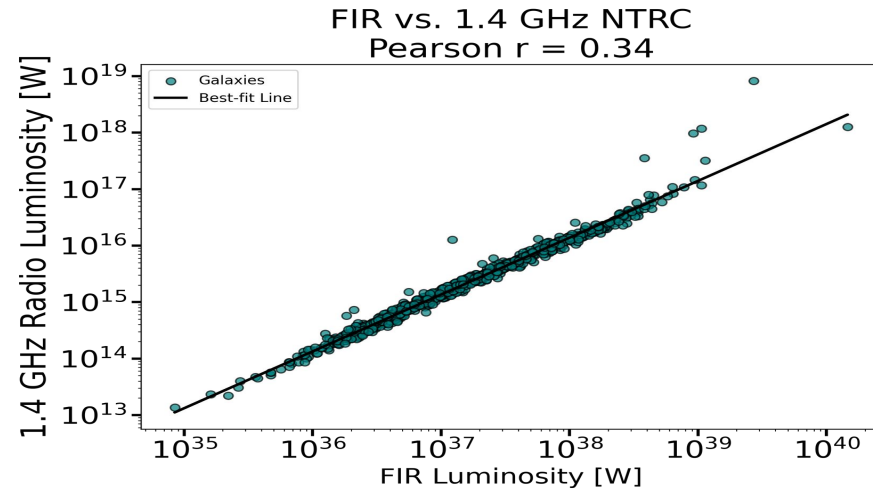


Figure 2 shows a positive, approximately linear correlation between FIR and 1.4 GHz radio continuum luminosities for the 852 galaxies, consistent with previous studies ($r = 0.34$)

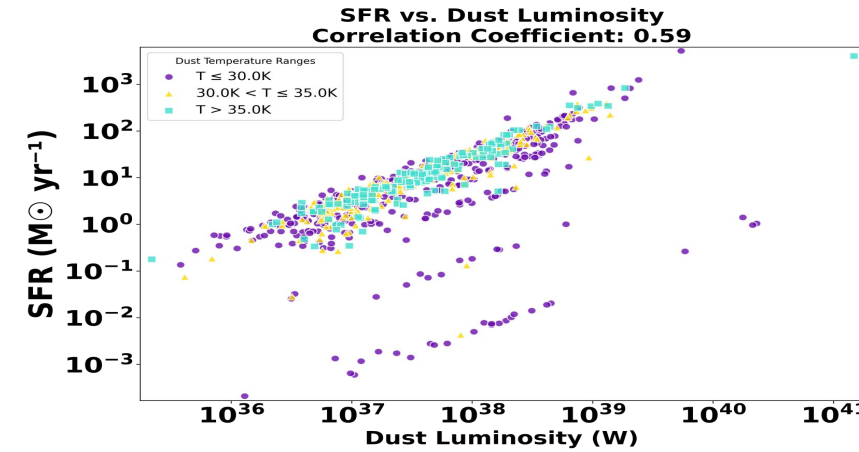


Figure 3 shows that for 852 galaxies, SFR correlates with dust luminosity but exhibits a depressed trend around LDIR $\sim 10^{40} L_{\odot}$, possibly indicating dust property variations or AGN contamination.

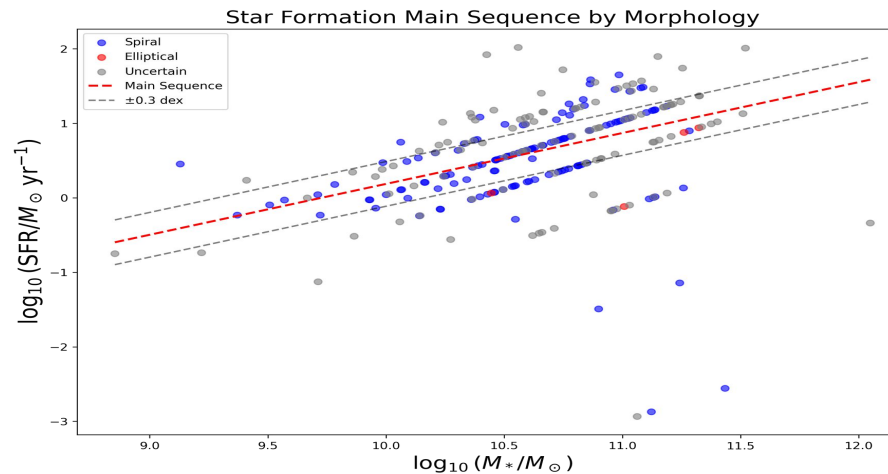


Figure 4: Distribution of recent SFR versus stellar mass for the 249 visually morphologically classified galaxies in our sample from Galaxy Zoo

Research Goals

- To investigate the accuracy and correlation of three widely-used star formation rate (SFR) indicators in galaxies, namely, UV emission, total far-infrared (FIR) emission, and non-thermal radio continuum (NTRC) at 1.4 GHz

Conclusion

- FIR emission captures dust-reprocessed light from obscured star formation, and UV emission reveals unobscured star-forming activity
- The radio synchrotron serves as a dust-unbiased SFR indicator due to its extinction resilience
- Fig 3. Galaxies with higher dust temp all have higher SFR, whereas the galaxies with lower dust temp show a range of SFRs
- Fig 4. Most galaxies are spirals showing a range of SF. They fall into distinct sfr bands.
- There is a trend that galaxies with high stellar mass show a higher SFR, and the high SFR falls into distinct bands