STAR FORMATION RATE CORRELATION WITH THE MASS OF GALAXIES AND THEIR METALLICITY

The research posters pertain to a study on the correlation between the star formation rate (SFR) and the mass and metallicity of galaxies.

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ABSTRACT

This research study explores the relationship between the star formation rate (SFR) and the mass of galaxies, as well as their metallicity. The study utilizes data from the Sloan Digital Sky Survey Data Release 7 (SDSS DR7) to conduct the analysis. The research finds that there is a positive correlation between the SFR and the mass of galaxies, which supports previous studies on the topic. Furthermore, the study also reveals a negative correlation between the SFR and metallicity, which suggests that metallicity plays a role in regulating star formation. Overall, the findings of this research provide further evidence of the intricate relationship between galaxy properties and star formation, which is essential for understanding the evolution of galaxies over time.

METHOD

The research method involved the collection and analysis of data from the Sloan Digital Sky Survey Data Release 7 (SDSS DR7). The data contained information on the star formation rate (SFR), mass, and metallicity of galaxies. The following steps were taken to analyze the data:

1. Data Collection: The data was obtained from the SDSS DR7 database, which is publicly available. The data was downloaded in the form of FITS files and imported into Python using the Astropy package.

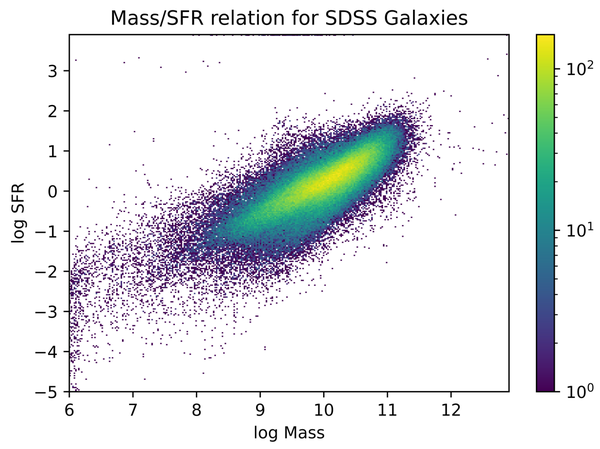
2. Data Preparation: The data contained several flags, which needed to be addressed before analysis. The flags were removed, and the data was cleaned to ensure that only reliable values were included in the analysis.

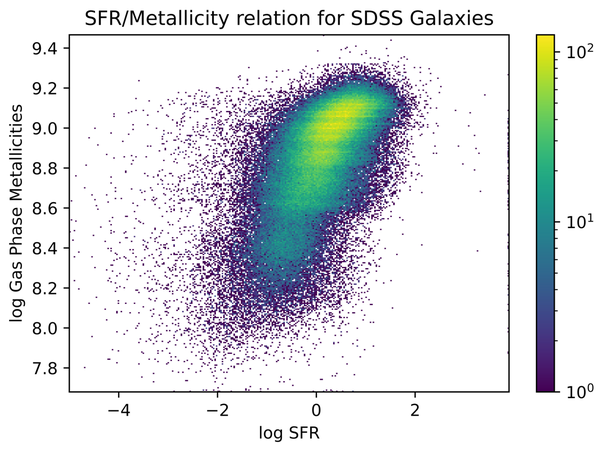
3. Analysis: The SFR, mass, and metallicity of galaxies were analyzed using Astropy. The data was analyzed twice, first by making restrictions on the whole array and second by slicing the specific needed array value for analysis. The analysis involved calculating the correlation between the SFR and the mass of galaxies, as well as their metallicity.

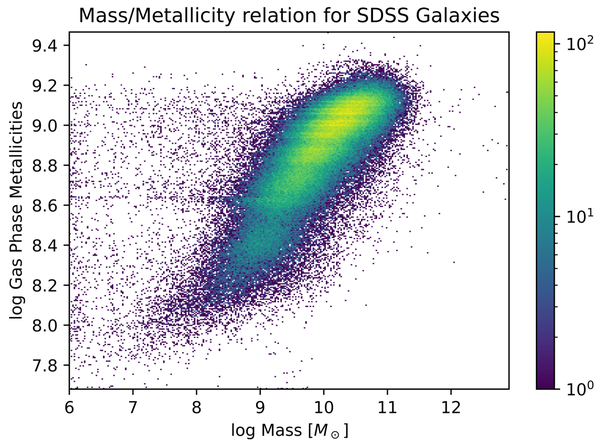
4. Visualization: The results of the analysis were visualized using Python's Matplotlib library. The correlations were plotted on graphs to help interpret the results.

RESULTS

First observation with flags:







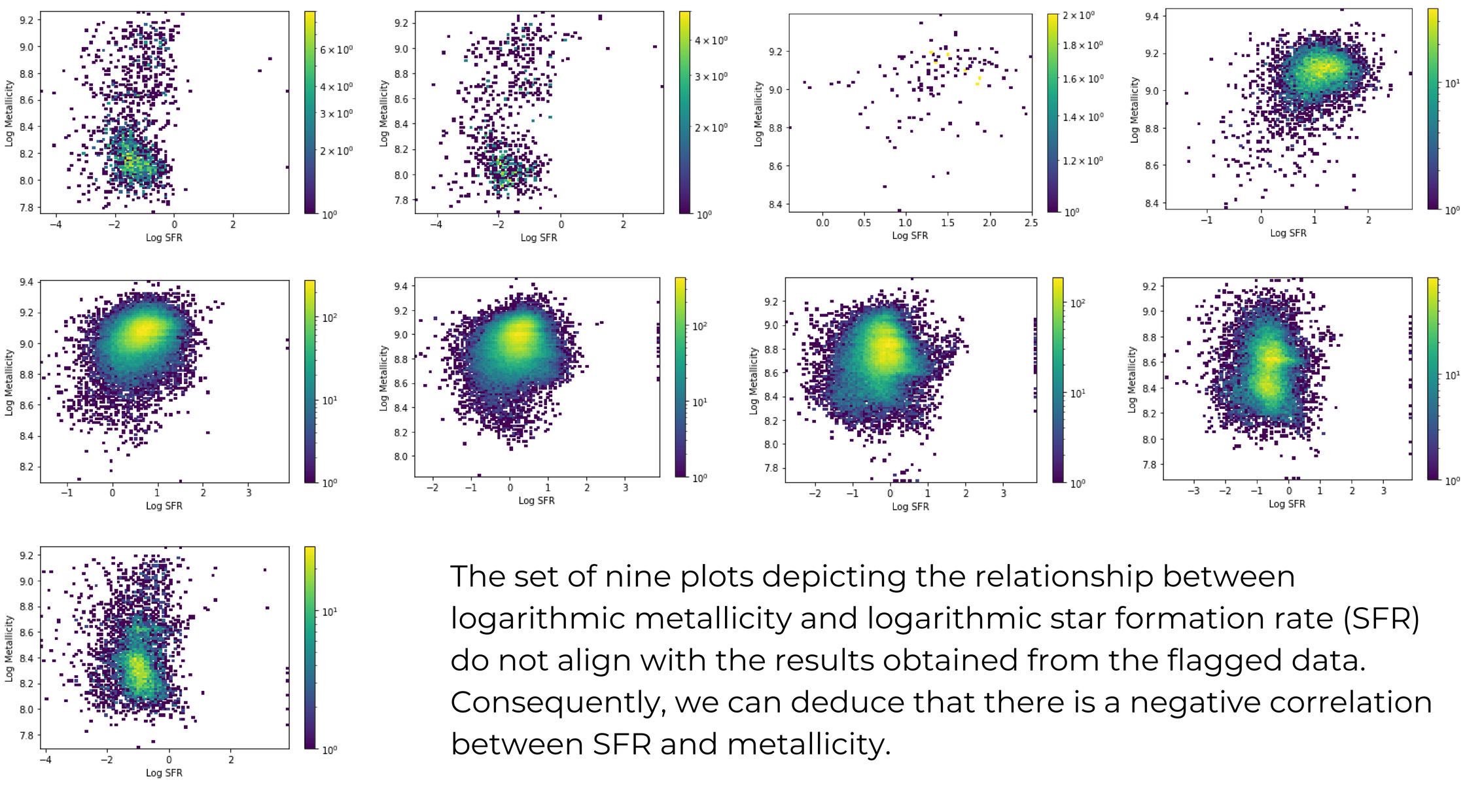
This plot displays the logarithmic relationship between the star formation rate (SFR) and the mass of galaxies. The data shows a positive correlation, indicating that as the mass of galaxies increases, so does the star formation rate. This suggests that there is a relationship between the amount of matter in a galaxy and the rate at which it forms new stars. The logarithmic scale used on the x and y axes means that the increase in SFR is proportional to the increase in galaxy mass raised to a power, reflecting the non-linear relationship between these two variables. Overall, the plot suggests that the growth of galaxies and the formation of stars are closely connected.

My research findings demonstrate a comparable positive correlation between galaxy metallicity and star formation rate, as well as between galaxy mass and metallicity, as observed in the other two plots. However, my analysis revealed issues with the flagged data that could compromise the accuracy of our results. Therefore, we relied on the results obtained from the non-flagged data to ensure the reliability of our conclusions. .

RESULTS

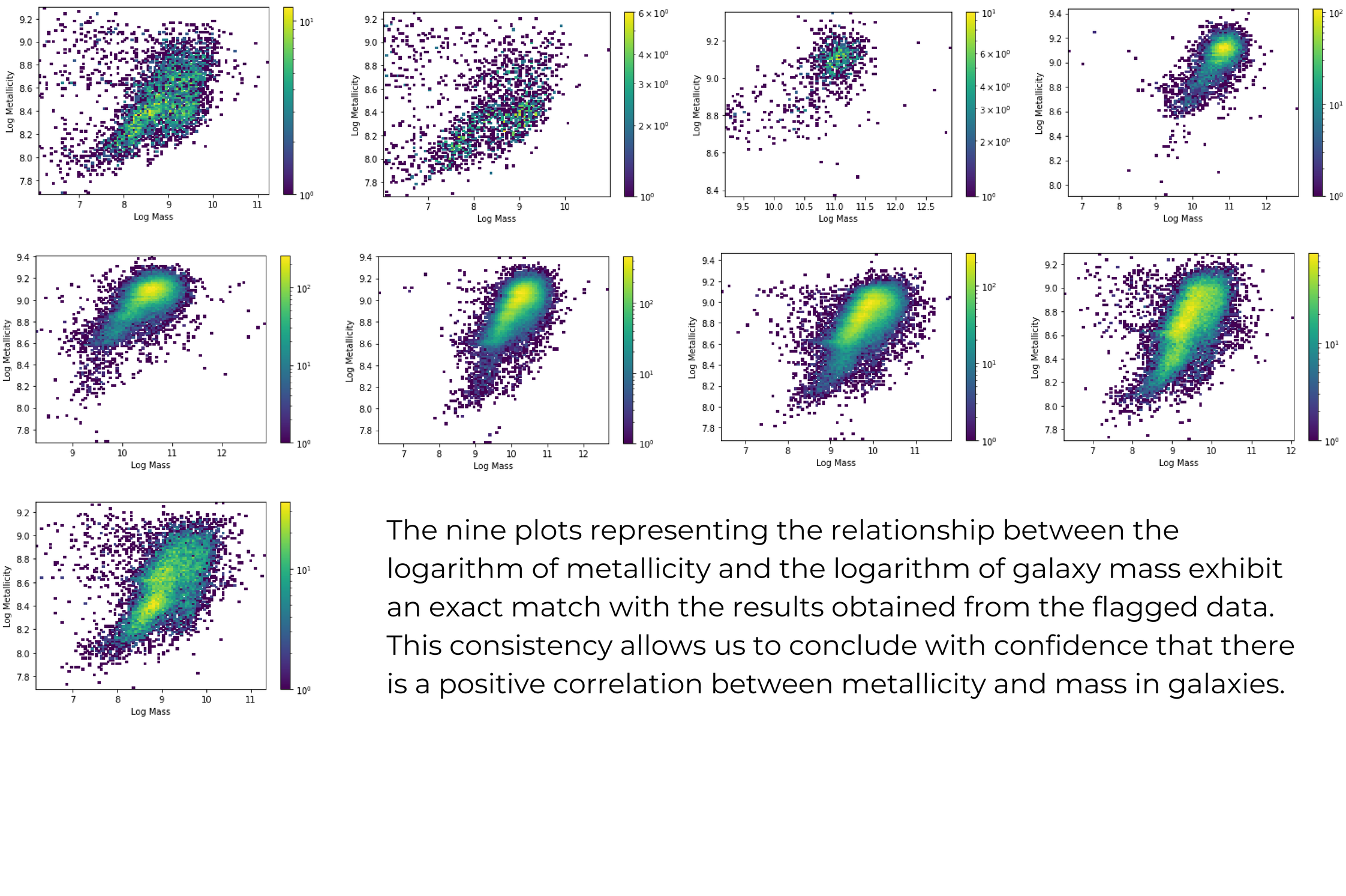
Second observation without flags:

Metallicity vs SFR (Unflagged)



The set of nine plots depicting the relationship between logarithmic metallicity and logarithmic star formation rate (SFR) do not align with the results obtained from the flagged data. Consequently, we can deduce that there is a negative correlation between SFR and metallicity.

Metallicity vs Mass (Unflagged)

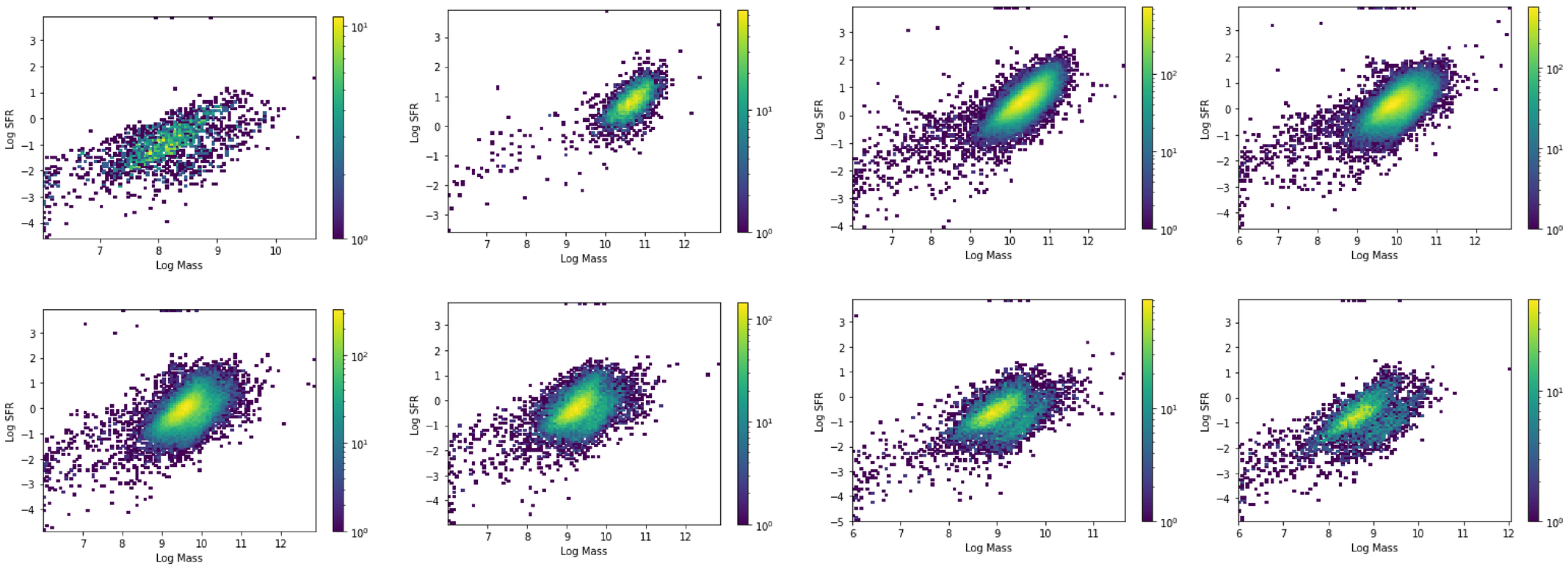


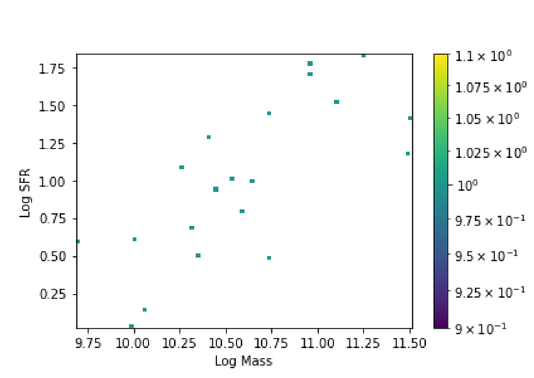
The nine plots representing the relationship between the logarithm of metallicity and the logarithm of galaxy mass exhibit an exact match with the results obtained from the flagged data. This consistency allows us to conclude with confidence that there is a positive correlation between metallicity and mass in galaxies.

RESULTS

Second observation without flags:

SFR and Mass of galaxies (Unflagged)





The above nine plots depicting the relationship between the logarithm of star formation rate (SFR) and the logarithm of galaxy mass yielded results that were consistent with those obtained from the flagged data. Our analysis confirmed a positive correlation between SFR and galaxy mass, leading us to conclude that the rate of star formation increases with increasing galaxy mass.

CONCLUSION

In conclusion, my research explored the relationship between the star formation rate (SFR), metallicity, and mass of galaxies. My analysis revealed a positive correlation between SFR and the mass of galaxies, indicating that larger galaxies have higher rates of star formation. Additionally, I observed a positive correlation between galaxy mass and metallicity, suggesting that more massive galaxies have higher metallicity. However, I also found a negative correlation between SFR and metallicity, indicating that galaxies with high metallicity have lower rates of star formation. These results suggest that the processes governing star formation and chemical evolution in galaxies are complex and interrelated, and further research is necessary to fully understand these relationships.

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