Summary: Diagnosing the interstellar medium of galaxies with far-infrared emission lines (Section2. Methodology)

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EAGLE comprise a number of hidrodynamical simulations. In this work are used three of them: Ref-L0025N0376, Ref-L0100N1504, and Recal-L0025N0752. This in order to achieve variety in terms of resolution and box-sizes allowing to compare the results in each case. The physical parameters of the sub-grid routines are calibrated to approximately match with the observed galaxy stellar mass functions at local universe.

The EAGLE galaxies' sample is made similarly to [1] focusing on central galaxies, to avoid environmental influence on morphology and kinematics, with at least 300 star particles within 30 pkpc from the center of the potential. The total of galaxies used for each simulation are: 415 for RECAL-L0025N0752, 202 for REF-L0025N0376 and 5000 for REF-L0100N1504. It is used the gas and star particles data to calculate the physical properties that are needed. The background interstellar radiation field (ISRF) is calculated using the star formation rate (SFR) surface density. Using these and the ISRF coming form the local stars, for wich it is used the **starburt99** model it is calculated the total ISRF. With the ISRF and the neutral gas mass it is created the neutral cloud structures inside galaxies. The ionised gas mass is used to create the diffuse ionised gas (DIG). Calibrating the $[N_{II}]$ DIG lines it is calculated the luminosity of $[C_{II}]$ line for each IMS phase en therefore the total $[C_{II}]$ luminosity by combining these three.

References

[1] Adrien CR Thob, Robert A Crain, Ian G McCarthy, Matthieu Schaller, Claudia DP Lagos, Joop Schaye, Geert Jan J Talens, Philip A James, Tom Theuns, and Richard G Bower. The relationship between the morphology and kinematics of galaxies and its dependence on dark matter halo structure in eagle. *Monthly Notices of the Royal Astronomical Society*, 485(1):972–987, 2019.