Titre : IR characteristic emission and dust properties of star-forming galaxies at 4.5 < z < 6.2

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Résumé : The luminosity functions at z < 4 - 5 suggest that most galaxies have a relatively low stellar mass (logM_star = 10) and a low dust attenuation (A_FUV = 1.0). The physical properties of these objects are quite homogeneous. We used an approach where we combined their rest-frame far-infrared and submillimeter emissions and utilized the universe and the redshift as a spectrograph to increase the amount of information in a collective way.

From a subsample of 27 ALMA-detected galaxies at z > 4.5, we built an infrared spectral energy distribution composite template. It was used to fit, with CIGALE, the 105 galaxies (detections and upper limits) in the sample from the FUV to the FIR.

The derived physical parameters provide information to decipher the nature of the dust cycle and of the stellar populations in these galaxies. The derived IR composite template is consistent with the galaxies in the studied sample. A delayed star formation history with tau_main = 500 Myrs is slightly favored by the statistical analysis as compared to a delayed with a final burst or a continuous star formation history. The position of the sample in the star formation rate (SFR)- M_star diagram is consistent with previous papers. The redshift evolution of the log M_star versus A_FUV relation is in agreement with evolution in the redshift of this relation. This evolution is necessary to explain the cosmic evolution of the average dust attenuation of galaxies. Evolution is also observed in the L_dust/ L_FUV (IRX) versus UV slope beta_FUV diagram: younger galaxies have bluer beta_FUV. We modeled the shift of galaxies in the IRX versus the beta_FUV diagram with the mass-weighted age as a free parameter, and we provide an equation to make predictions.

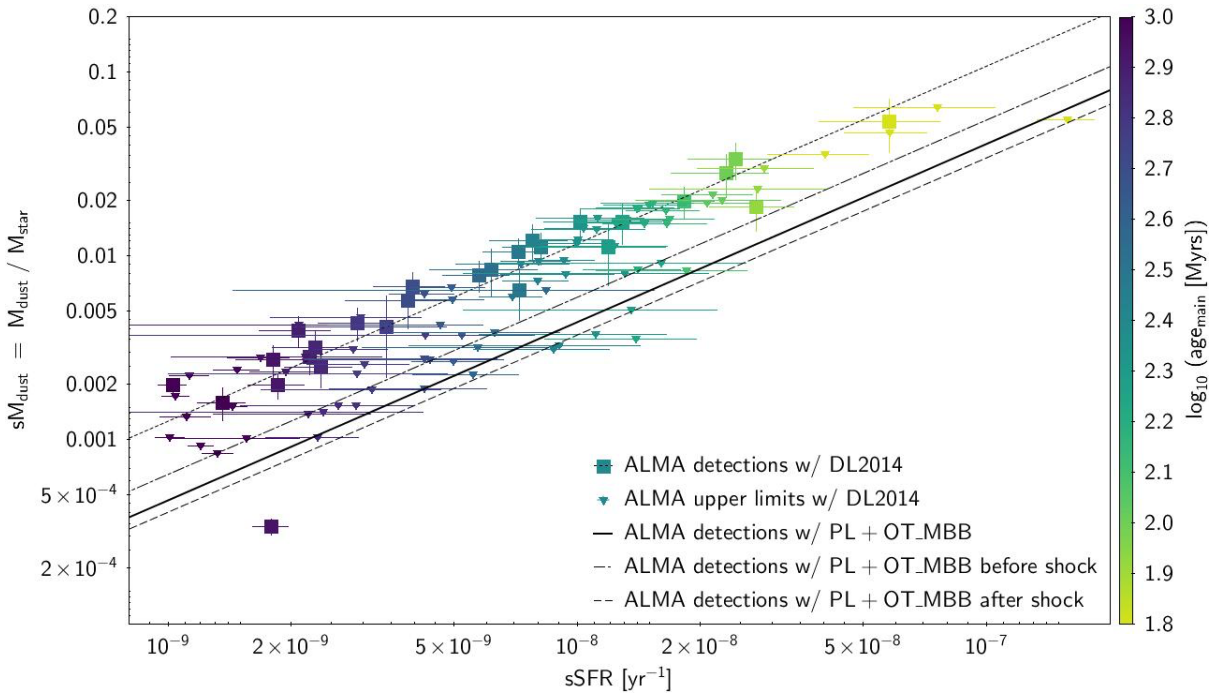

Figure 1 : Evolution of the specific dust mass with the age of the stellar population for a sample of 105 ALPINE galaxies observed with ALMA.