The predicted colours of galaxies

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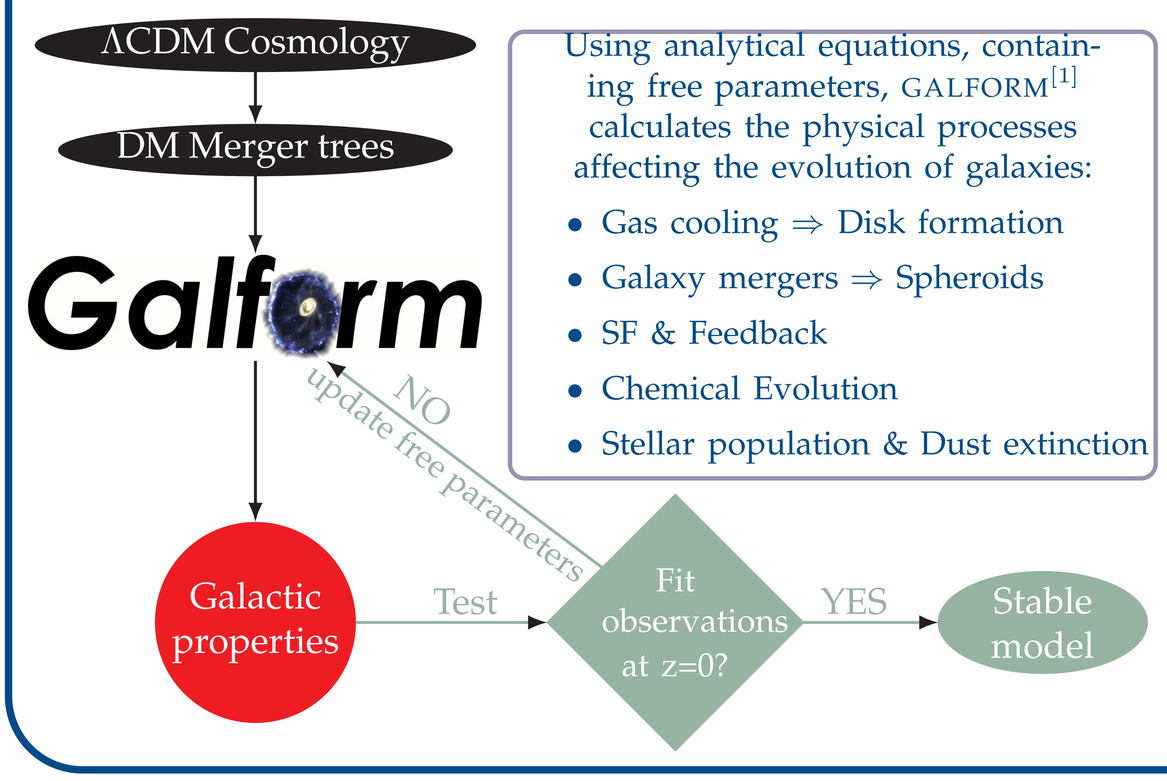
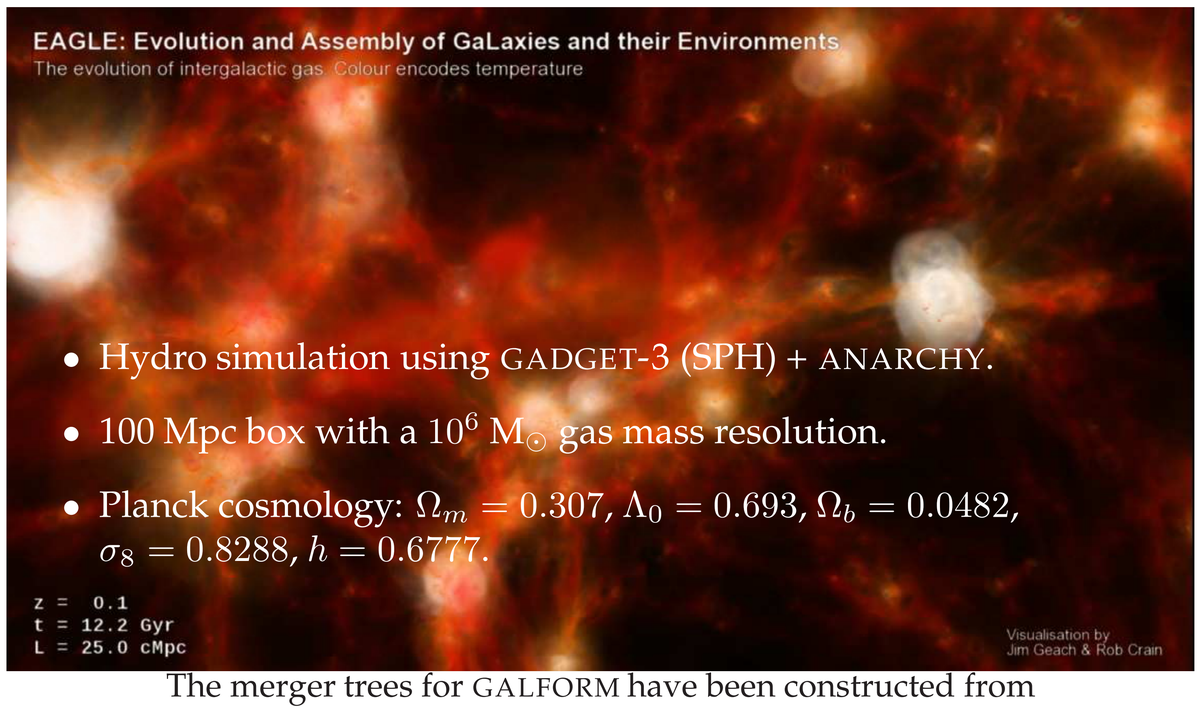
The semi-analytical approach: Because galaxies are not only shaped by gravity



Using analytical equations, containing free parameters, GALFORM[1] calculates the physical processes affecting the evolution of galaxies:

- Gas cooling ⇒ Disk formation
- Galaxy mergers ⇒ Spheroids
- SF & Feedback
- Chemical Evolution
- Stellar population & Dust extinction

Dark matter merger trees from EAGLE[2]



- Hydro simulation using GADGET-3 (SPH) + ANARCHY.
- 100 Mpc box with a 10^6 $M_\odot$ gas mass resolution.
- Planck cosmology: $\Omega_m = 0.307$, $\Lambda_0 = 0.693$, $\Omega_b = 0.0482$, $\sigma_8 = 0.8288$, $h = 0.6777$.

The merger trees for GALFORM have been constructed from the EAGLE Dark Matter only simulation.

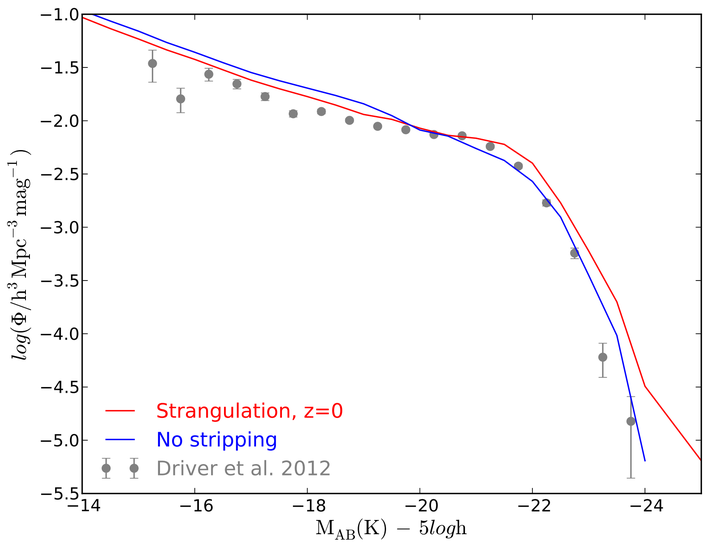
The flavour of GALFORM used for this study has a gradual stripping of the hot gas of satellite galaxies[3]

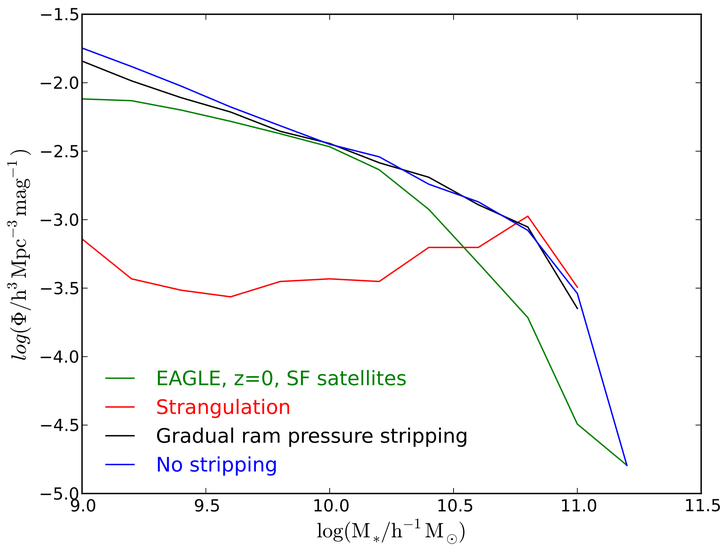
Our starting point is a previously published model[4], which includes:

- A star formation law that follows the atomic & molecular gas.
- Bursts of star formation that can be triggered by both mergers & disk instabilities.
- Star formation quenching by: Photoionisation, SNe & AGN feedback.
- A self consistent calculation for the dust attenuation, using a realistic distribution of the dust.

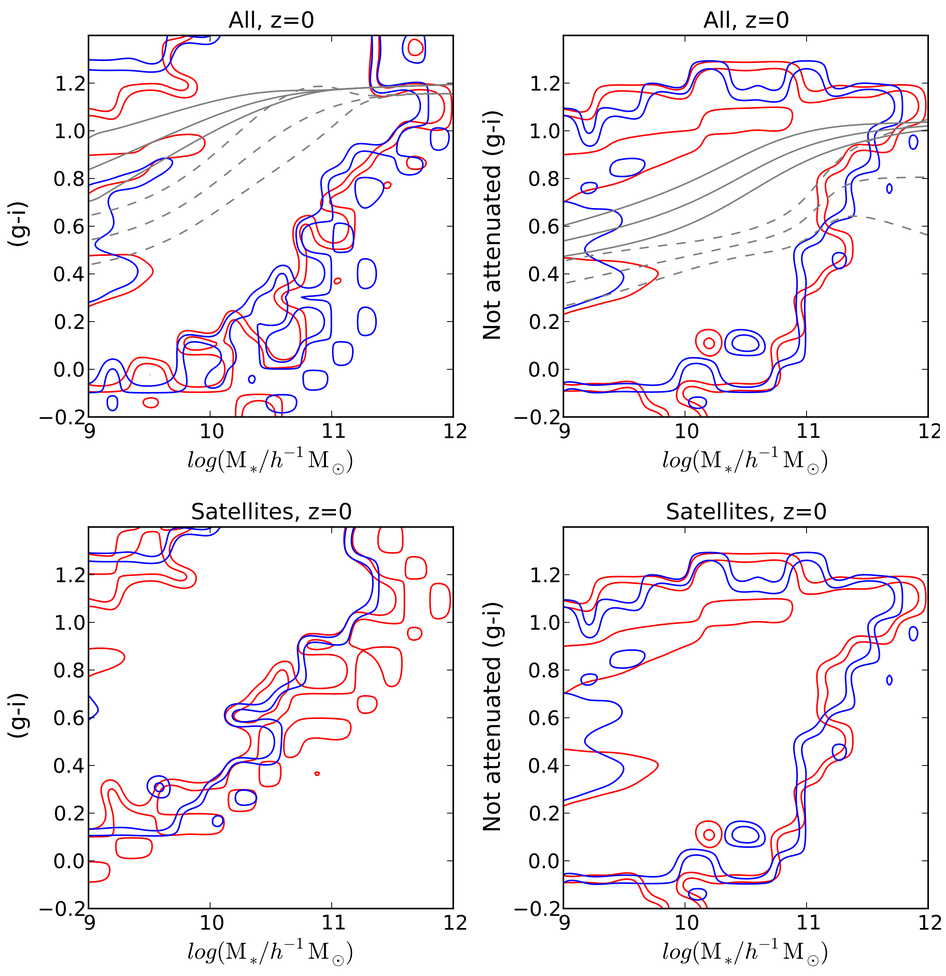
For this work, besides changing the cosmology to Planck, we also adopted a universal Chabrier IMF, as it was done for the EAGLE simulation.

The free parameters were tuned to reproduce the observed bJ and K-band luminosity functions at z=0 and to give a reasonable evolution in V-band. By default GALFORM assumes strangulation, i.e. that all the hot gas of satellite galaxies is stripped instantaneously when they enter their host halo. When comparing to galaxies from the EAGLE simulation we find a good agreement in both the total SMF and in the median sSFR for the star forming sequence, however:

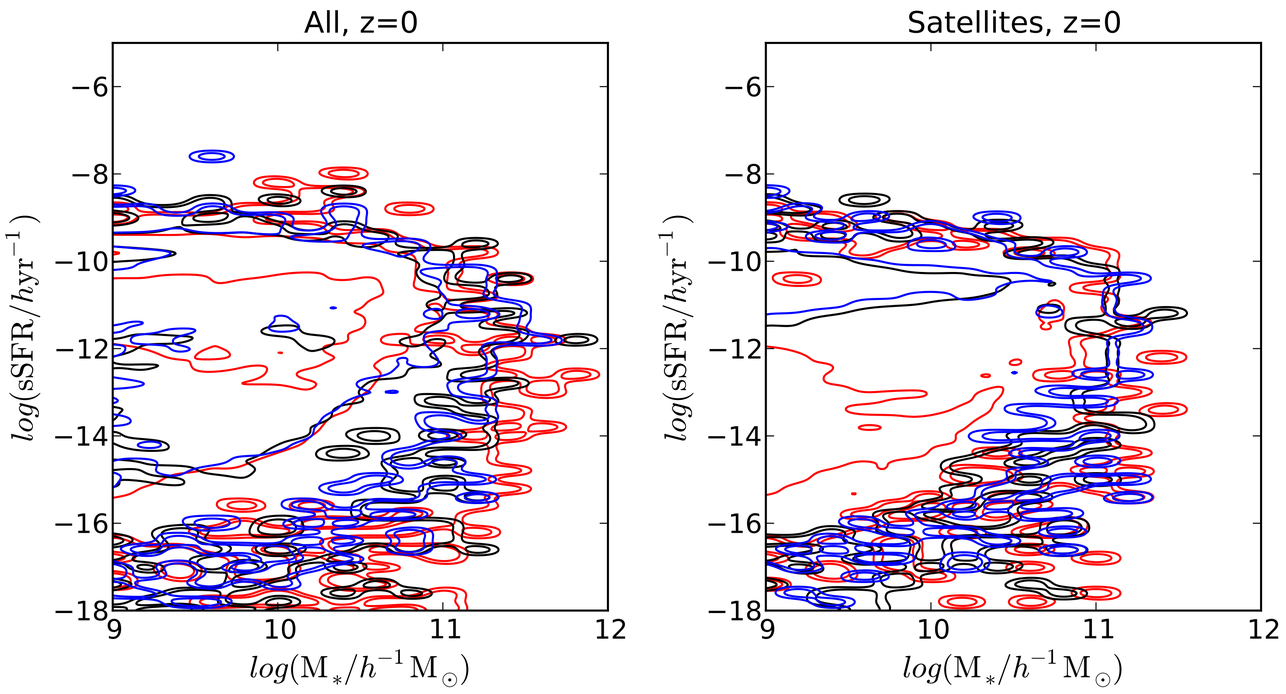




The predicted colours of galaxies in a Planck cosmology



The colours of the contour lines correspond to the same models as above. The grey lines show the region where GAMA galaxies are observed[5].



These initial results show the impact that the stripping of hot gas has on both the predicted colour and sSFR of galaxies. Further work is ongoing for exploring other stripping mechanisms and other modelled physical processes affecting the colours of galaxies.

References

[1] Cole et al., 2000, MNRAS, 319, 168. [2] Schaye et al. 2014, arXiv:1407.7040. [3] Font et al. 2008, MNRAS, 389, 1619. [4] Gonzalez-Perez et al., 2014, MNRAS, 439, 264. [5] Taylor et al., 2014, arXiv:1408.5984.

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