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THE GALMER DATABASE: MODELING COLORS AND SPECTRA

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Abstract. The GalMer database is a library of thousands of simulations of galaxy interactions and mergers. We followed the evolution of the baryonic (gas and stars) and dark matter components through a Tree-SPH code (Semelin & Combes, 2002), including star formation recipes and metal enrichment. Different galaxy morphologies, mass ratios and orbital parameters are simulated, in order to study statistically the main physical processes related to galaxy encounters (see Di Matteo *et al*, 2007; Di Matteo *et al*, 2008a, 2008b). All the simulations are available at the web address *http://galmer.obspm.fr*, together with the tools for the on-the-fly analysis. Here we present some applications of this database.

1 Broadband photometric colors and spectra

We developed a technique to model spectrophotometric properties of interacting galaxies using results of GalMer simulations to trace kinematics, star formation and chemical enrichment history. Spectra, broadband photometric colors, and luminosity-weighted line-of-sight velocities are modeled by using PEGASE.HR (Le Borgne *et al*, 2004) and PEGASE.2 (Fioc & Rocca-Volmerange, 1999).
We pre-compute only once a grid of simple stellar populations (SSPs) corresponding to a given IMF (Miller & Scalo, 1979 in our case) and the grid of ages and metallicities, and we then apply it to all the particles. For each spatial bin, the dust extinction associated to each gas particle is computed using column density (to get AV) and the prescription of Fitzpatrick (1999) (to get the wavelength dependence). It is then applied to the total spectral energy distribution computed along the line of sight (excluding the current particle). This is done by co-adding the pre-computed SSPs from the grid mentioned above with the weights corresponding to a contribution of each age and metallicity contained in the SFH (star formation history) and CEH (chemical enrichment history). The dust extinction is then derived from the column density of gas, assuming a Galactic ratio and using the prescription of Fitzpatrick (1999), and applied to the total spectrum or SED as it was computed at the previous step. Then the total spectrum of the current particle is blue- or redshifted according to its radial velocity.
Figs. 1 and 2 show the resulting photometric colors and optical spectra for a simulated Sa galaxy, evolving isolated.

References

Di Matteo, P., Combes, F., Melchior, A.-L., & Semelin, B. 2007, A&A, 468, 61

Di Matteo, P., Combes, F., Melchior, A.-L., & Semelin, B. 2008a, A&A, 477, 437

Di Matteo, P., Bournaud, F., Martig, M., Combes, F., Melchior, A.-L., & Semelin, B. 2008b, A&A accepted, astro-ph/0809.2592

Fioc, M. & Rocca-Volmerange, B. 1999, A&A, 344, 393

Fitzpatrick, E.L. 1999, PASP, 111, 63

Le Borgne, D., Rocca-Volmerange, B., Prugniel, P., Lançon, A.,Fioc, M., & Soubiran, C. 2004, A&A, 425, 881

Miller, G. E. & Scalo, J. M. 1979, ApJS, 41, 513

Semelin, B. & Combes, F. 2002, A&A, 388, 826

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Fig. 1. Photometric colors of an Sa galaxy, evolved isolated, 500 Myr after the beginning of the simulation. Three different line-of-sights are shown, corresponding to an edge-on view (left image), an inclination of 30 deg (central image) and a face-on view (right image). Color composition is as follows: B=g', G=r', R=z'.

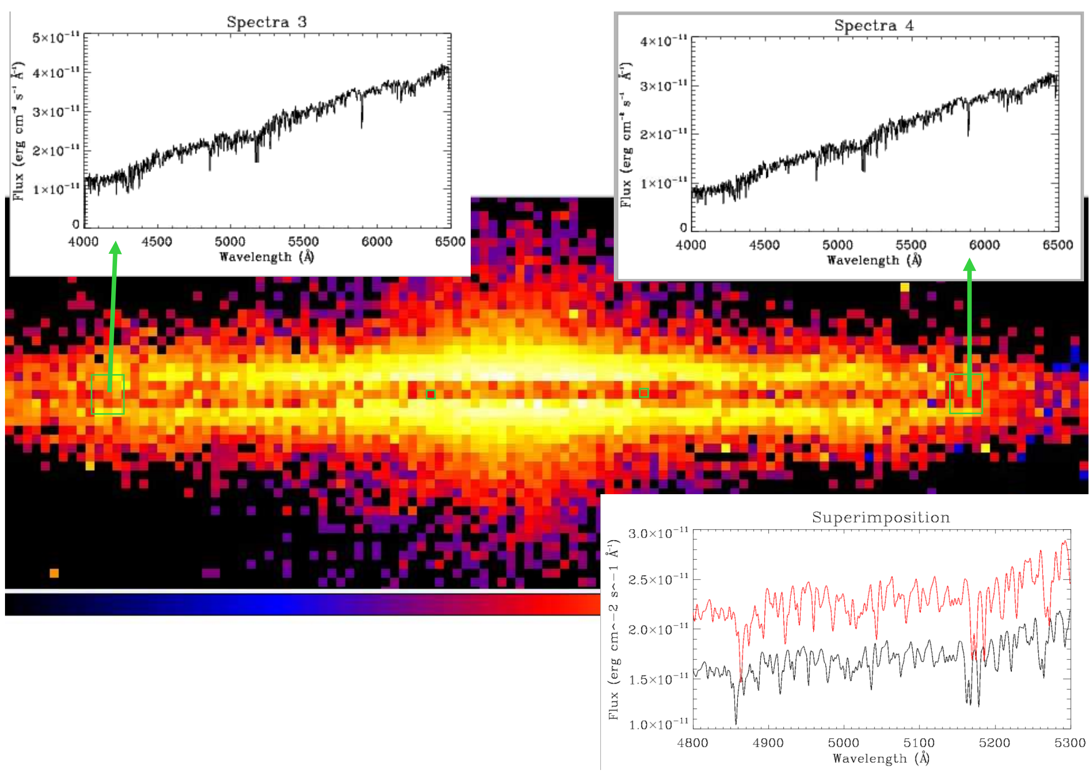

Fig. 2. Spectra of an Sa galaxy, evolved isolated 550 Myr after the beginning of the simulation. The spectra correspond to regions located about 12 kpc away from the galaxy center and to a 1 kpc × 1 kpc area. The underlying galaxy image is in B-band. The panel on the bottom right shows a comparison of the two spectra, revealing the rotation of the galaxy disk (blue and redshift).