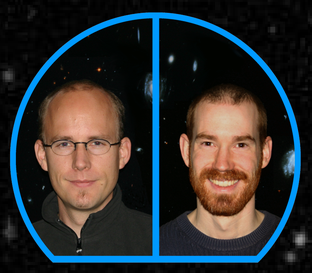

FERENGI: Full and Efficient Redshifting of Ensembles of Nearby Galaxy Images

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0 executive summary

We present a code that simulates the appearance of galaxies at z=0.3...1.1 as observed with the HST, using local SDSS images as input. It creates realistic images taking all cosmological size, dimming and bandpass shifting into account, as well as PSF and S/N change. The FERENGI code and ~100 galaxy images simulating GEMS/COSMOS single orbit HST/ACS observations are made publically available from http://www.mpia.de/COSMOS/ferengi

1 aim & background

Ground- and space-based galaxy evolution projects as GEMS (Rix et al. 2004) or COSMOS (Scoville et al.) need to describe galaxies with simple parameters (magnitude, shape, structure) to quantify evolution. Two problems arise:

- Automated programs (CAS, GALFIT, but also "eyeballing"), are sensitive to the signal-to-noise ratio, and thus to redshift ("depth ***K***-correction").
- At different redshifts, different spectral and morphological ***K***-corrections have to be considered.

As a solution we developed a code creating realistic galaxy images at redshifts 0.1<z<1.1, matching the resolution, depth and bandpass of any (HST) survey, using local multi-band galaxy images drawn from SDSS. The output images can be used to calibrate galaxy fitting routines as a function of redshift, and to evaluate the strength of spectral and morphological ***K***-corrections for a given data set.

With its aims and sample size this work goes far beyond existing studies (Giavalisco et al. 1996, Bouwens et al. 1998, Kuchinsky et al. 2001, Burgarella et al. 2001).

2 input & redshifting

- Input: SDSS images in ***u, g, r, i, z*** bands; galaxies cz<7000 km/s
- Cosmological change: angular size, surface brightness dimming
- ***K***-correction by interpolation between bands with templates (using ***k_correct*** by Blanton et al.)
- PSF transformation between SDSS and target instrument/filter
- Noise properties matched to specific surveys: currently GEMS (HST/ACS F606W+F850LP), COSMOS (HST/ACS F814W)
- Placed on real data empty sky background
- Output: One image for each target redshift (0.1<z<1.1)

3 redshifting results

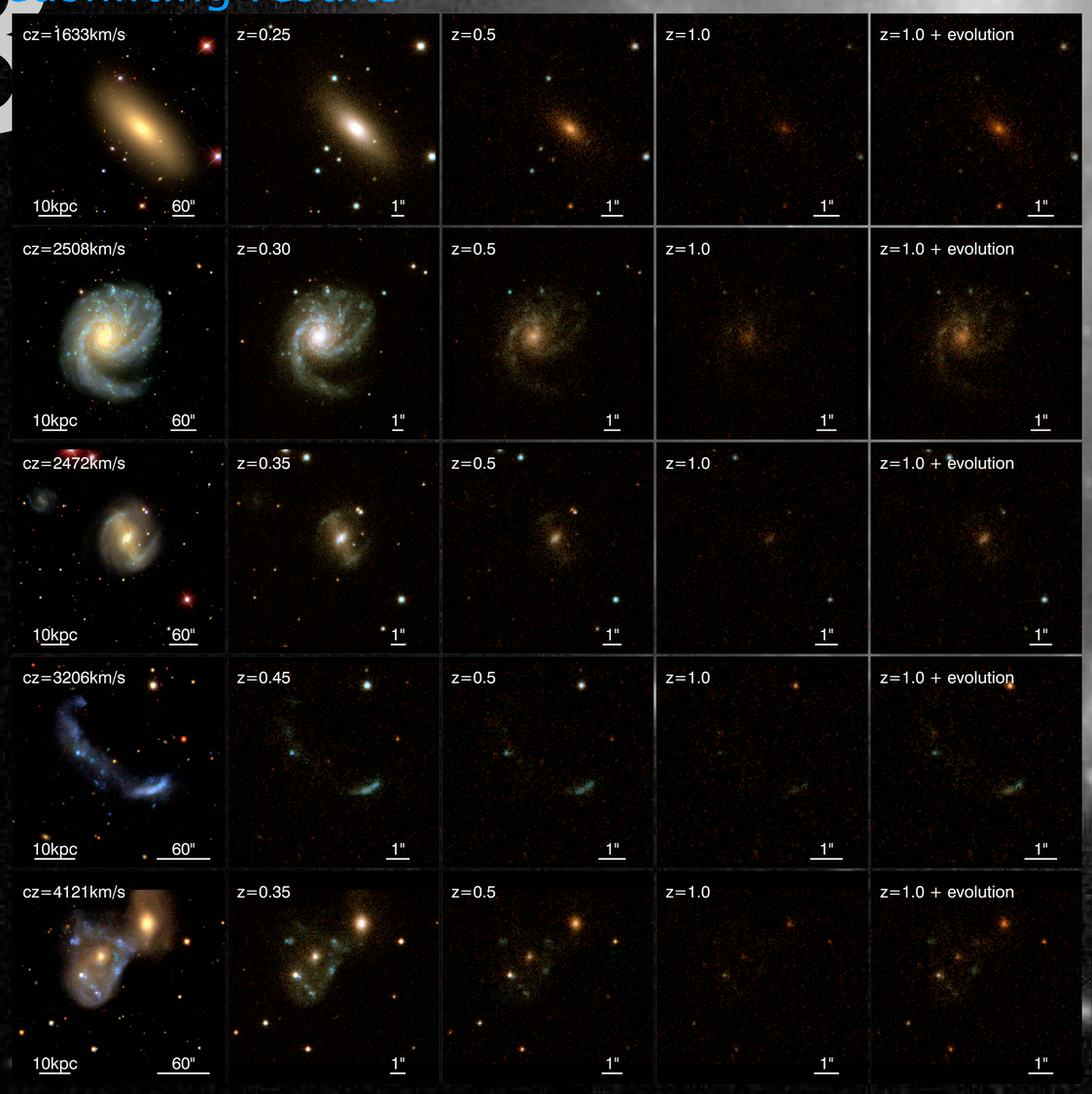

Fig. 1: Five SDSS galaxies placed at z=local, ~0.3, 0.5, and 1.0 (without and with 1 mag evolution) matched to COSMOS F814W filter (HST/ACS) and depth. Images have identical scale to show S/N and resolution degradation.

4 conclusions

When determining structural parameters of galaxies these have to be calibrated against the influence of evolution and morphological and spectral ***K***-correction in order not to bias evolution estimates.

We currently created a sample of ~100 galaxies for first application as calibrators, and aim at creating a complete sample of 3,000 galaxies in the near future, spanning the whole morphological parameter space of (local) galaxies for direct science. Applications include:

- Test whether at earlier times the variety of morphologies is different from today.
- Creation of model host galaxies of type 1 QSO by including a point source in the center – needed to estimate the morphologies of QSO hosts at higher redshifts.
- If UV bands are included, simulated galaxies can be produced out to higher redshifts – only minor changes are required to implement this in our code.

We are releasing the initial sample of ~100 galaxies mimicking the single-orbit HST/ACS images of the GEMS and COSMOS projects and redshifted to 0.1<z<1.1 as well as the code soon. The complete sample of 3,000 galaxies will follow later. A paper is submitted to ApJ (Barden, Jahnke & Häußler). Please refer to the project website for all release information: http://www.mpia.de/COSMOS/ferengi

references

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- Bouwens et al. 1998, ApJ, 506, 557
- Burgarella et al. 2001, A&A, 369, 421
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