

JSP for Weak Lensing

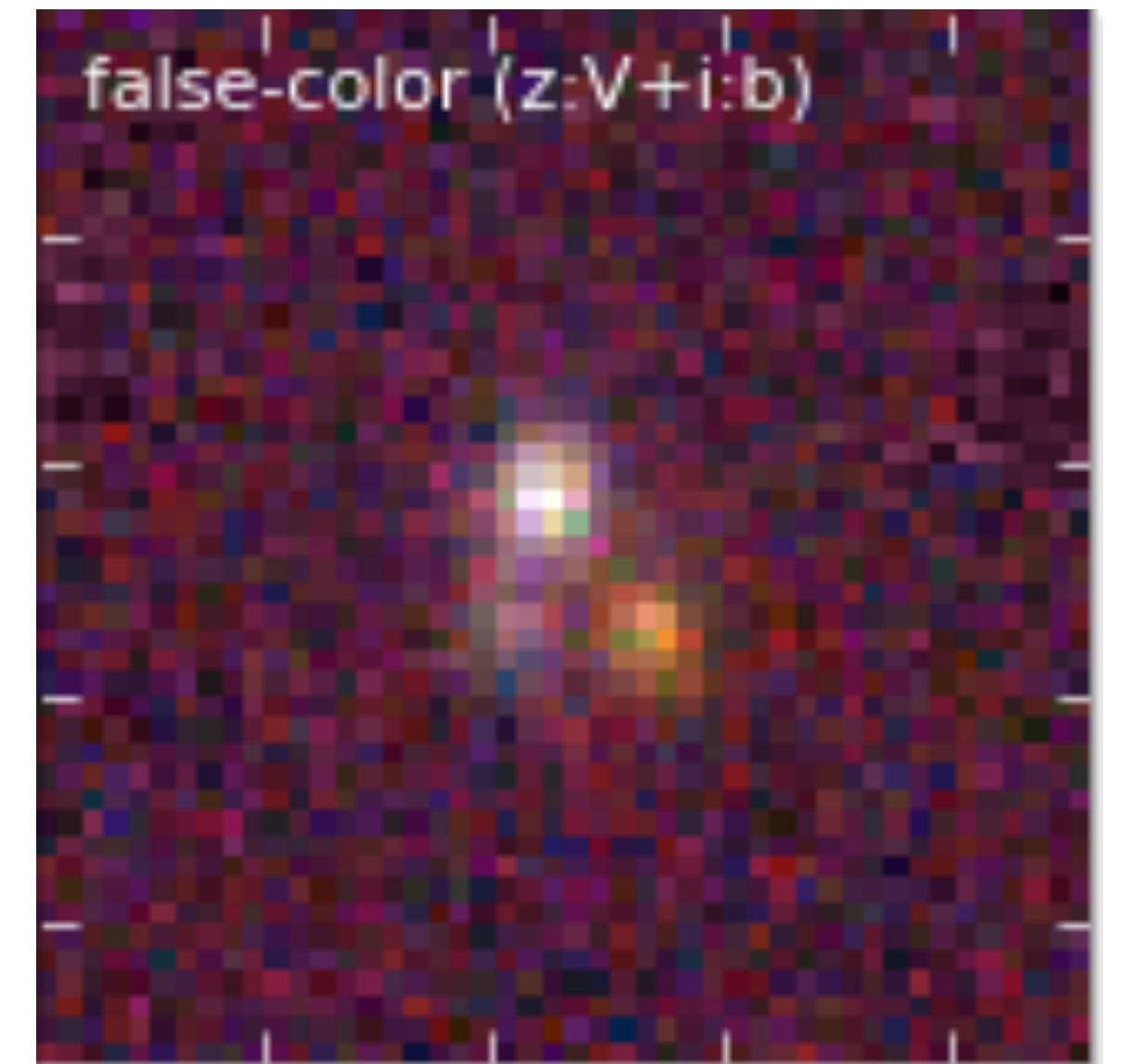
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Weak lensing requirements

- Photometry for photo-z, clustering
- Ellipticities for shear, sizes for convergence
- Cosmological constraints: $\sigma(w_0) \lesssim 0.1$; $\sigma(w_a) \approx 0.2$; $\sigma\left(\sum m_\nu\right) \lesssim 0.02 \text{ eV}$
- Additional tests: Structure Formation; Modified Gravity
- Bias requirements: $m \approx 10^{-3}$; $\Delta z \approx 10^{-3}(1+z)$



Weak lensing simplifications

- No temporal information needed: coadds of the static universe suffice
- Photo-z: Aperture/model does not need total fluxes, just consistent colors
- Shapes: Statistical estimation, i.e only mean relation to shear has to be right
- (Meta)calibration: Biases from PSF, noise, method, detection, blending treatable
- Sample customization: Cuts on SNR, color, etc possible

JSP products for weak lensing

- Single exposures and PSFs; coadd images and PSFs in all bands: native resolution, astrometry and photometry cross-calibrated
- Simplest: Measurements of source in survey X on data in survey Y
- Joint detection catalogs; robust star-galaxy separation, outlier detection, sky subtraction
- Deblending scenes for single-object analysis within or across surveys
- Joint multi-object fitting (ideally on coadds)
- Ab initio sims / fake source injection: unsheared, sheared, multi-plane sheared

Conclusions

- There's more than one way! We don't know the best one yet
- WL does not *require* full JSP: e.g. catalog combinations
- Community sees full JSP as best way to control systematics
- Methods exist for some tasks (e.g. multi-object, multi-observation fitting)
- Others (like joint detection) still at prototype stage (at best)
- How well approach works for weak lensing depends on *all* details
- End-to-end simulations necessary for validation