Cosmo Sims: Input from Working Groups

What do we want? When do we want it?

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Outline

- Question posed
- Working group input
- Summary





- What quantities do you care about most in simulation mocks?
 - Galaxy properties? Tied to cosmology?
- What (if any) range of cosmologies would be useful?
- What's the time scale?





Large Scale Structure

- Simulation mocks requirements:
 - Most important: known input galaxy clustering
 - Realistic systematic input
 - Galaxy colours (for photo-z). Want to be able to determine average photo-z distribution.
 - i.e. as long as galaxy @z=1 has an appropriate SED, ratio of star-forming to passive galaxies @z=1 is less important.
 - Clustering as a function of colour/redshift
- Volumes:
 - For covariance matrices, large # simulations of one cosmology in short term (more in long term)
 - For pipelines, need larger volumes ~100 deg². Several cosmologies are ideal.
- Short term: Larger volume (~110 deg²) of one cosmology simulated many times. It's more important that input is well known that what specific cosmology is used.





Weak Lensing

- Simulation mocks requirements:
 - Care more about intrinsic galaxy properties: realistic galaxy shapes, sizes, morphologies and colours. Scales with redshift.
 - Colour gradients in SED and colour-dependent galaxy shapes less important (but still desirable!)
 - Intrinsic alignments useful but not a priority.
 - To study systematically, it'd be great to have sims with this turned on/off.
- Volumes:
 - One focal plane enough for most studies.
 - Work on non-canonical WL statistics need large volumes (1000s deg²) with variations on LCDM (and more!), but care much less about galaxy properties.
- Short term: small volume (~10 deg²) to full LSST depth in one cosmology, with shear and realistic galaxies.





Clusters

- Simulation mocks requirements:
 - Needed for cluster mass calibrations from WL data: Realistic galaxy size and shapes are most important, then realistic galaxy cluster colours and intrinsic alignments.
 - Mass distributions from cosmo sims also needed (later).
 - Needed for cluster selection from photometric data: sim mocks with realistic galaxy type, colour and distribution for range of cluster z/mass.
- Volumes:
 - Small range of cosmologies needed for cluster mass calibration
 - Longer time scale (~2 years): mocks for cluster selection from photometry.
 - ~2 year time-frame: connecting cluster properties to cosmo will require full hydro sims to calibrate mass-observable relationship – needs several cosmos, thousands of clusters. DES has prioritised this.
- Short term: small volume in few cosmologies with realistic galaxy properties. To be discussed: what level of resolution needed?





Strong Lensing

- Simulation mocks requirements:
 - Reconstructing lens environments: requires shear/convergence, but also deflection angle maps on redshift planes, and Einstein ring image at high resolution.
 - Calibrate WL info in non-lens fields: needs shear, photo-z estimation and M* estimation.
- Volumes:
 - Reconstructing the lens environment requires small volumes of image output: working with Bologna Lens Factory.
 - Calibration needs small volumes (~10 deg²) over multiple cosmologies.
- Short term: small volume (10 deg²) to LSST depth in several cosmologies, with shear, realistic colours and masses.





Supernovae

- Simulation mocks requirements:
 - Need catalogues of SN with photometry, light curves and associated with host galaxies.
 - Cosmo sims used to model line-of-sight effects on SN fluxes (as with SL).
- Volumes:
 - Small volumes of cosmo sims provide info on line-of-sight effects. One cosmo will suffice.
- Short term: Small volume in one cosmology is useful. Need some method to place SN in simulation mocks with uncertainties in SN flux calibration, that can accommodate different models of when and where SN appear in the Universe.





Photo-z

- Simulation mocks requirements:
 - Colours are obvious priority, also galaxy correlation statistics highest priority is getting accurate galaxies in halos with realistic SEDs.
 - Morphology important for blending wok.
 - Lensing magnification (as an option?)
 - Lower priority: Galaxy colour gradient, bulge+disk offset
- Volumes:
 - Need >100 deg².
 - Cosmology a non-issue one cosmology is enough.
- Short-term:
 - Depends on accuracy! Need realistic colours and realistic bias schemes in >100 deg²volume.







- Most useful in short term: small (~10 deg²) volumes with great detail (several cosmologies), and larger (~100 deg²) volumes with less detail, one cosmology
 - Limit is what we can realistically simulate and analyse with phosim.
- Also, very large volumes (~10000 deg²) with ~no galaxy properties beyond position and shear, with a range of cosmologies.
- Need to know a lot about the inputs to the cosmology.





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