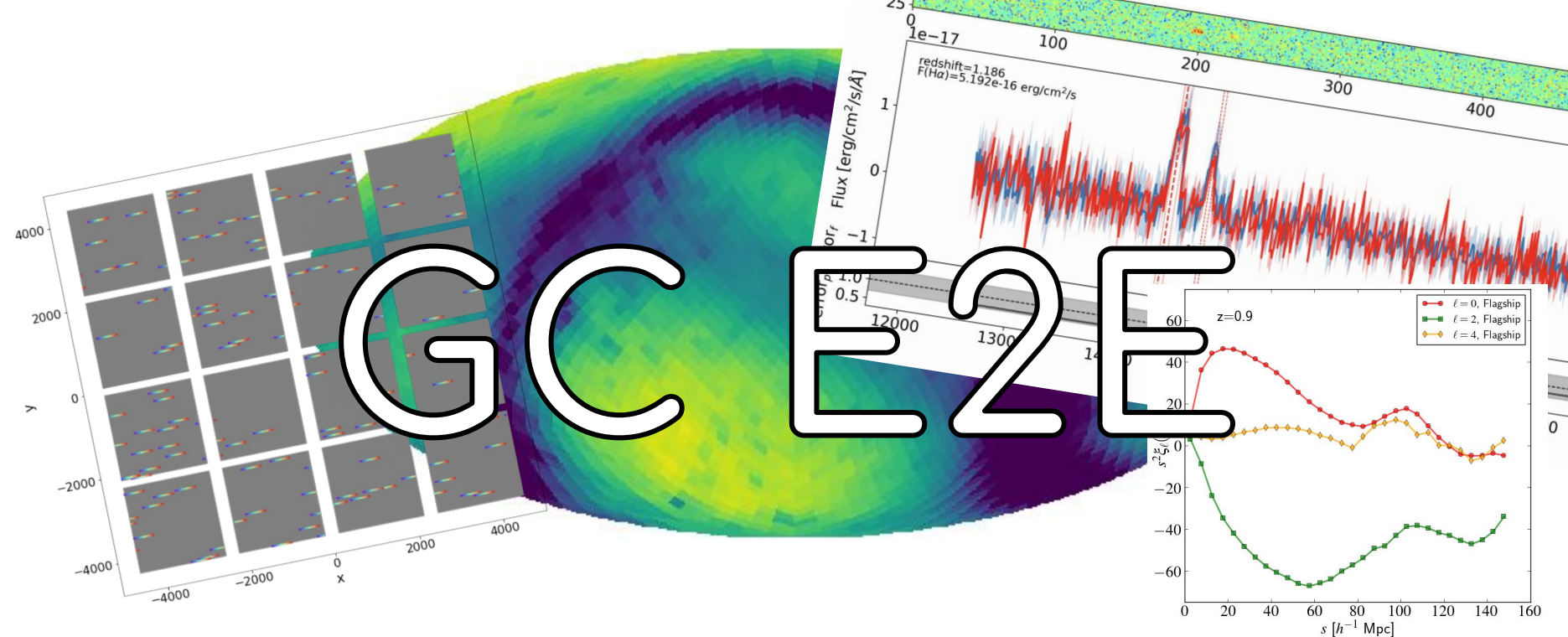


GC E2E

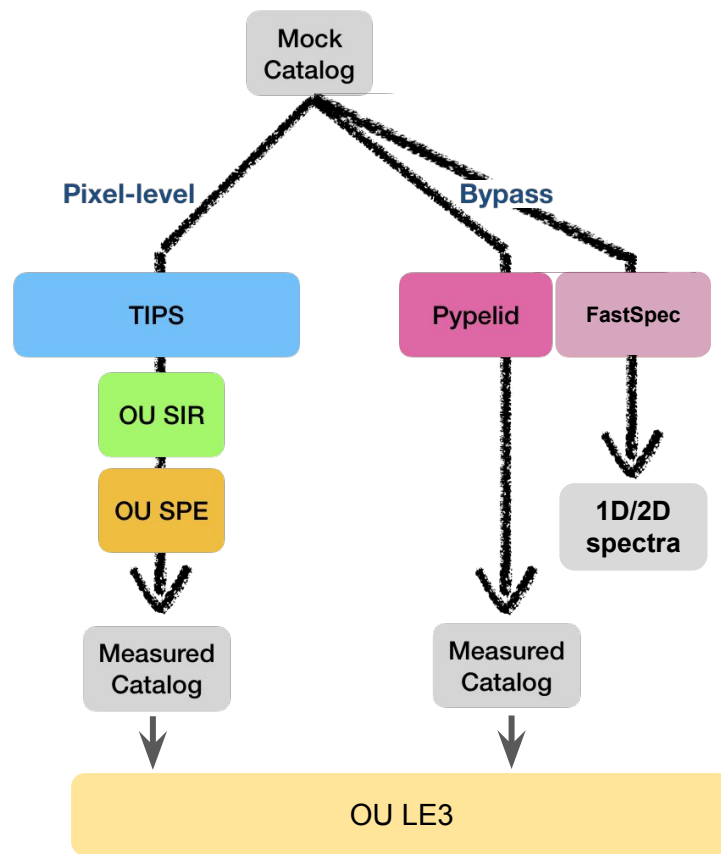


Sylvain de la Torre (other leads: B. Granett, M. Moresco)

Euclid-France GC meeting - 20 Avril 2021

E2E simulation tools

- Pypelid (Euclid pipeline bypass):
 - Computes SNR of emission lines accounting for exposure pattern, foregrounds and continuum contamination
 - Simulates stacked 1D spectra
 - Redshift measurement with template fit (random and systematic errors)
- FastSpec:
 - 1D & 2D spectrum simulator (continuum and emission lines)
 - Include optimal 1D extraction
 - Any dithering pattern, grism angle and number of exposure
 - Constant noise over spectra, no specific focal plane effects



E2E inputs & outputs

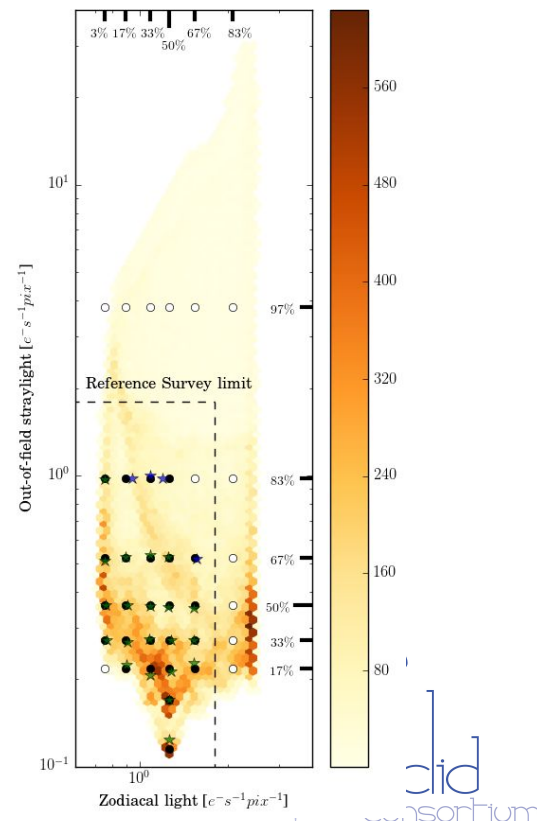
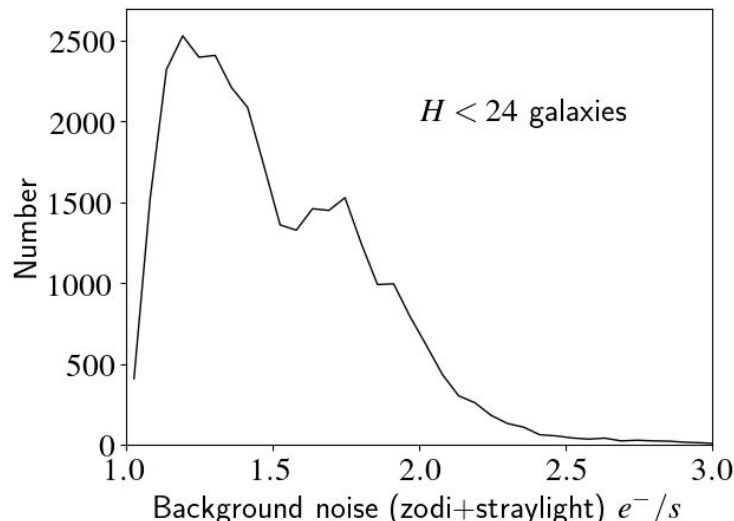
- Inputs:
 - mock galaxy catalogue (as in EUCL-POR-RS-8-001)
 - star catalogue
 - foreground maps: zodiacal light, out-of-field straylight, MW extinction
 - survey properties: list of exposure locations and orientations
 - instrument properties: geometric and noise characteristics
- Outputs:
 - Galaxy catalogue
 - detection probabilities
 - “observed” redshifts containing systematic effects due to observation and reduction
 - Galaxy spectra with noise



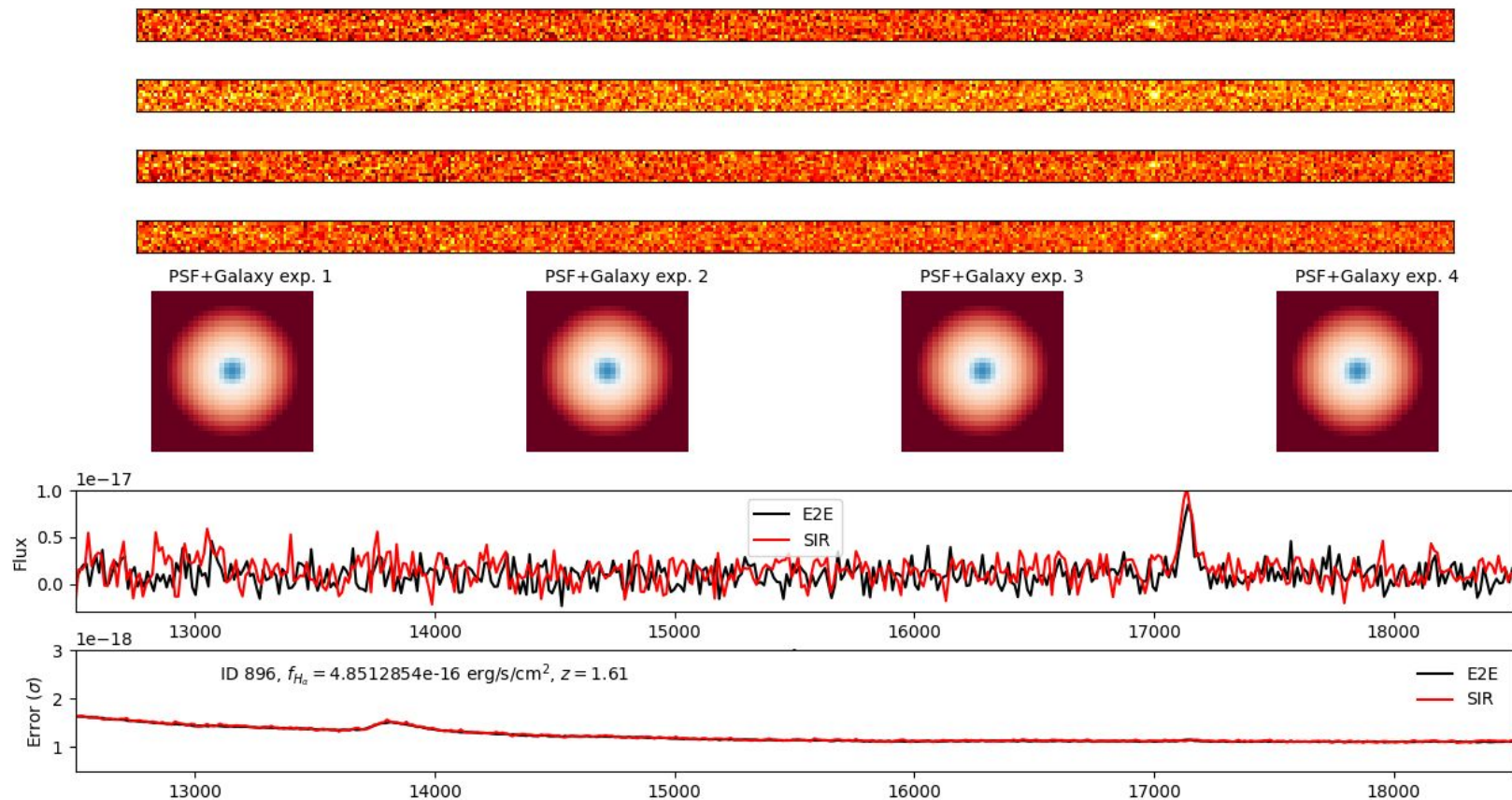
FastSpec & EL-COSMOS simulated spectra

- Pilot run

- EL-COSMOS: 518 404 synthetic spectra (BC 2003) with emission lines obtained by fitting the COSMOS 2015 photometry
- 207000 Euclid-Wide-like simulated red-grism spectra
- Background noise levels based on SPV2

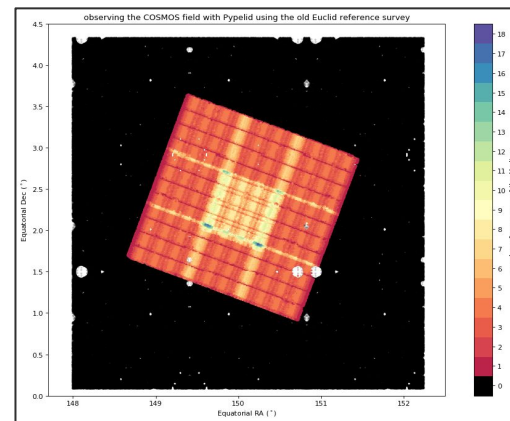
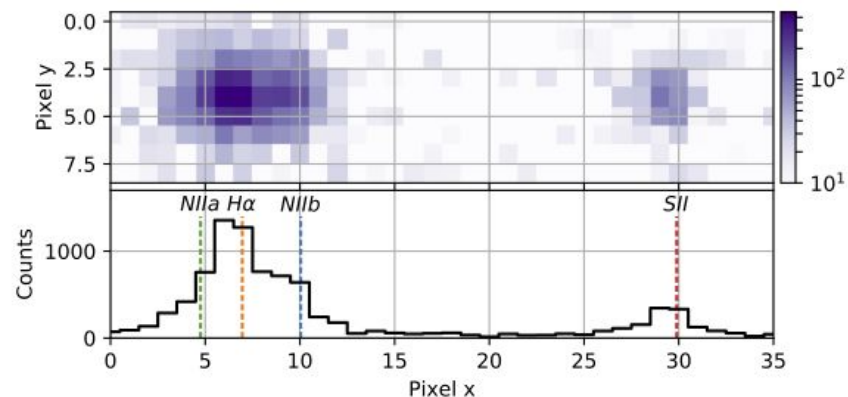


FastSpec & EL-COSMOS simulated spectra



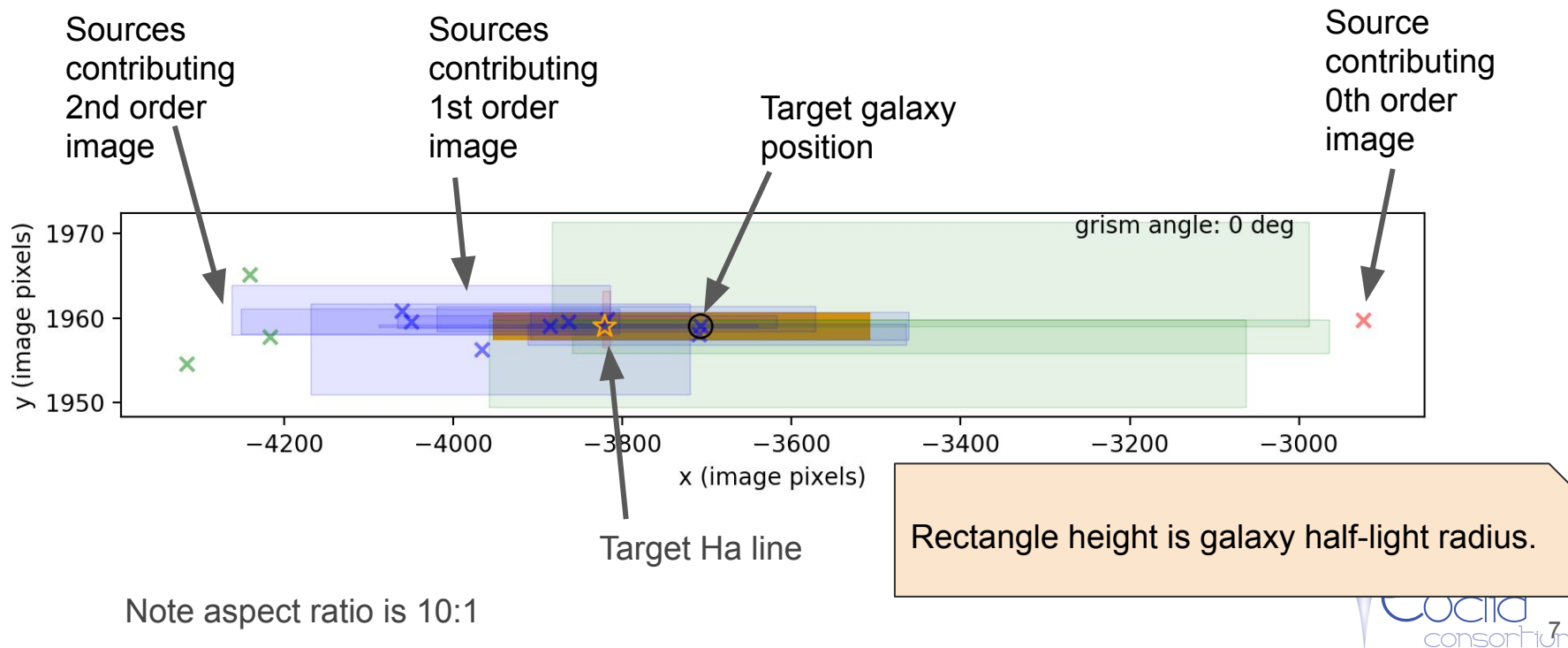
Pypelid algorithm

- Estimates the SNR of galaxy emission lines in the final exposure stack
- Accounts for foregrounds and contamination noise
- Loads instrument and survey parameters directly from MDB
- Models the light profile (morphology and PSF)
- Renders noisy 1D spectra (emission lines only)
- Runs template fit for redshift measurement
- Updated with the latest K-pattern & vignetting model
- Updated to simulate also blue grism and RG+BG observations (Deep-like)



Contamination model for overlapping continua

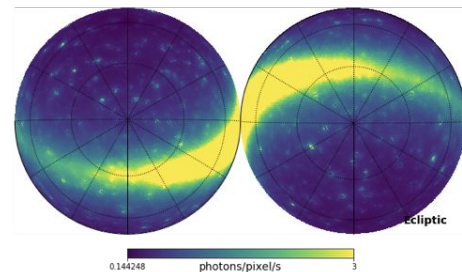
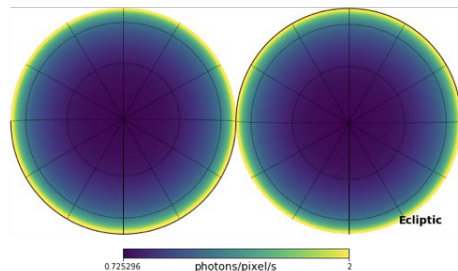
[based on PROFESS by S. de la Torre]



Noise sources

✓ Implemented

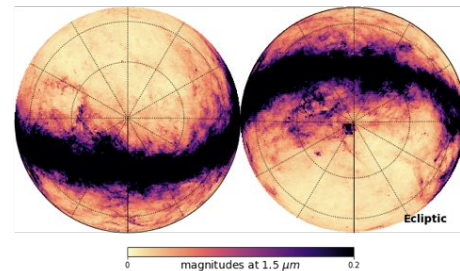
- Detector noise
- Overlapping galaxy and stellar spectra (continuum emission)
- Fixed zodi map, Aldering 2001 spectrum
- Out-field Stray light map precomputed from star catalog
- Extinction computed with Fitzpatrick 1999 fit and Planck E(B-V) map
- Redshift measurement error (random and systematic)



✗ Not (yet) implemented

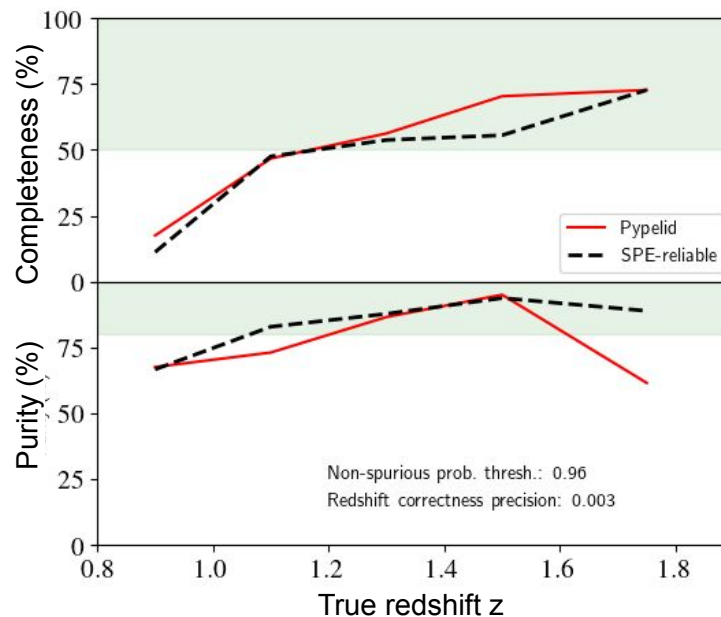
- In-field straylight
- Persistence
- Cosmic rays
- Wavelength calibration error
- Extraction systematics
- Spectrophotometric calibration error could be added in post-processing

} additional effects that
can be added
statistically relying on
calibrations

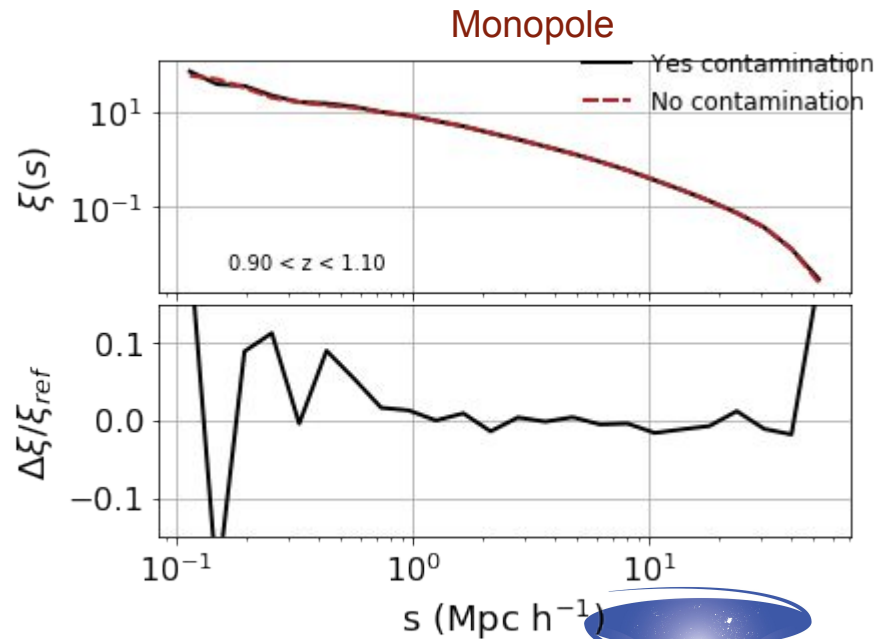
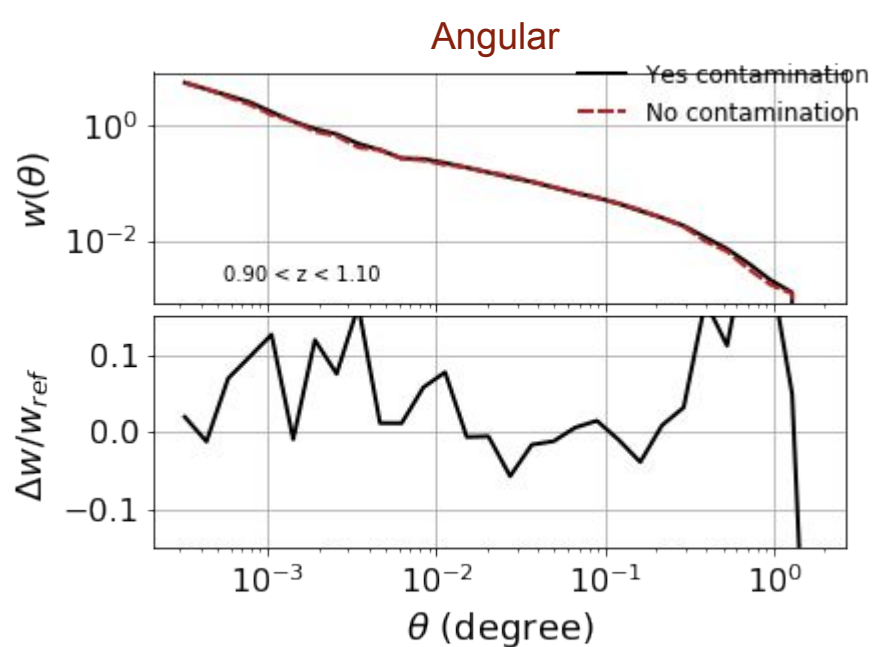


Pypelid calibration and validation

- Validation of algorithms
 - Noise model
 - Contamination model
 - Spectrum SNR
 - Redshift determination
 - Template-fitting for redshift measurement
- There are a few parameters that require calibration
 - Detection threshold tunes purity and completeness
 - Templates and priors for redshift measurement (SPE bypass)



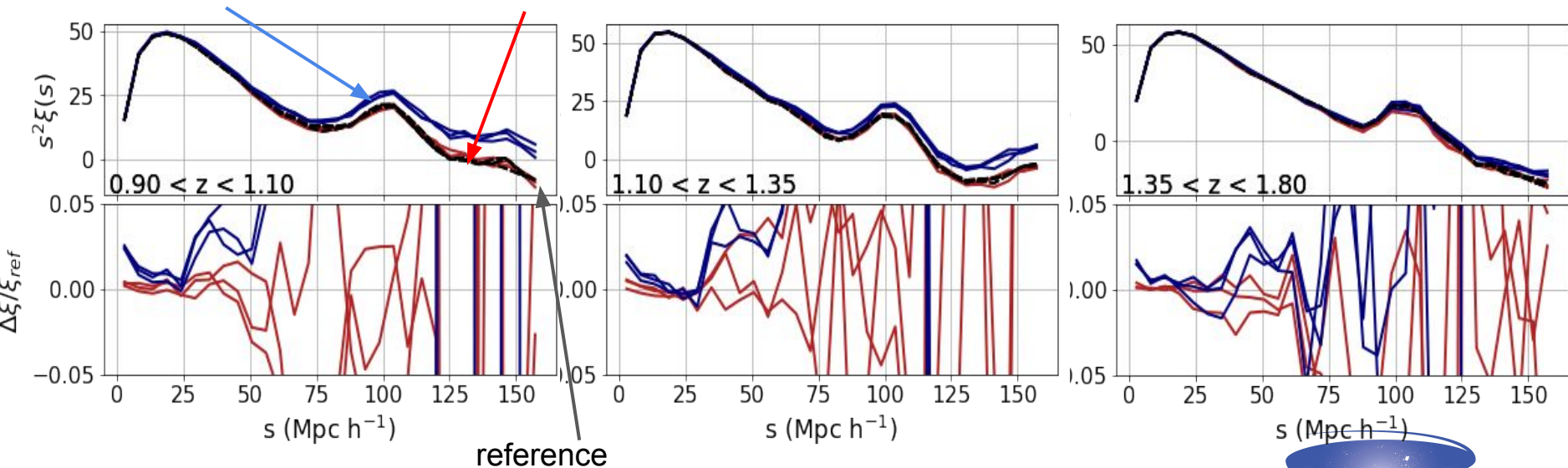
Impact of contamination on clustering



Impact of selection function on clustering

Uniform randoms (not
expected to work)

Visibility mask randoms



Lines of the same color show different
shuffling realizations (shot noise)

E2E Key Projects

KP1: Description of the end-to-end bypass for galaxy clustering (Pypelid code)

KP2: Description of the bypass algorithm to model contamination from overlapping spectra in slitless spectroscopy

KP3: Description of deep field bypass simulations including source catalog (if not using Flagship) and modifications to the Pypelid code

KP4: Presentation of the pre-launch model of the spectroscopic redshift errors, random and systematic, in both the Deep and Wide surveys that apply to the galaxy samples used for galaxy clustering science

KP5: Description of the pre-launch spectrophotometric calibration error model relevant for galaxy clustering and its implementation in bypass simulations

KP6: Description of the pre-launch persistence model relevant for galaxy clustering and its implementation in bypass simulations

