BGS survey validation
using the GAMA and DESI overlap

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Feasibility of DESI Bright Time Survey

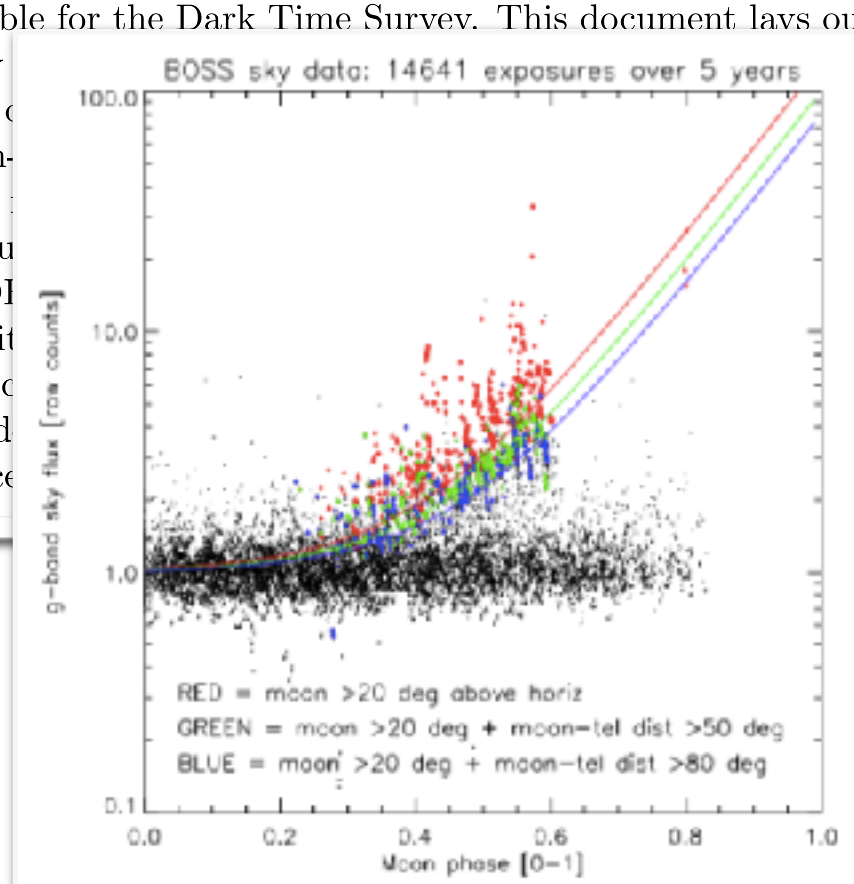
David Schlegel, 11 Dec 2017 (DRAFT)

DESI-doc-3547

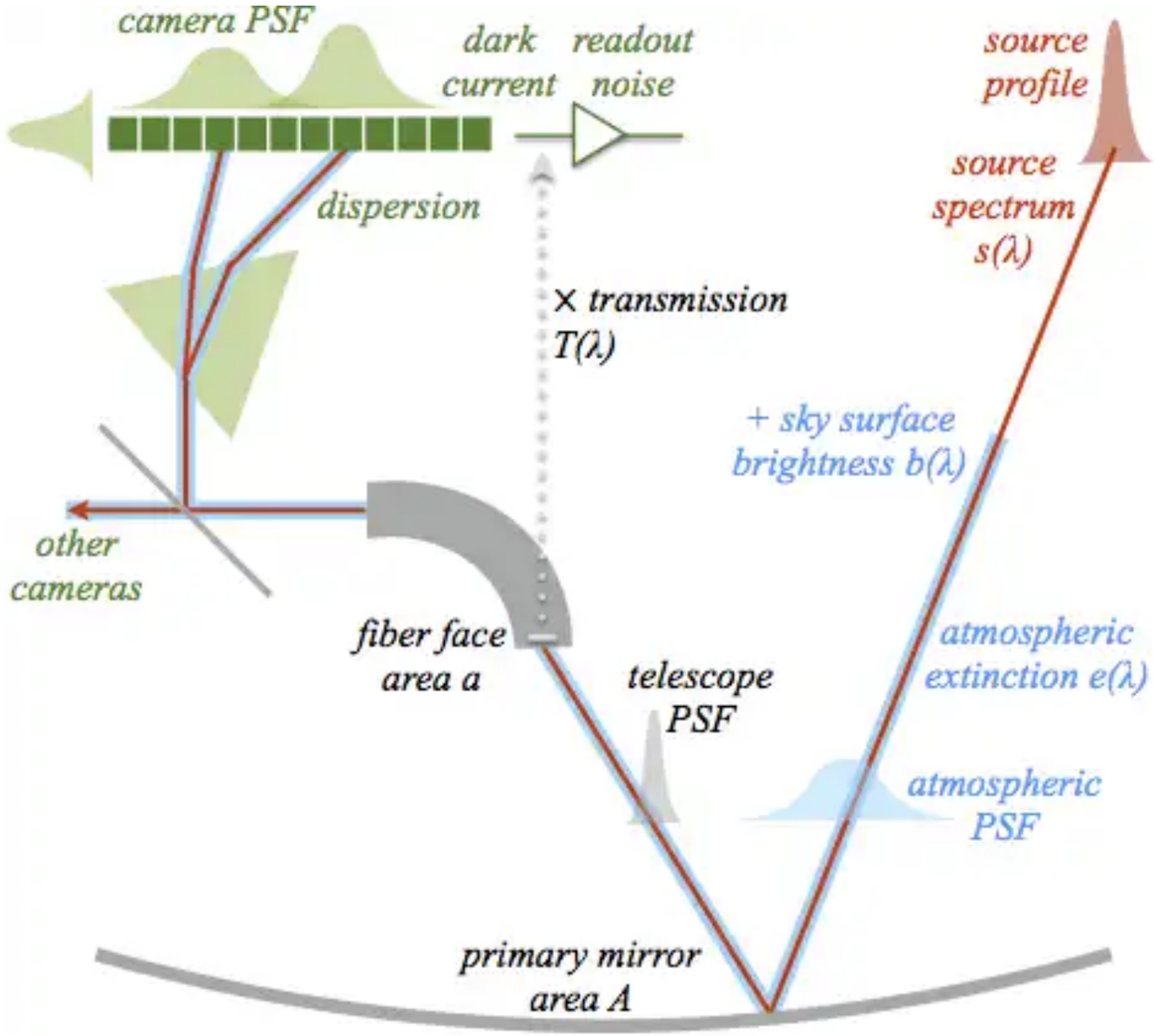
Abstract

The DESI Bright Time Survey will make use of the time that is not suitable for the Dark Time Survey. This document lays out the feasi-
bility [...] e exposure
time [...] responding
to un- [...] re strongly
from [...] rvey to be
condu[...]

DE[...] use bright
condit[...] noise limit.
Telesc[...] ne, such as
broad[...] ch brighter
source[...] oise limit.

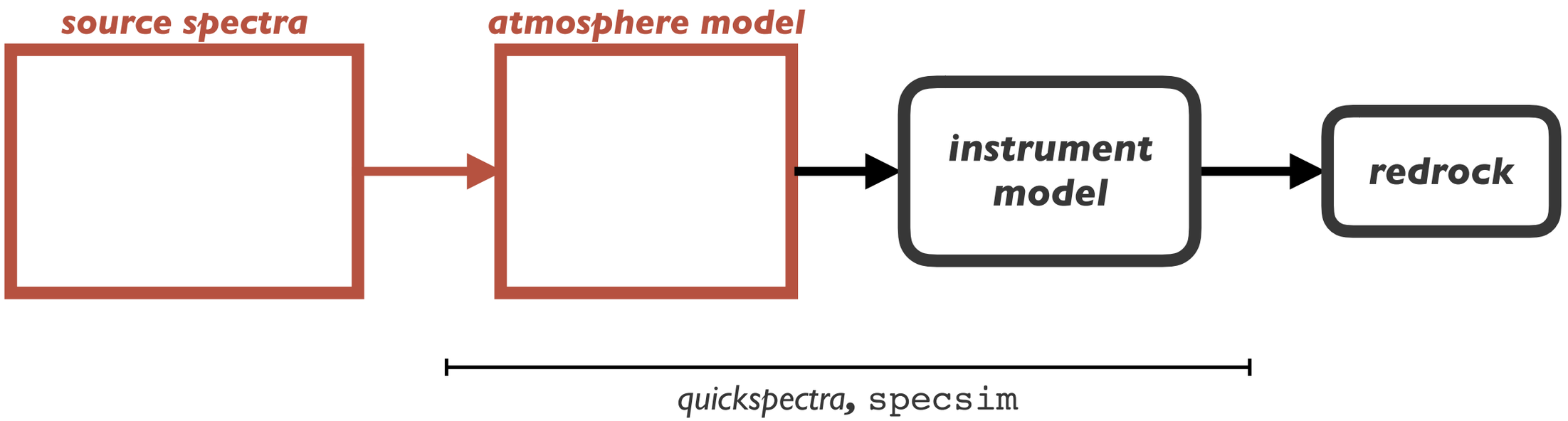


https://desi.lbl.gov/DocDB/cgi-bin/private/ShowDocument?docid=3547



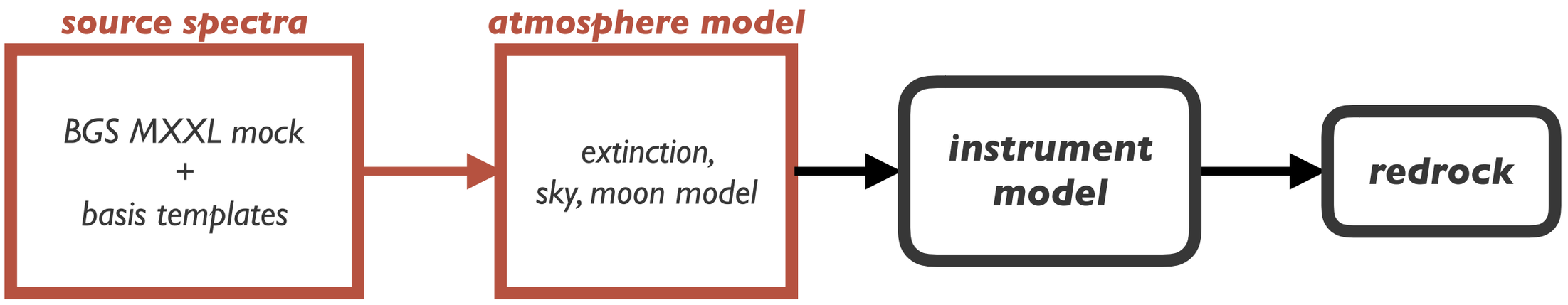
specsim

http://specsim.readthedocs.io/en/latest/guide.html



John Moustakas
https://github.com/desihub/desisim/blob/master/doc/nb/bgs-redshift-efficiency.ipynb

current pipeline for testing BGS feasibility

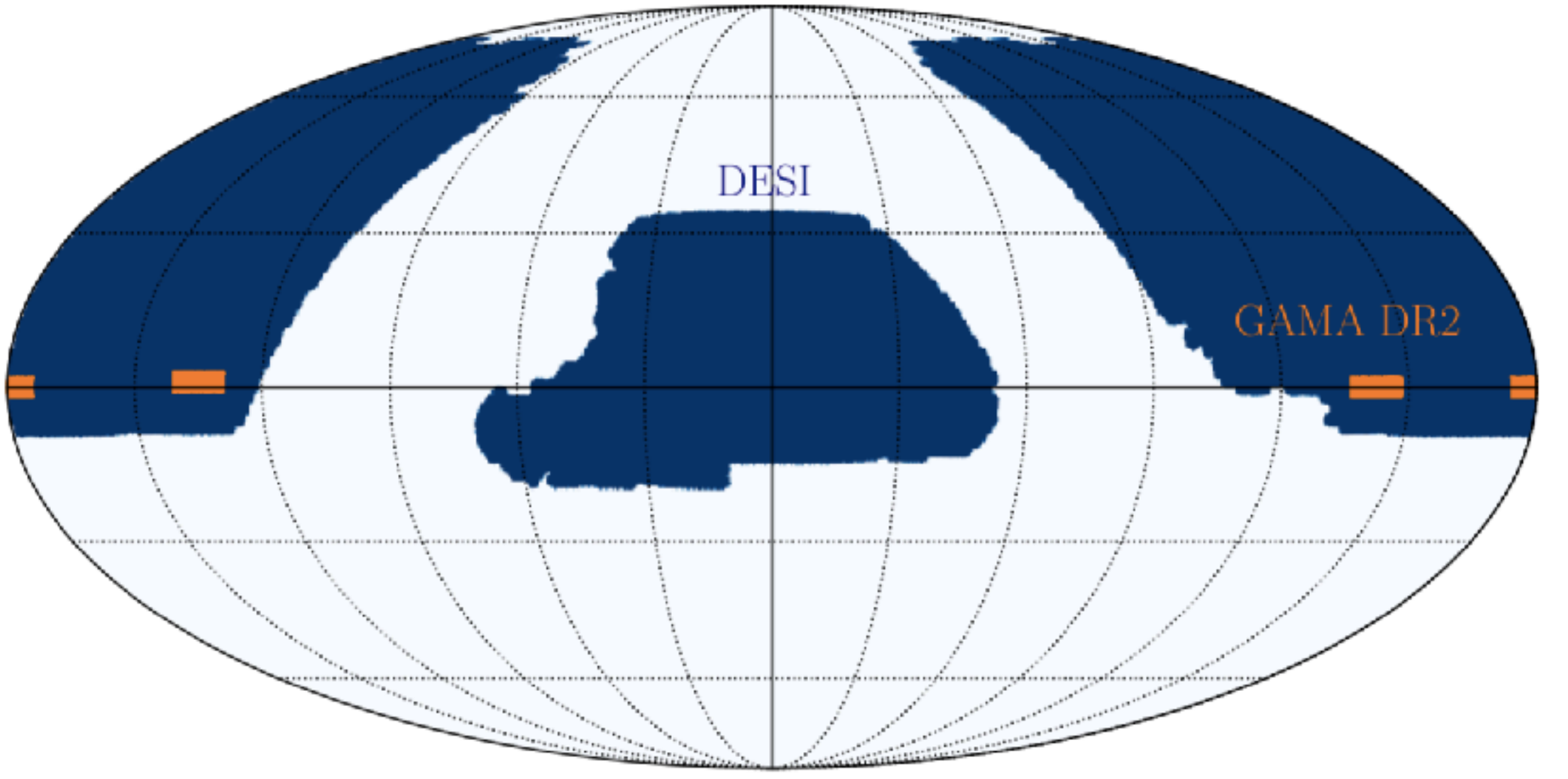


John Moustakas
https://github.com/desihub/desisim/blob/master/doc/nb/bgs-redshift-efficiency.ipynb

improving the BGS feasibility tests

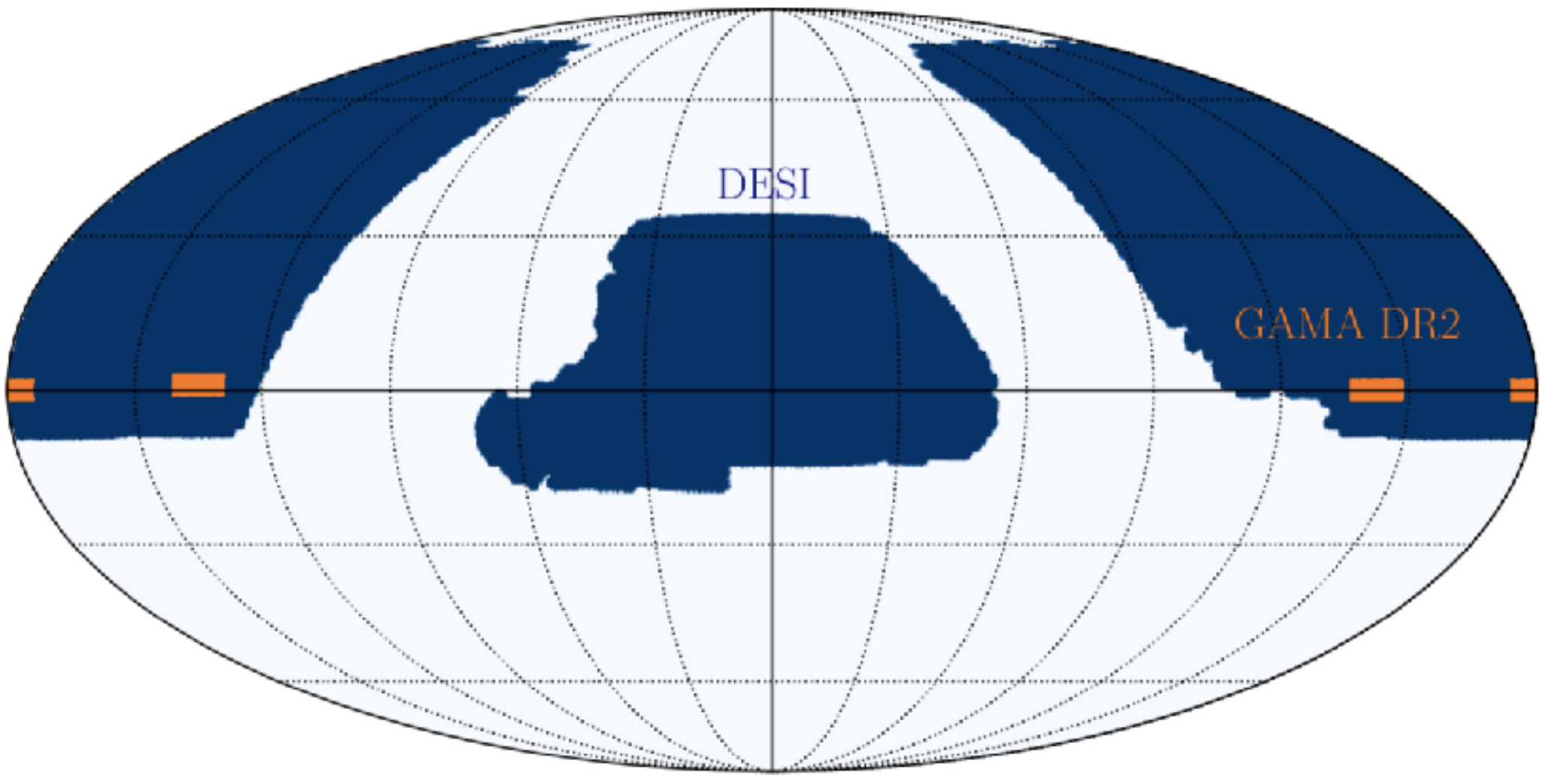
using GAMA, Legacy Surveys, sky model from BOSS

GAMA DR2 overlap with DESI



http://www.gama-survey.org/dr2/ ; Liske et al. (2015)

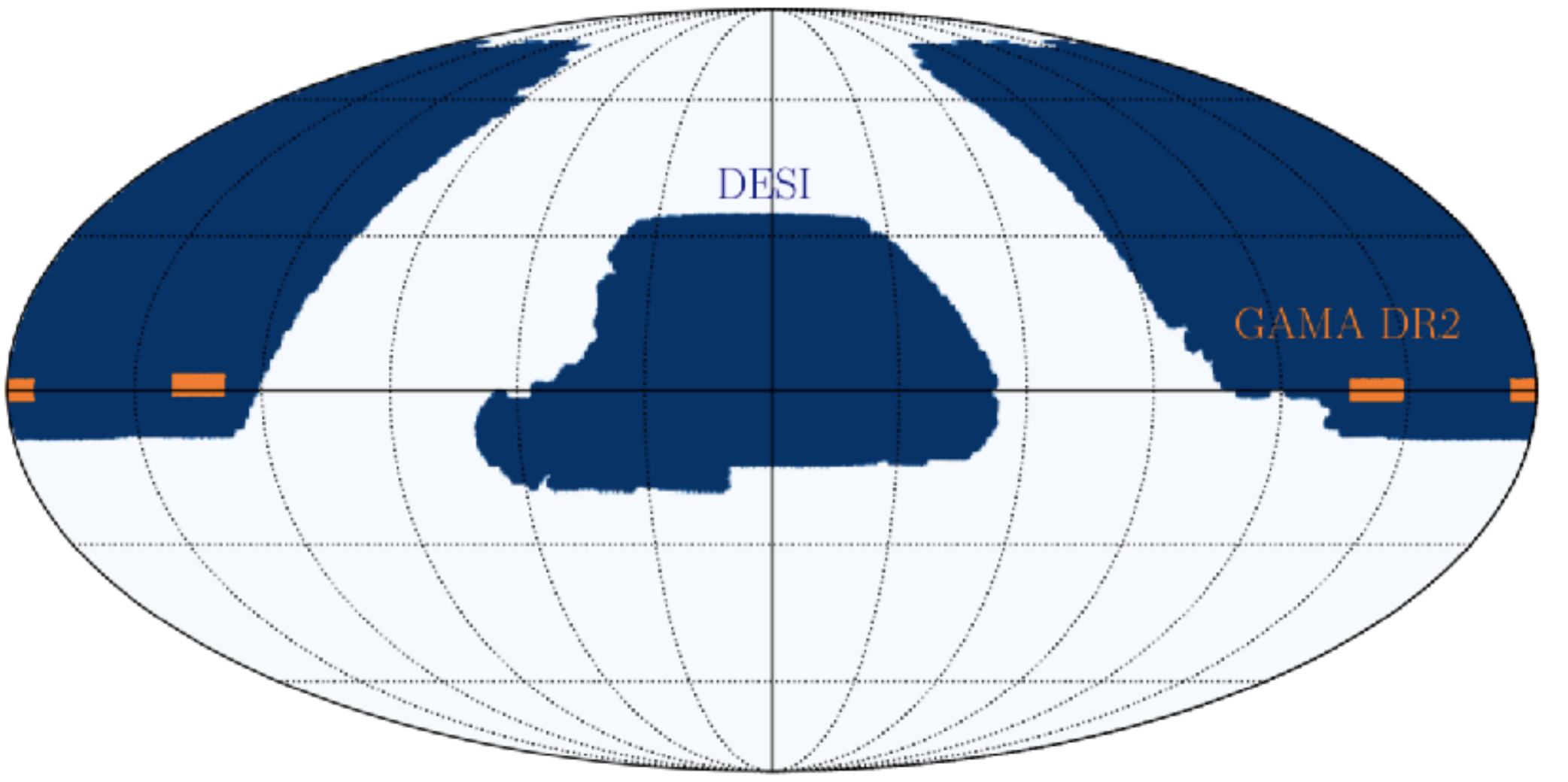
GAMA DR2 overlap with DESI



72,225 objects in 3 x 48deg² GAMA I survey regions
r <19.0 mag in two regions, r <19.4mag in a third

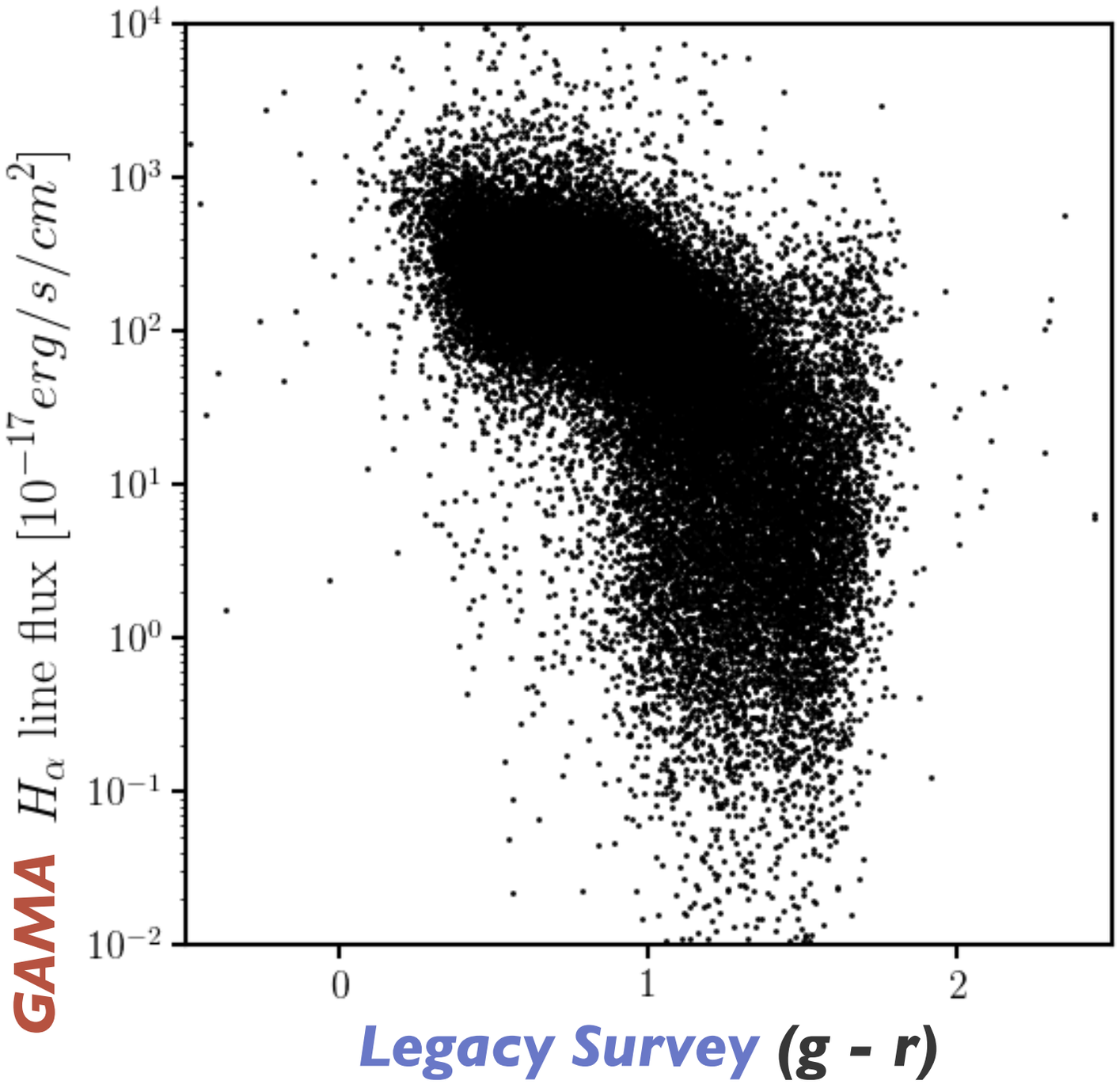
http://www.gama-survey.org/dr2/ ; Liske et al. (2015)

GAMA DR2 overlap with DESI



AAT/AAOmega spectra, redshifts, emission lines,
optical and NIR (ugrizYJHK) photometry

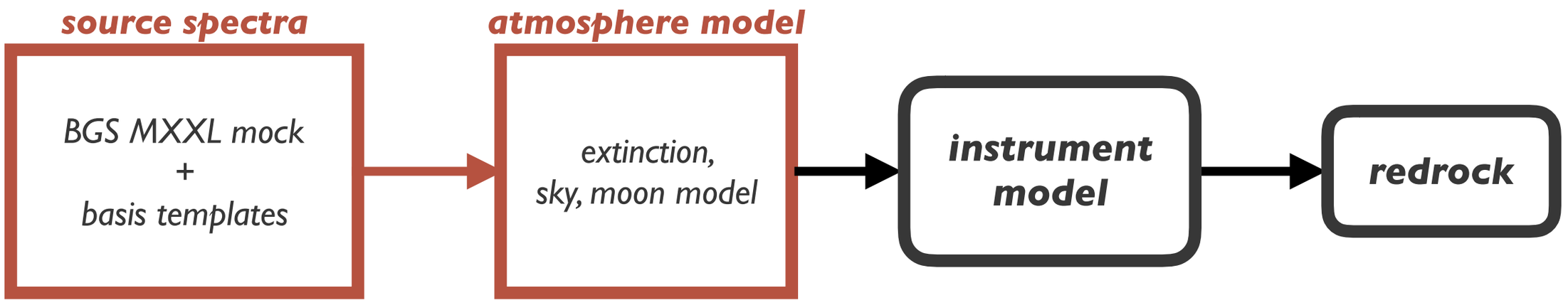
http://www.gama-survey.org/dr2/ ; Liske et al. (2015)



~40,000 galaxies

http://legacysurvey.org/

current pipeline for testing BGS feasibility



John Moustakas
https://github.com/desihub/desisim/blob/master/doc/nb/bgs-redshift-efficiency.ipynb

current pipeline for testing BGS feasibility

source spectra

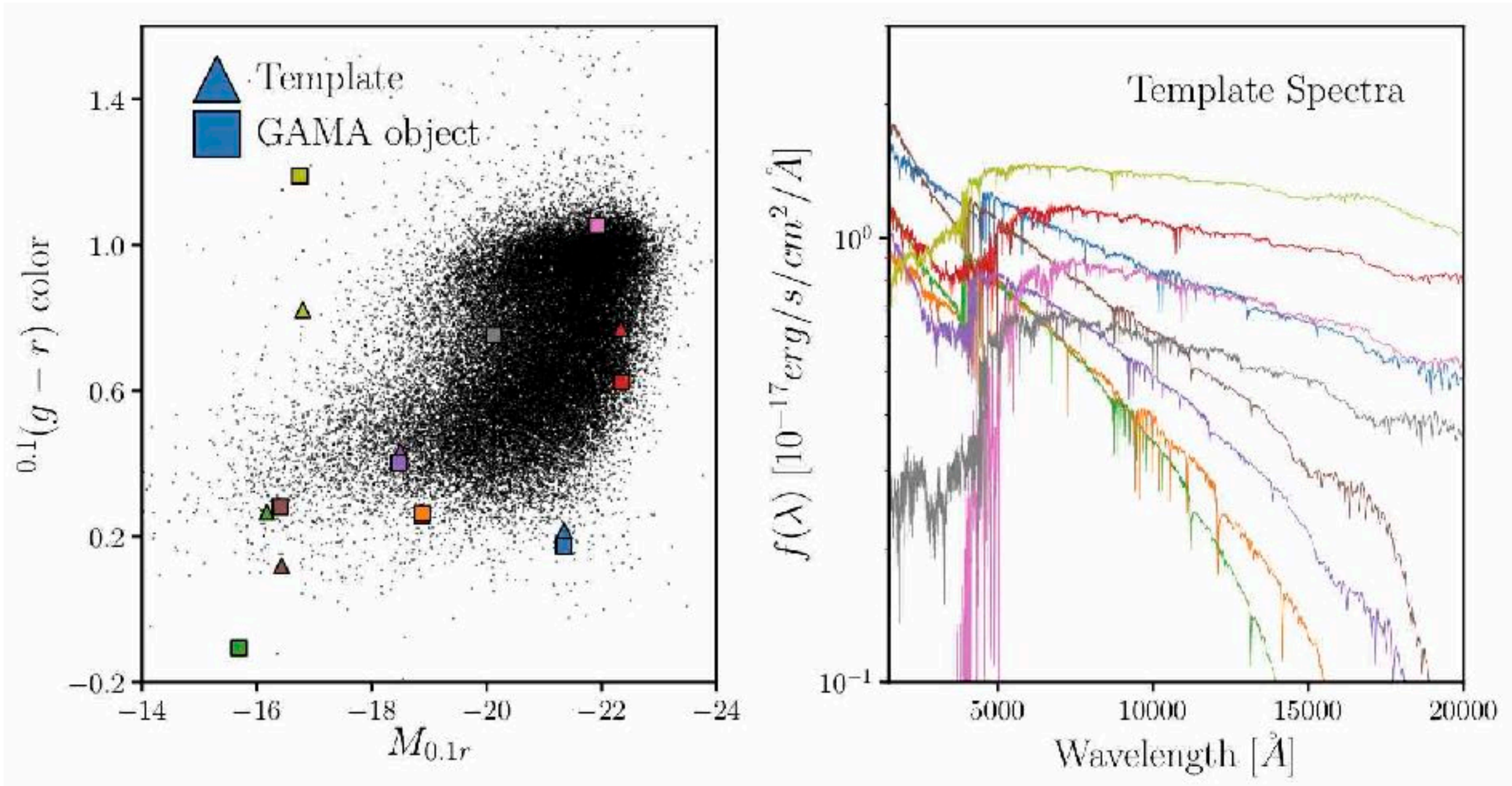
BGS MXXL mock
+
basis templates

John Moustakas
https://github.com/desihub/desisim/blob/master/doc/nb/bgs-redshift-efficiency.ipynb

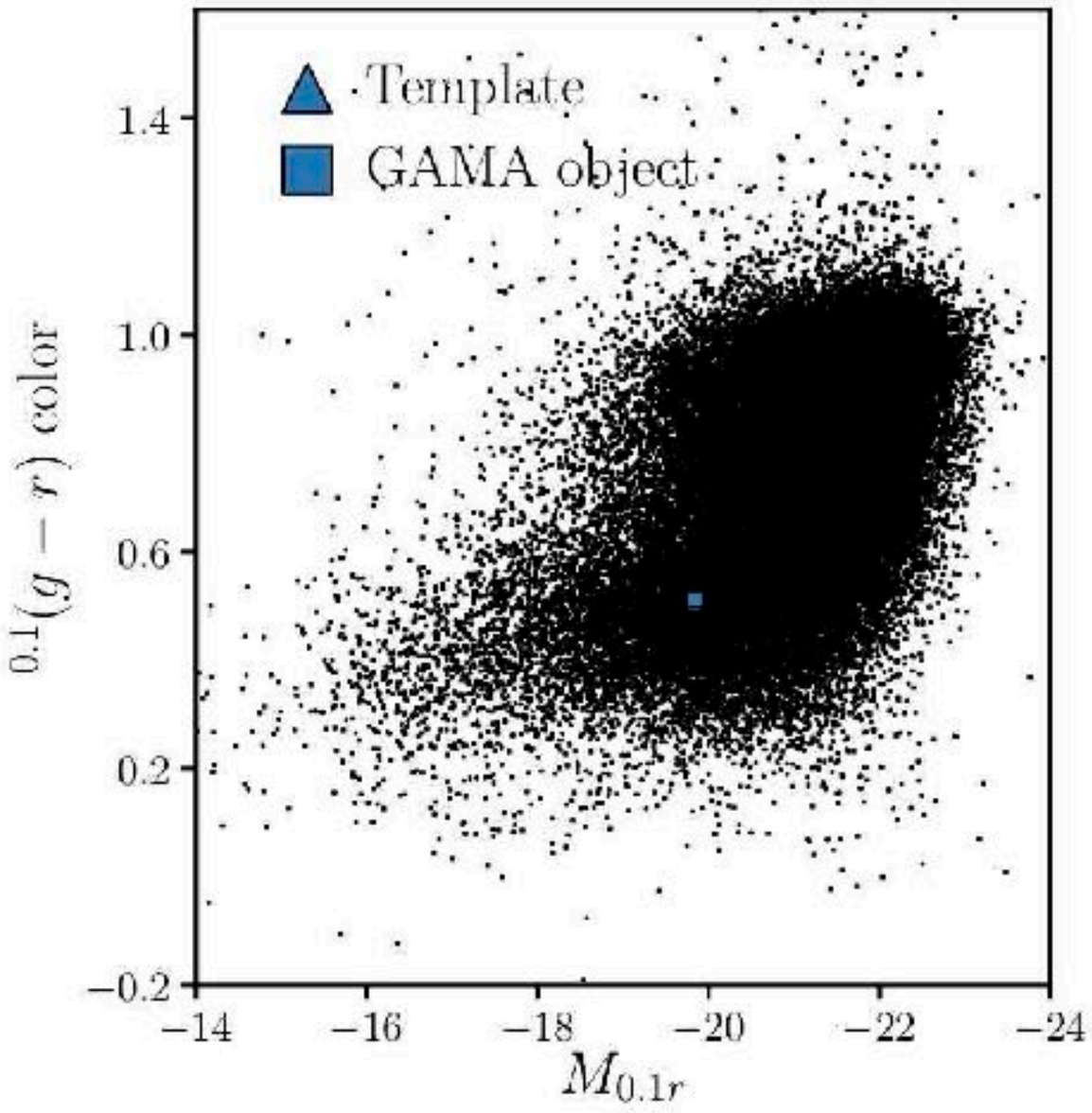
source spectra

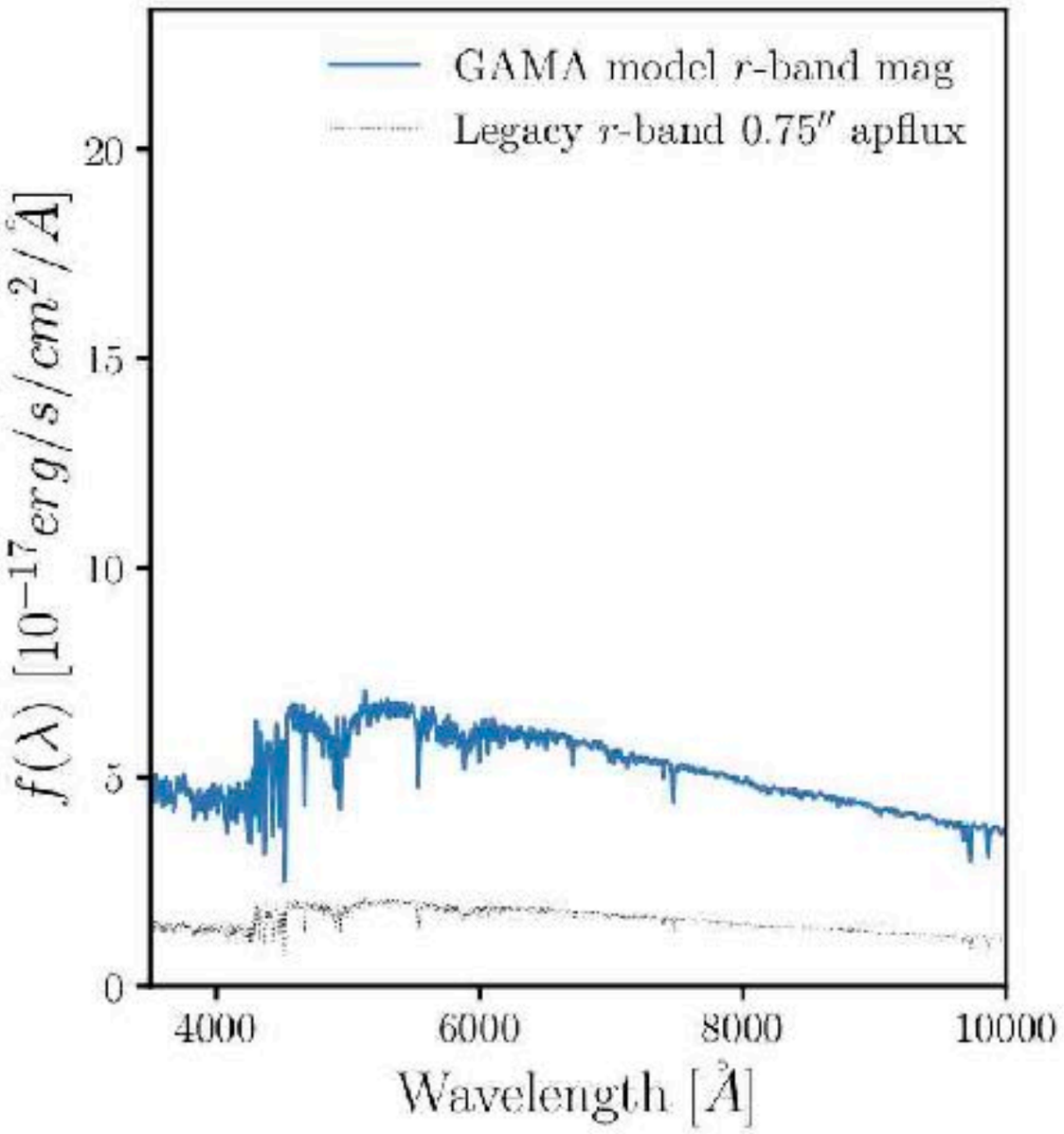
GAMA &
Legacy Survey
+
basis templates

John Moustakas
https://github.com/desihub/desisim/blob/master/doc/nb/bgs-redshift-efficiency.ipynb



https://github.com/desihub/desisim/blob/master/doc/nb/bgs-redshift-efficiency.ipynb



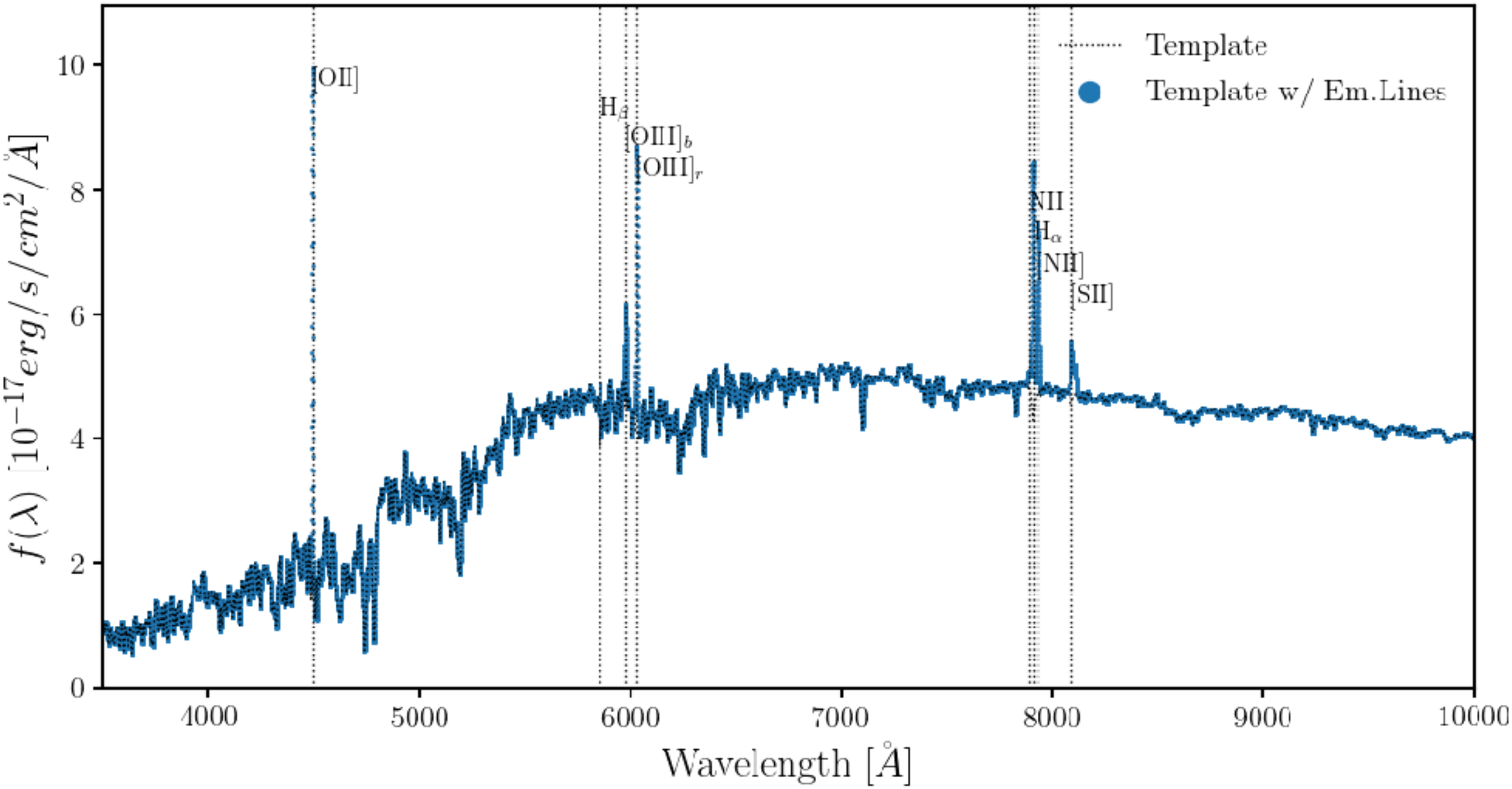


desisim.templates

GAMA — emission line flux and width from Gaussian fitting

Spectral line	Wavelength (Å)	Name in catalogue	Maximum redshift
Quantities 1 – 2, 6 – 7 are available			
[O II][1]	3727	OII	1.375
Quantities 1 – 5 are available			
[O II]B[1]	3726	OIIB	1.375
[O II]R[1]	3728	OIIR	1.375
Quantities 1 – 7 are available			
Hβ	4861	HB	0.821
[O III]	4959	OIIIB	0.785
[O III]	5007	OIIIR	0.768
[N II]	6548	NIIB	0.352
Hα	6563	HA	0.348
[N II]	6584	NIIR	0.344
[S II]	6716	SIIB	0.318
[S II]	6731	SIIR	0.315
Quantities 6 – 7 are available			
[Ne V]	3345	INEVB	1.646
[Ne V]	3425	INEVR	1.584
[Ne III]	3869	INEIII	1.287
Hδ	4102	IHD	1.158
Mg	5174	IMG	0.710
NaID	5892	INAD	0.502
[O I]	6300	IOI6300	0.405
[O I]	6364	IOI6364	0.391

GAMA DR2; Hopkins et al. (2013)

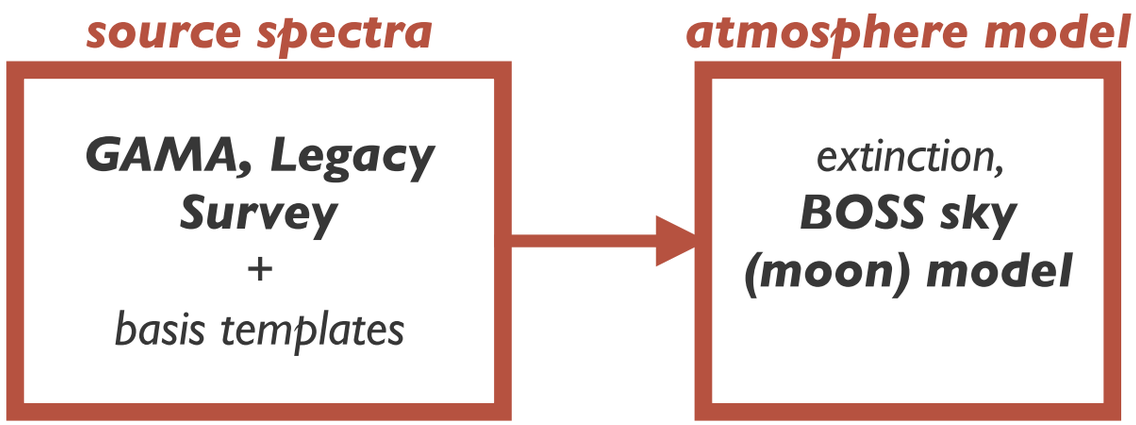

Template
Template w/ Em.Lines
[OII]
H_δ
$[OIII]_b$
$[OIII]_r$
NII
H_α
[NII]
[SII]
$f(\lambda)$ $[10^{-17} erg/s/cm^2/\mathring{A}]$
Wavelength $[\mathring{A}]$
0
2
4
6
8
10
4000
5000
6000
7000
8000
9000
10000

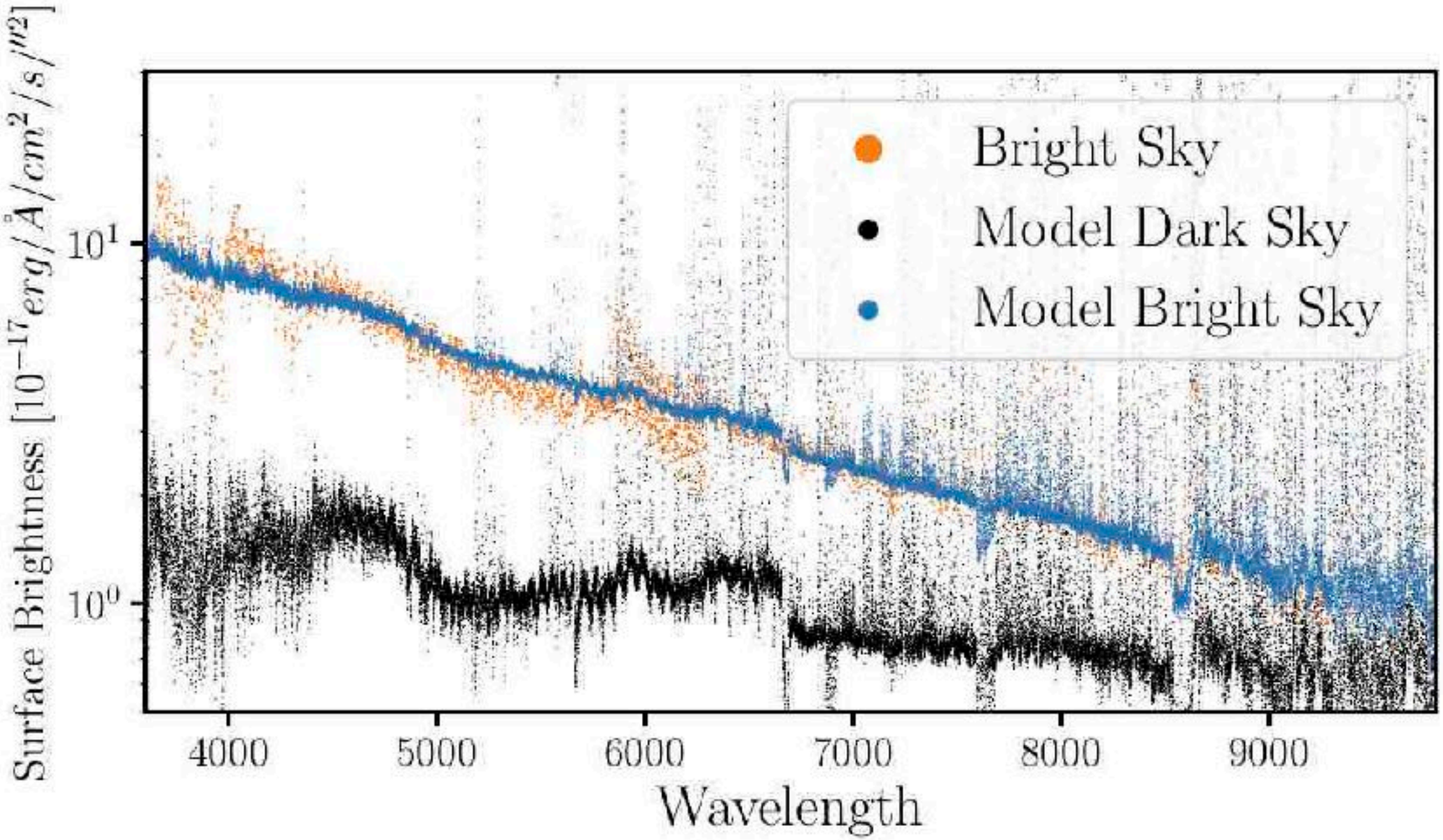
source spectra

GAMA, Legacy Survey

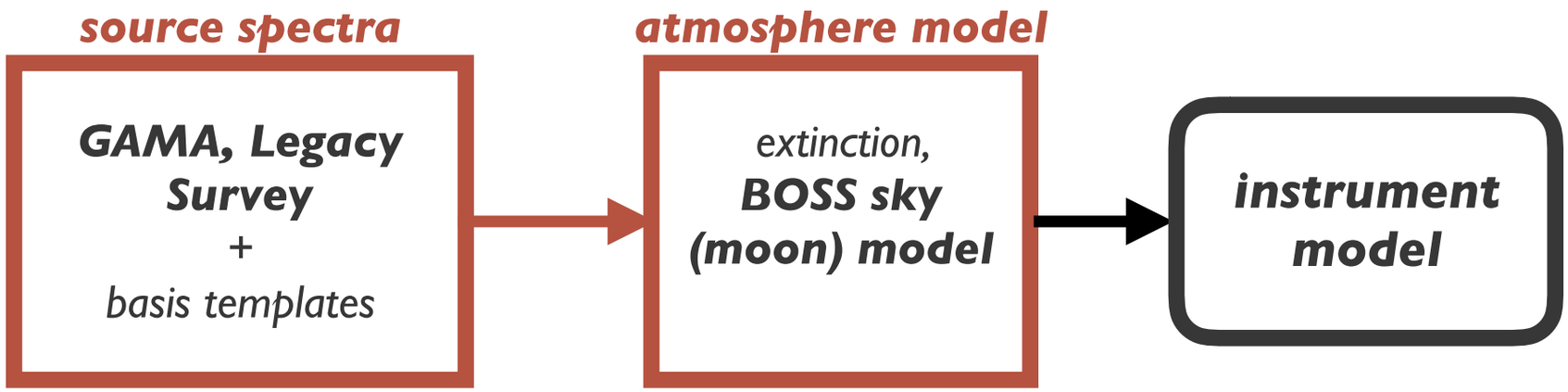
+

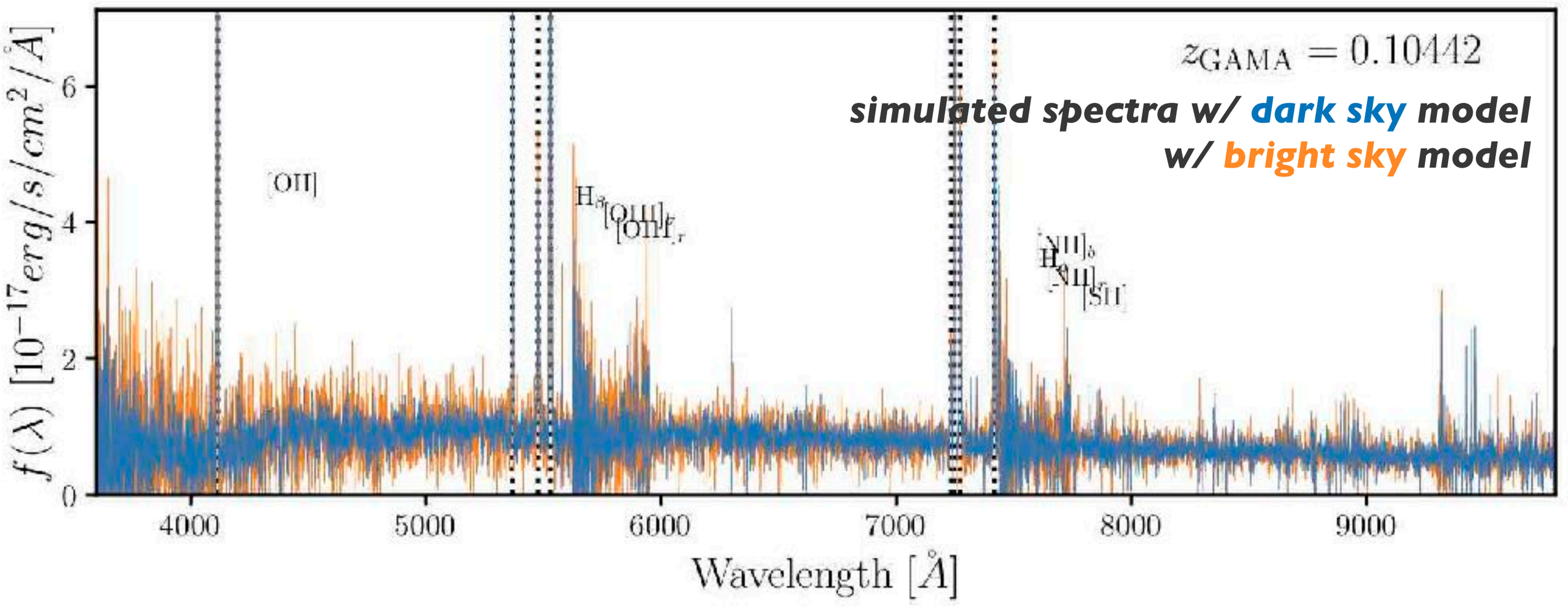
basis templates

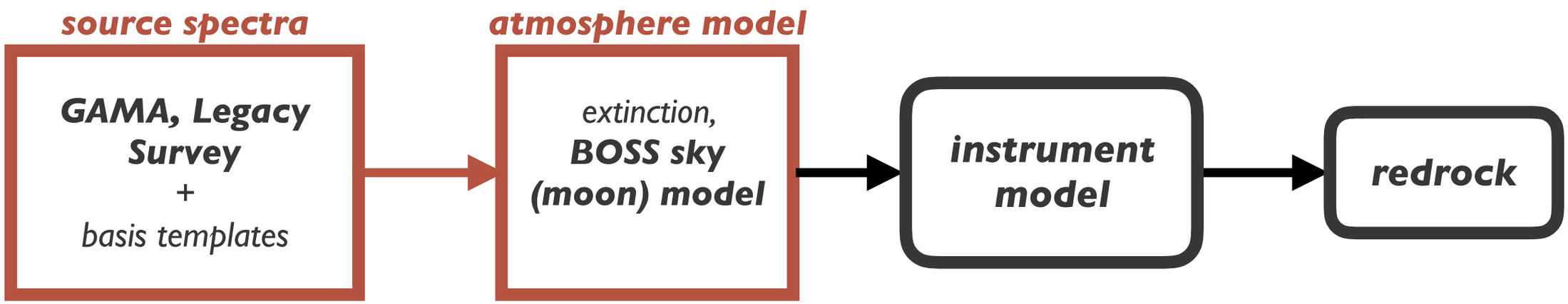

source spectra
GAMA, Legacy Survey
+
basis templates
atmosphere model
extinction,
BOSS sky (moon) model

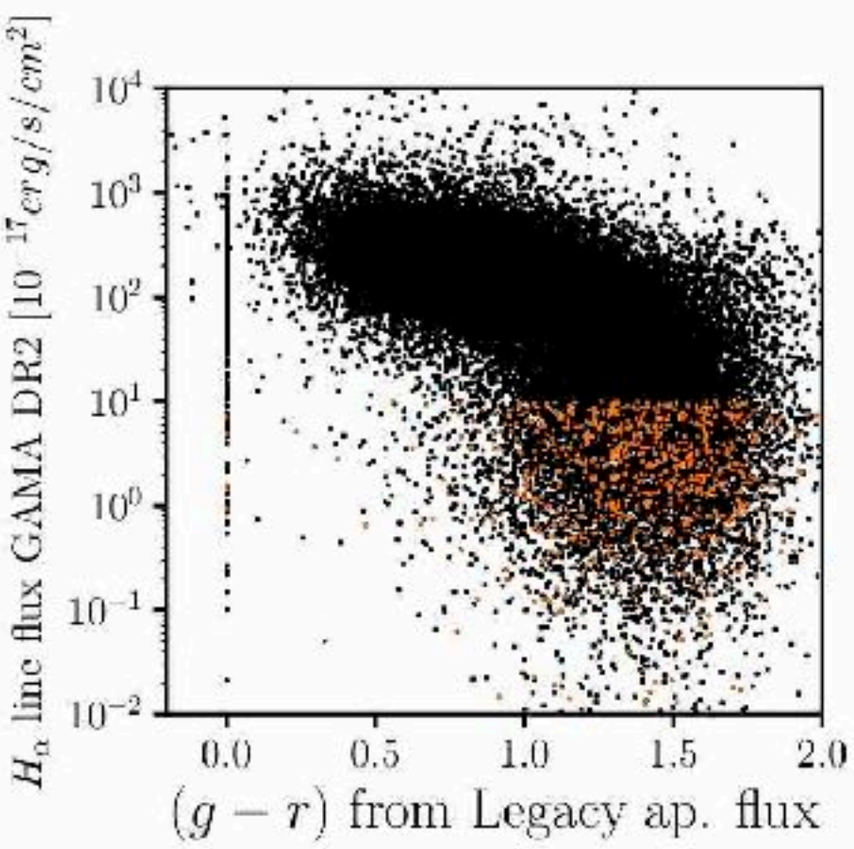


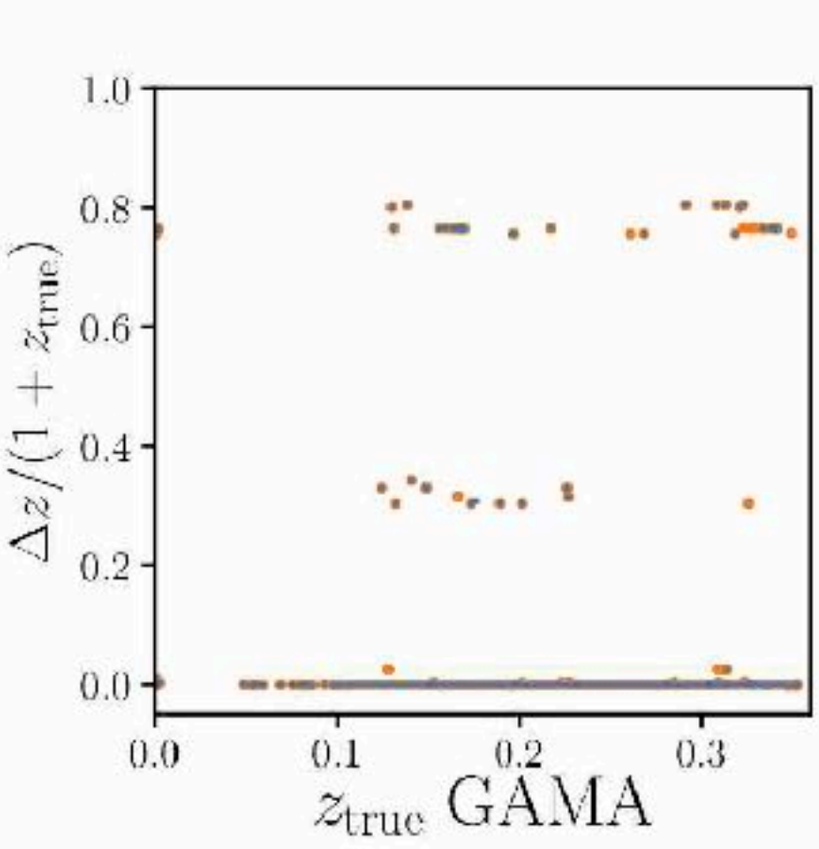
bright sky surface brightness from Parker Fagrelius

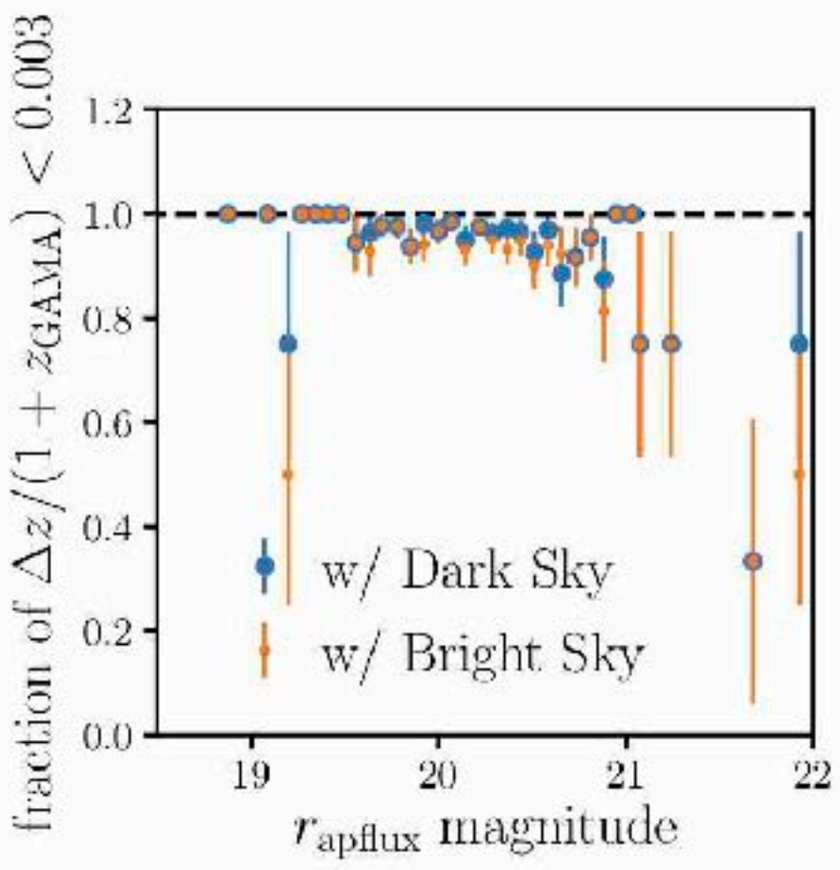

source spectra
GAMA, Legacy Survey
+
basis templates
atmosphere model
extinction,
BOSS sky (moon) model
instrument model


$z_{\mathrm{GAMA}} = 0.10442$
simulated spectra w/ dark sky model
w/ bright sky model
[OII]
H_δ
[OIII]
[OIII]
[NII]
H_α
[NII]
[SII]
[SII]
$f(\lambda)$ $[10^{-17} erg/s/cm^2/\AA]$
0
2
4
6
4000
5000
6000
7000
8000
9000
Wavelength $[\AA]$


source spectra
GAMA, Legacy Survey
+
basis templates
atmosphere model
extinction,
BOSS sky
(moon) model
instrument model
redrock







*PRELIMINARY

GAMA *spectroscopy and* ***sky model from BOSS***
allow us to more realistically test the feasibility of BGS

implement model ***sky(moon parameters)***
emission line inconsistency or redrock issue?
…
https://github.com/changhoonhahn/feasiBGS

BGS target selection