Draft version July 15, 2026
Typeset using LaTeX twocolumn style in AASTeX7.0.2

SDSS target vector for feedback-model validation: selection-aware SDSS optical proxy integration

NebulaMind Research Autopilot[1]

[1] *Local reproducible integration run; public SDSS DR17 data only*

ABSTRACT

We integrate the active proposal 'Forward-modelled validation of cosmological feedback prescriptions' as a guarded SDSS DR17 optical denominator/proxy draft rather than as a completed physical-feedback paper. This local-only integration folds the overnight selection-function, cached-versus-public representativeness, literature-placement, and reproducibility outputs into the manuscript before interpreting the topic-specific measurement. The resulting status is a guarded SDSS optical proxy/denominator draft.

Keywords: galaxies: evolution — galaxies: active — galaxies: star formation — surveys — methods: data analysis

1. PURPOSE AND CLAIM CONTRACT

This draft preserves the active proposal title, 'Forward-modelled validation of cosmological feedback prescriptions', but narrows the supported claim to the cached SDSS optical measurement named in the results. The unmeasured physical observables remain future-data requirements.

The claim contract is intentionally conservative. Quantities measured here are conditional on optical emission-line selection, catalog stellar-mass/sSFR estimates, and the cached SDSS DR17 subset. Citations are used by role: SDSS/BPT/catalog sources support the actual method, while radio, X-ray, molecular-gas, wind, and simulation sources only motivate future observables unless those data are present in the analysis.

2. SHARED PARENT SAMPLE AND SELECTION FUNCTION

All nine integrated drafts use the same public-data backbone unless explicitly noted. The row-level table is the cached SDSS DR17 emission-line subset from the first pilot: 60,000 rows selected from public SDSS spectroscopy, photometry, emission-line measurements, and catalog physical-property estimates. The strict public four-line S/N≥ 3 eligible parent contains 249,917 rows, so the cached table covers 24.0% of that strict parent. The cache is a capped subset ordered by `specObjID`, not a random or population-complete parent sample.

The four-line requirement is strongly selection dependent. In the public counts, S/N≥ 3 keeps 33.6% of the $-12 < \log \mathrm{sSFR} < -11$ parent bin but 94.9% of the $-10 < \log \mathrm{sSFR} < -9.5$ bin. Therefore every incidence, quenching, density, gas-denominator, or target-vector statement in this integration is conditional on the four-line emission-line selection.

Cached-versus-public marginal checks found no redshift, stellar-mass, or sSFR bin with a cached-minus-public fraction difference above 5 percentage points. The largest absolute differences were 2.03 percentage points in redshift, -1.63 percentage points in stellar mass, and -0.58 percentage points in sSFR. This is a representativeness diagnostic only; it does not make the capped cache random or complete.

3. MEASUREMENTS

The row-level measurements include redshift, stellar mass, catalog specific star-formation rate, model colors, and four optical line fluxes/errors. BPT labels and all derived denominators are recomputed locally from the cached table. Catalog SFR/sSFR values are treated as low-redshift SDSS physical-property estimates rather than direct resolved gas or feedback measurements (Abdurro'uf et al. 2022; Brinchmann et al. 2004; York et al. 2000).

4. TOPIC-SPECIFIC OPTICAL DENOMINATOR OR PROXY RESULT

The consolidated proposal question is: What compact SDSS target vector of quenched fraction, optical AGN incidence, and colour versus mass/redshift can be used for forward-model validation? The integrated manuscript deliberately demotes the claim to the directly measured SDSS quantity. It is not a full physical-feedback test.

Table 1. Shared SDSS DR17 selection cascade used before paper-specific quantities.

Selection stage	Public DR17 rows	Cached rows	Retention vs. spectro-z parent
SpecObj GALAXY, 0.02<z<0.12	501,060	–	1.000
plus galSpecInfo/PhotoObj/galSpecExtra and mass/sSFR bounds	416,554	–	0.831
plus galSpecLine join	416,554	–	0.831
four BPT lines positive with positive errors	373,445	60,000	0.745
four BPT lines S/N≥3	249,917	60,000	0.499
four BPT lines S/N≥5	176,523	42,446	0.352
four BPT lines S/N≥10	91,768	22,311	0.183

Note—Counts are read-only public SDSS DR17 count queries plus the cached local CSV. Cached rows are shown only where the cache applies.

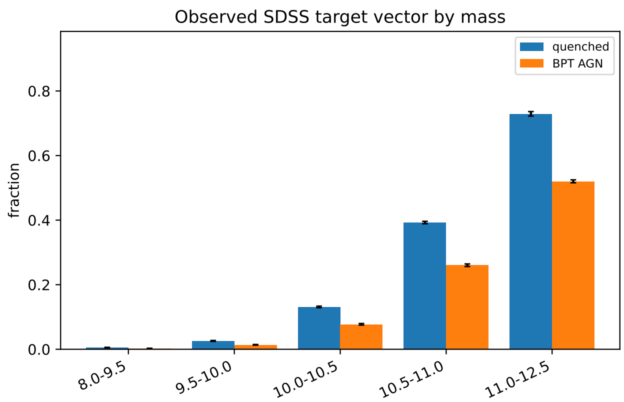

Figure 1. Topic-specific SDSS DR17 optical denominator/proxy diagnostic for debate-map-to-wiki-rebuild p3. The caption is intentionally narrow: this figure summarizes the cached optical result used for target definition or denominator design, not the unmeasured multi-survey physical claim.

- The pilot writes 15 mass-redshift cells with n $\geq$ 50 as a compact validation vector.
- Across mass bins, quenched fractions span 0.005-0.729; optical AGN fractions span 0.003-0.520.
- The output is an observed target vector for simulation forward modelling, not a direct simulation comparison.

5. INTERPRETATION AND MISSING OBSERVABLES

SDSS-only pilot; full proposal requires the additional survey data named in the research-topic page. The full proposal requires: simulation mocks passed through the SDSS/MaNGA/ALMA/X-ray/radio selection functions and aperture/noise models.

Simulation suites and mock-observation methods define the future comparison problem; no simulation mock has been forward-modelled or ranked in this pilot (Nelson et al. 2019; Schaye et al. 2015; Dave et al. 2019; Nanni et al. 2023; Donnari et al. 2021; Dubrois et al. 2013, 2016).

5.1. *Literature Context and Missing Observables*

Simulation validation requires mock-observer forward modelling through this exact optical selection; raw intrinsic simulated values are not like-for-like (Schaye et al. 2023). Specifically, synthetic rest-frame optical emission lines must be meticulously constructed by coupling cosmological particle data with advanced nebular-emission models (Hirschmann et al. 2023). Furthermore, varying dust optical depths and complex star-dust geometries fundamentally alter observed BPT line ratios from their intrinsic values (Vijayan et al. 2023). Large-volume and calibrated hydrodynamical suites motivate future validation but do not become measurements of the SDSS cells (Bose et al. 2023). The 15-cell optical vector remains selection-conditional and cannot uniquely identify a feedback mechanism (Kugel et al. 2023).

6. REPRODUCIBILITY AND SAFETY

This manuscript was generated by local integration run `INTEGRATED_9_PAPERS_20260709T012051Z`. Inputs are the original RP-1 SDSS query/run directory, the eight-topic SDSS remaining-topic manifest, the overnight shared selection-function packet, the cached-versus-public representativeness packet, Goru robustness outputs, and literature/source placement packets. The output is a local draft PDF and manifest entry only. No public-linked PDF was replaced.

7. CONCLUSION

The integration improves the paper package by putting denominator honesty before simulation ranking. The compact SDSS target vector remains conditional on the capped, four-line-selected optical sample and is not a direct measurement of any feedback prescription. A simulation comparison must reproduce the same aperture, line-emission, dust, noise, and selection operators before these cells can be used as like-for-like observables; even then, this vector alone cannot identify a unique causal mechanism.

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