



Contribution ID : 10

Type : **Poster**

## BEAMS with Bias Correction: Is It Well-Calibrated?

*Wednesday, 28 October 2026 14:21 (1)*

Type Ia supernovae (SNe Ia) are important standardizable candles used to measure cosmic distances and constrain the expansion rate of the universe. A central challenge in analyzing these transients is Malmquist bias, which the Bayesian Estimation Applied to Multiple Species (BEAMS) with Bias Correction (BBC) framework aims to correct. While BBC yields unbiased cosmological constraints for small samples, its underlying BiasCor lookup table may fail to maintain performance as sample sizes scale up significantly.

In this work, we evaluate the calibration of the BBC framework using backward simulation-based inference. We simulate surveys containing 2,000, 5,000, and 20,000 pure SNe Ia under the precise cosmological model assumed by the BBC BiasCor table. Passing these samples through the BBC pipeline, we perform Simulation-Based Calibration (SBC) to test whether the framework is properly calibrated.

Even within this idealized setting – no sample contamination and model misspecification – we show that the BiasCor component introduces systematic overconfidence that worsens as sample size increases. Furthermore, the BiasCor correction interacts with the parameter degeneracy to underestimate uncertainty specifically along that axis rather than uniformly. As next-generation surveys like the Vera C. Rubin Observatory dramatically scale up SNe Ia datasets, these findings highlight important limitations in the current BBC pipeline and motivate the development of scalable and fully calibrated frameworks.

### Did you give a contributed talk at CASCA 2026?

Yes

### If you are selected for a poster, would you be interested in giving a short flash talk on your work?

Yes

### What is your career level?

Undergraduate

### Which keyword describes the area of focus of this talk?

Astrostatistics

**Primary author(s) :** VO, Linh

**Co-author(s) :** Dr STONE, Connor; Prof. HLOŽEK, Renée (Dunlap Institute for Astronomy and Astrophysics, Université Laval)

**Presenter(s) :** VO, Linh

**Session Classification :** Transients & Cosmology