

# Quasars as a New Standard Candle

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Distance Ladder

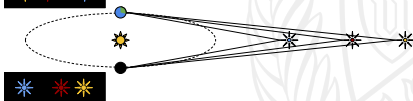
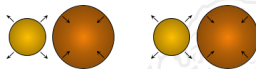
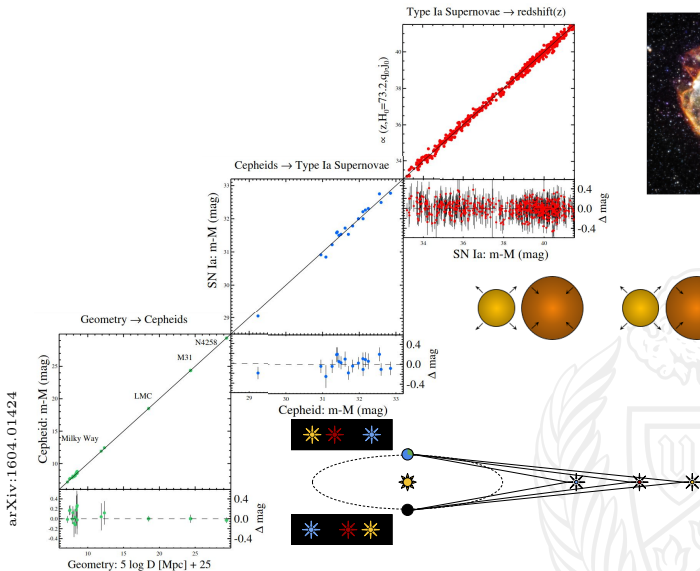
Advantages of Quasars

Issues with Quasars

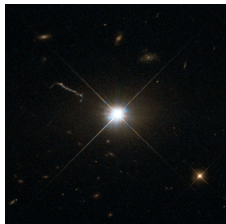
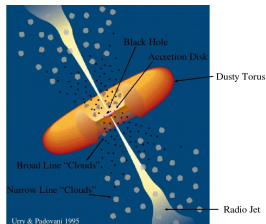
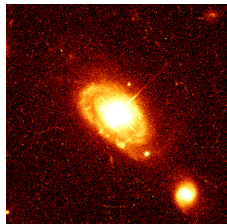
Our Work (slope-redshift relation)

Conclusion

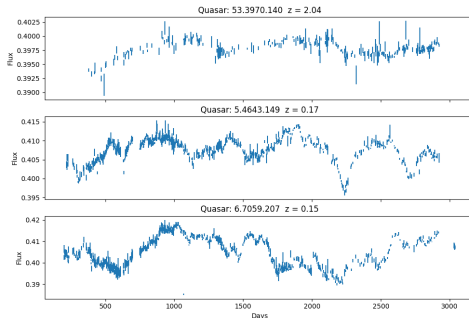




arXiv:1604.01424

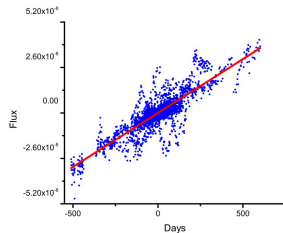
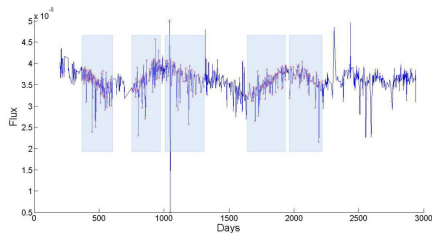


1. observation times can last on order of decades
2. typically very distant with a peak population in the range  $1.7 < z < 2.7$
3. number of flagged quasars exceeding  $7.5 \times 10^5$



1. high luminosity dispersion across all wavelengths
2. underlying physics not extremely well understood
3. no obvious discernible pattern

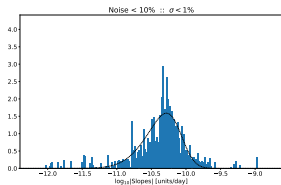
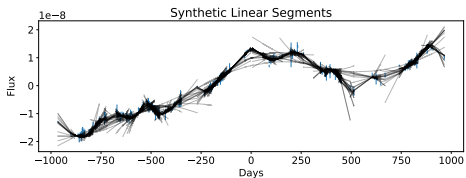
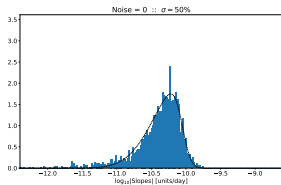
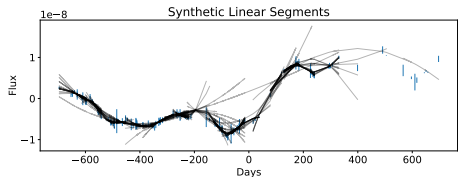
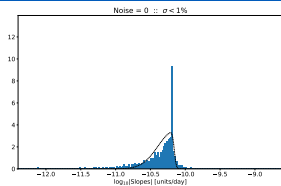
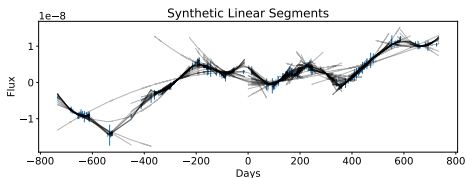
[arxiv:1204.5191v2]

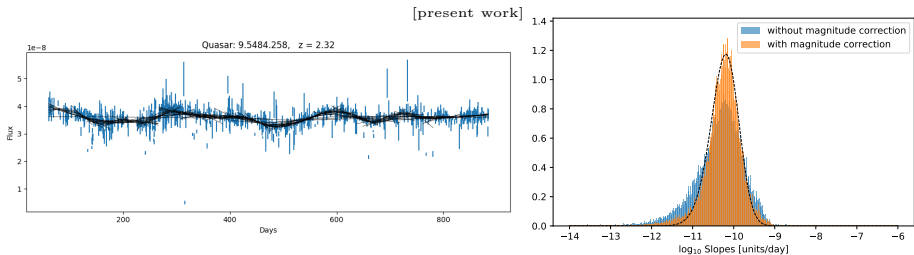


$$s_{OBS}(1+z) = s_{QSO}$$

- ▶ In previous work, a simple eyeballing method was applied to spot linear trends.
- ▶ Proved successful in determining the redshift of a quasar to within 1%.
- ▶ Only applied to 13 quasars.

# s-z relation (synthetic data)





► Improvements:

- Allows for an objective and reproducible determination of the existence of a preferred variational slope.

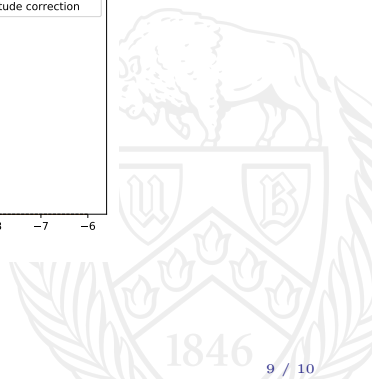
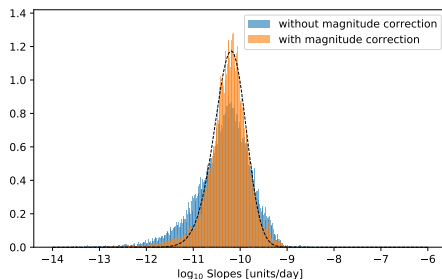
► Issues:

- Still unclear where random noise in data becomes relevant.
- Microlensing and other anomalous events can have large unwanted effects.
- Requires continuous sampling at high frequency (few quasar surveys have frequent enough sampling at present).



- ▶ Quasars could be a significant contribution to the distance ladder.
- ▶ A simple slope-redshift relation proves to be common in well sample quasars.

$$s_{OBS}(1+z) = s_{QSO}$$



The End

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# Backup



