

Towards Precision Cosmology with Galaxy Catalogues

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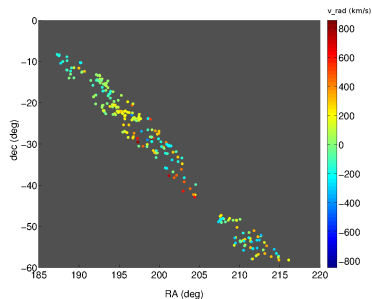
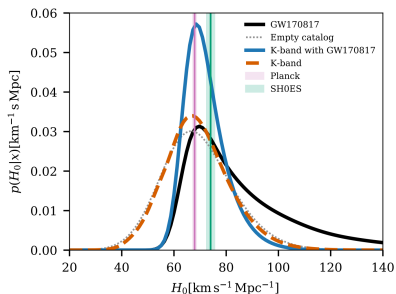


October 24, 2023

Hubble constant estimation

$$c z = H_0 d$$

- ▶ Distance from GW, redshift from galaxy catalogue
- ▶ No EM signal: statistical method
- ▶ Latest O3 result using GLADE+: $68^{+8}_{-6} \text{ km s}^{-1} \text{ Mpc}^{-1}$



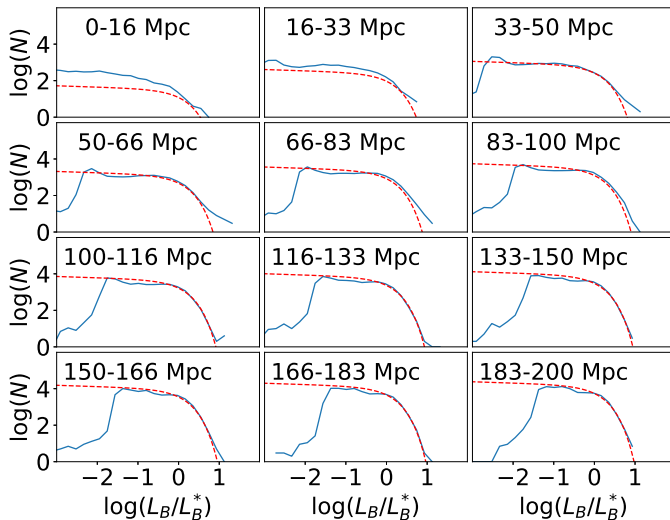
- ▶ Cross-matching five astronomical catalogues
- ▶ ~ 23 million galaxies
- ▶ Improved peculiar velocity estimates
- ▶ Stellar mass estimates & BNS merger rates provided
→ better galaxy weighting

`glade.elte.hu`

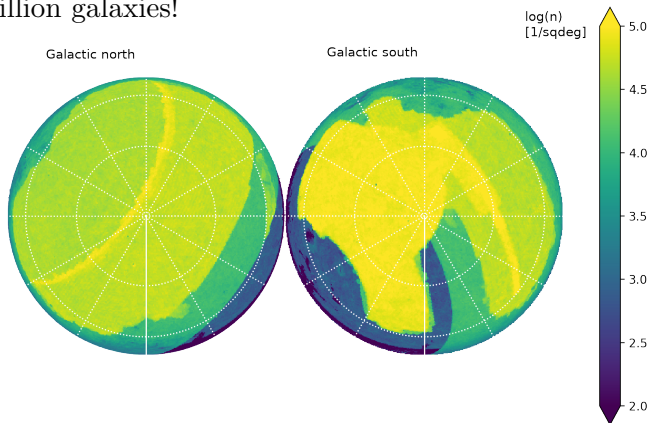
Dályá et al. 2022, arXiv 2110.06184

Sources of uncertainty from the EM side

Missing galaxies, uncertainties in redshift, luminosity, etc.

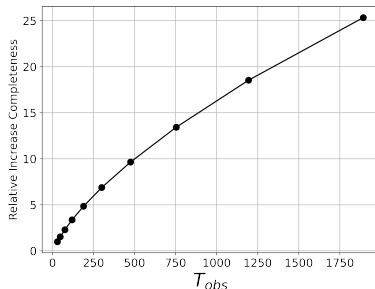
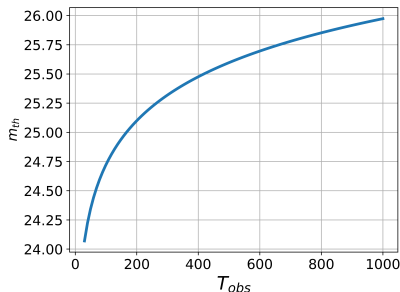


- ▶ LS DR8 + Duncan, LS DR9 + Zhou, LS DR10
- ▶ Pan-STARRS \times CatWISE
- ▶ SkyMapper, Siena Galaxy Atlas, SDSS spectro-z
- ▶ 1 billion galaxies!



Targeted dark siren follow-up

- ▶ How long does it take to increase our completeness with a given amount?
- ▶ Event at 500 Mpc, using Vera Rubin Observatory
- ▶ One pointing; have to take into consideration the localization area



- ▶ M. L. Brozzetti, G. Greco, University of Perugia
- ▶ Interactive web tool to evaluate the completeness for a given GW detection
- ▶ Optimizing follow-up observations → galaxy discoveries?
- ▶ Soon you can submit your newly discovered galaxies!

