FACULTY OF SCIENCES

Dark siren H_0 measurement using subsets of galaxy catalog

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COSMOLOGY WITH GWS

- Low redshift:

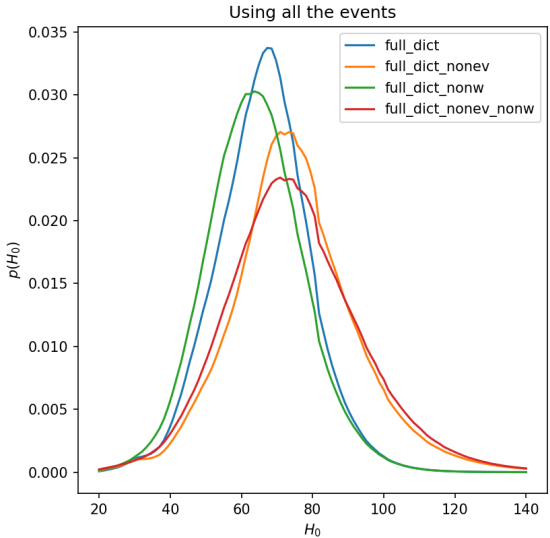
$$d_L \approx \frac{cz}{H_0}$$

- H_0: measurement techniques:
  - Cepheid Photometry: dependent on cosmic distance ladder
  - CMB: from models
  - GW: comparable to cepheid photometry but independent of cosmic distance ladder
    - Bright siren: EM counterparts for GW signals
    - Dark siren: no EM counterparts $\Rightarrow$ galaxy catalogs

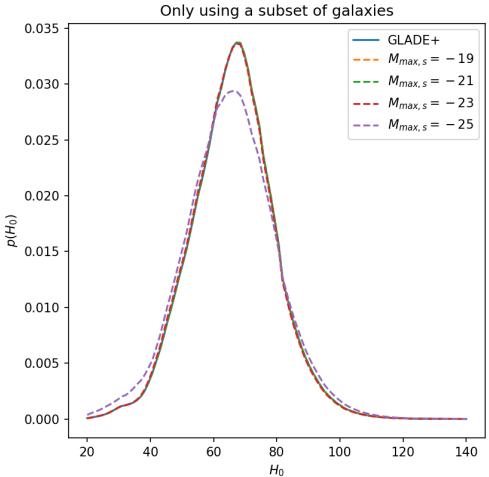
DARK SIREN ANALYSIS

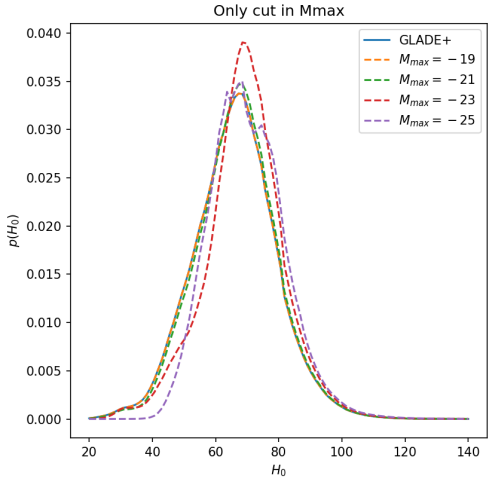
- Bayesian statistics
- a number of potential host galaxies $\Rightarrow$ LOS redshift prior
- catalog incompleteness: host galaxy can be present in the galaxy catalog or not
  - in-catalog part: weighted sum of Gaussians
  - out-of-catalog part: fill using Schechter function
- this project: limit the potential host galaxies (only bright galaxies)
  - in-catalog part: make subsets of the galaxy catalog (Mmax_subset)
  - out-of-catalog part: maximum magnitude limit for the Schechter function (Mmax_cut)
- weighing: luminosity, evolving host probability with redshift !

EFFECTS OF WEIGHING

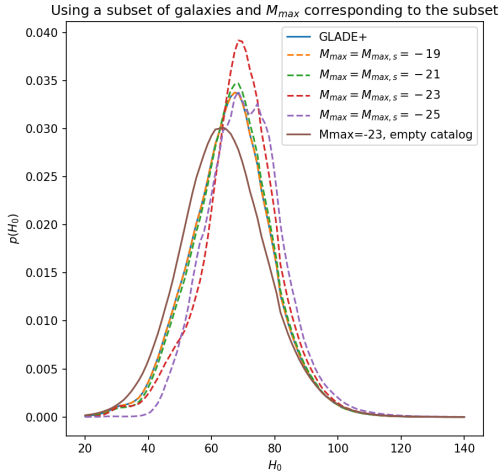


ASSUMING EVOLVING HOST PROBABILITY AND LUMINOSITY WEIGHING

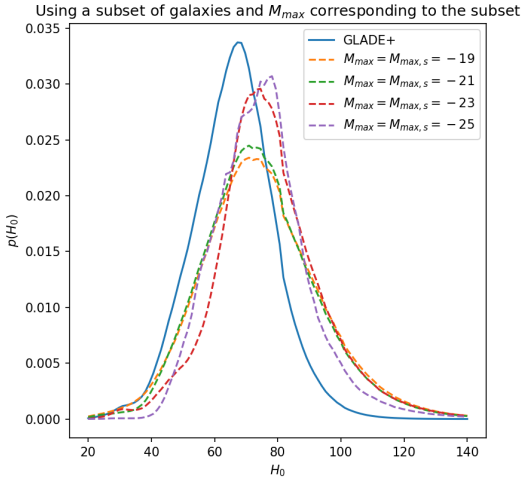




ASSUMING EVOLVING HOST PROBABILITY AND LUMINOSITY WEIGHING



ASSUMING NON-EVOLVING HOST PROBABILITY AND NO LUMINOSITY WEIGHING



Some observations and future plans

- Mmax_subset: shift to a lower value with higher uncertainty
- Mmax_cut: shift to a higher value with lower uncertainty
- Mmax_cut_subset: slightly higher value with lower uncertainty
- out-of catalog part dominating: due to incomplete catalog?
  - Will a deeper catalog be dominated by the in-catalog part?
- Why the apparent opposite behavior of in-catlog and out-of-catalog part?
- Subsets using weighted sampling: Will the have the same effect as evolving host probability and luminosity weighing?
- Deeper catalog: simulations (BUZZARD)