



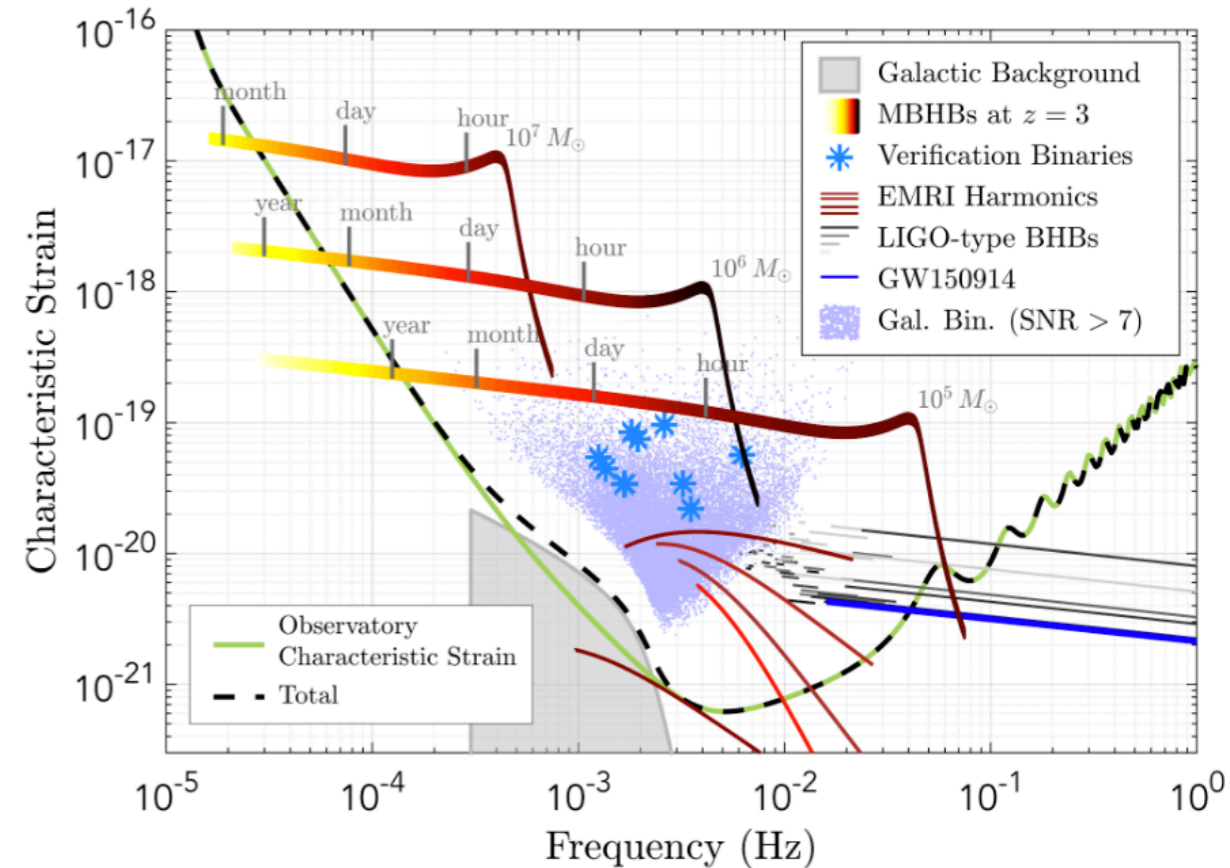
Applying LIGO-Virgo continuous gravitational wave analysis methods to LISA data

**Evan Goetz
University of British Columbia**

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Analyses for GW signals in LIGO-Virgo and LISA

- LIGO-Virgo data is noise dominated
- LIGO-Virgo compact binary coalescence analyses
=> matched filtering for transient signal
- Continuous wave analyses of signals from rapidly rotating neutron stars
=> matched filtering* for quasi-monochromatic signal
- Certain classes of LISA sources are quasi-monochromatic on timescale of months to years



LISA mission proposal for ESA L3 mission

* CW searches are often more complicated than matched-filtering²

CW analysis parameter estimation

- Parameters for an isolated neutron star emitting monochromatic gravitational wave signal

$$\vec{\lambda}_{\text{NS}} = \{\alpha, \delta, f, \dot{f}, h_0, \cos \iota, \psi, \phi_0\}$$

- Long integration times required (expected signal is noise-dominated)
- Matched-filter analysis only practical for pulsars with timing solution
- MCMC techniques to perform parameter estimation
- With less knowledge, unknown parameters have to be searched over, often with suboptimal methods due to computing constraints

Application to LISA sources

- Certain qualitative overlap LIGO-Virgo CW signal/analyses and LISA signal/analyses
- Natural extension of LIGO-Virgo CW parameter estimation techniques

$$\vec{\lambda}_{\text{CB}} = \{\alpha, \delta, h_0, m_1, m_2, \cos \iota, \psi, \phi_0, \vec{s}_1, \vec{s}_2, e, \dots\}$$

- CW Search techniques potentially useful for low-SNR or “obscured” signals
- Useful to search the “confusion limited” regime...?

Next steps

- Investigate utility of LIGO-Virgo continuous wave search methods
- Extending CW parameter estimation method/software to LISA sources
- Understanding under what conditions these are most beneficial/useful (e.g., CW searches the low-SNR LISA regime?)
- Thanks for your attention!

Extra slides

Possible sources of interest

- CW methods most useful for slow phase evolution, e.g., compact binary well-before merger
- Compact binaries; NS-NS, NS-BH, BH-BH
- Extreme mass ratio (before the merger)
- BH binaries + SMBH (triple system)
- Other exotic systems?