

LISA Analysis Tools Workshop

April 15–18, 2024

Talk by: Michael Katz, NASA MSFC



LATW Organizing Committee



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Structure of the workshop



Intro talk

Background info
Source information



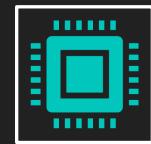
Tutorials

Group work
Tasks and questions



Webpage:

[indico.physics.auth.gr/
e/LATW](https://indico.physics.auth.gr/e/LATW)



Codes/install:

[github.com/mikekatz0
4/LATW](https://github.com/mikekatz04/LATW)



LATW Slack

Mon, Tues, Wed:

1 Tutorial in the morning with 15 min coffee break midway
1+ hr lunch break.
1 Tutorial in the afternoon with 15 min coffee break midway.

Thursday is challenge day/workday.

How to approach the workshop

A lot of material (not easy either)

Not a lot of theory or background. **A lot of coding.**

Focus on the coding for now

Take it slow, read the documentation, and try things

Discuss with your group (share screen when needed)

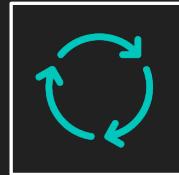
Remember the individual codes have tutorials!

These are examples, they work, but are not ready for a paper...

Why experiment? Why try new things?



Remote workshops allow much greater access and contribute to DEI.



Iterate towards the best setup for remote workshops.



Easier on the organizers. Reproducible and low-cost.

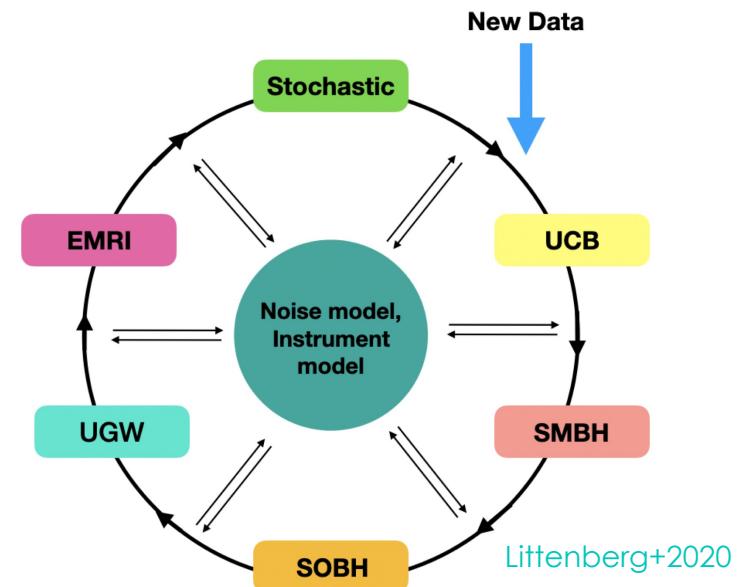
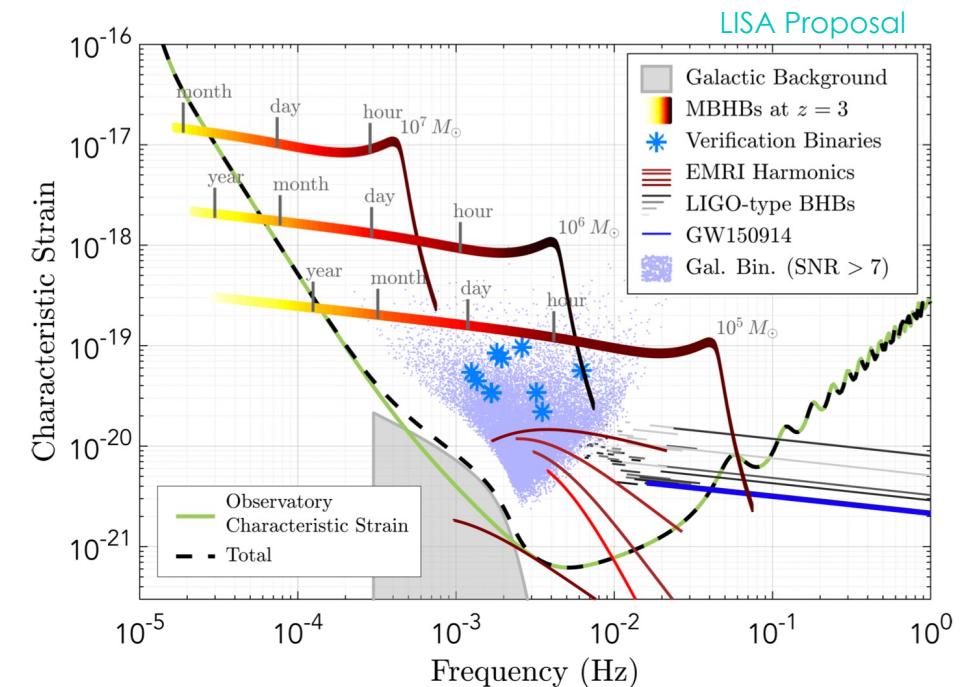


More opportunities for early career scientists to learn and interact with the community.

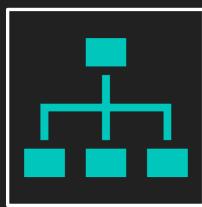
If we want to make positive, lasting change and increase access, we need to try new things. Remote conferences maximize the chance for those without funding or ability to travel to participate in our community. We need to recognize the power and reach of remote workshops, iterate towards better solutions, and commit to this as a new repeatable structure within our community.

LISA Global Fit

- Fit multiple source types
 - All in one data stream
- Fit noise and instrumental information
 - Gaps, glitches, sensitivity drift, etc.
 - No source-free data
- Extremely large-dimensional statistical fit ($D \sim 10^5$)
- Low-latency analysis
- Large variety of stakeholder interests



What is LISA Analysis Tools?



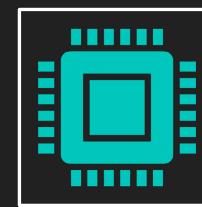
Cohesive set of tools with **similar structure**, **documentation**, and **tutorials** designed for **LISA** analysis.



Open-source



Community-oriented and community-developed



High-performance computing across CPU nodes and/or **GPUs**.

Hierarchical Structure within LAT Environment

Fast and accurate waveform generation

Prototyping sub-global fit analyses

Building your own global fit

Publicly available full global fit pipeline

Codes in within LISA Analysis Tools

LISA Analysis Tools
(lisatools)

Fast EMRI
Waveforms (few)

BBHx (bbhx)

GBGPU (gbgpu)

lisa-on-gpu
(fastlisaresponse)

Eryn (eryn)

Future plans

If you are interested in
doing the work of one of
these projects, please let
me know.

Stochastic
backgrounds

Product-space
MCMC

Flexible ODE
integrators

Global fit code
coming

Integrate
lisacatools
(Littenberg+)

More waveform
types (e.g.
EMRIs, lisabeta)

GPU parallelized
multiple
ensemble
samplers

GPU pip install

Tutorial 1: LISA Analysis Tools basics

