



spectre



# *Spectre* Goals

## Science:

- GWs from binary mergers
- Core-collapse supernovae

## Computing

- Exascale machines
- Scalability

## Community code

- Documentation, tutorials, support, etc.

# What we thought we needed

- DG
- Tasking with Charm++
- Too much C++

# You win some, you lose some.

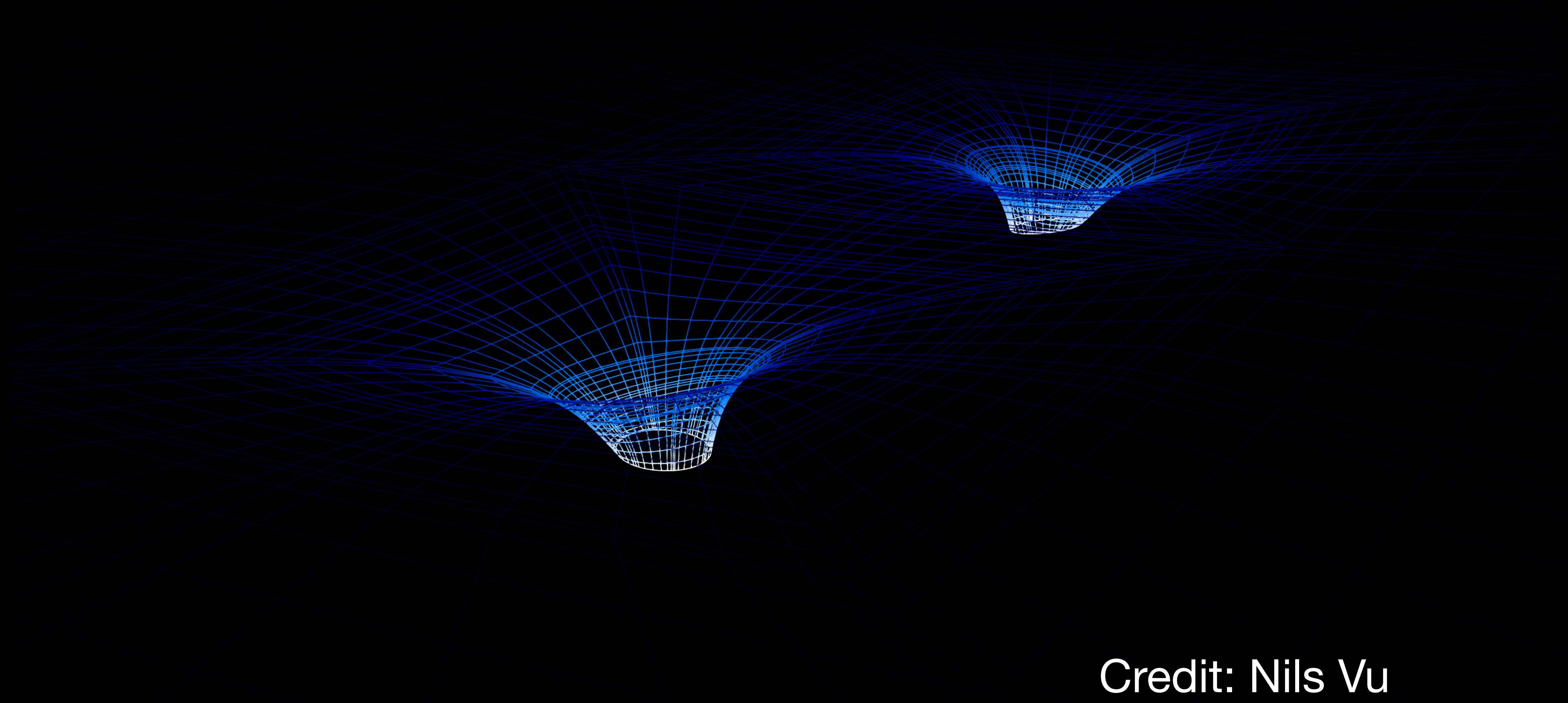
- ~~DG~~
  - Don't trust applied mathematicians (?) 😜
- ~~Charm++ and tasking (?)~~
  - Don't trust documentation (?) 😕
  - GPUs recently made major advancements 😢 😭 😅
- ~~Too much C++~~
  - Don't trust grad student (me!) (?) 😇 😊

# You win some, you lose some.

- ~~DG~~ -> DG-FD hybrid
- Tasking (currently with some Charm++)
  - GPU discussions and early tests
- ~~Too much C++~~ -> discussions and efforts to simplify

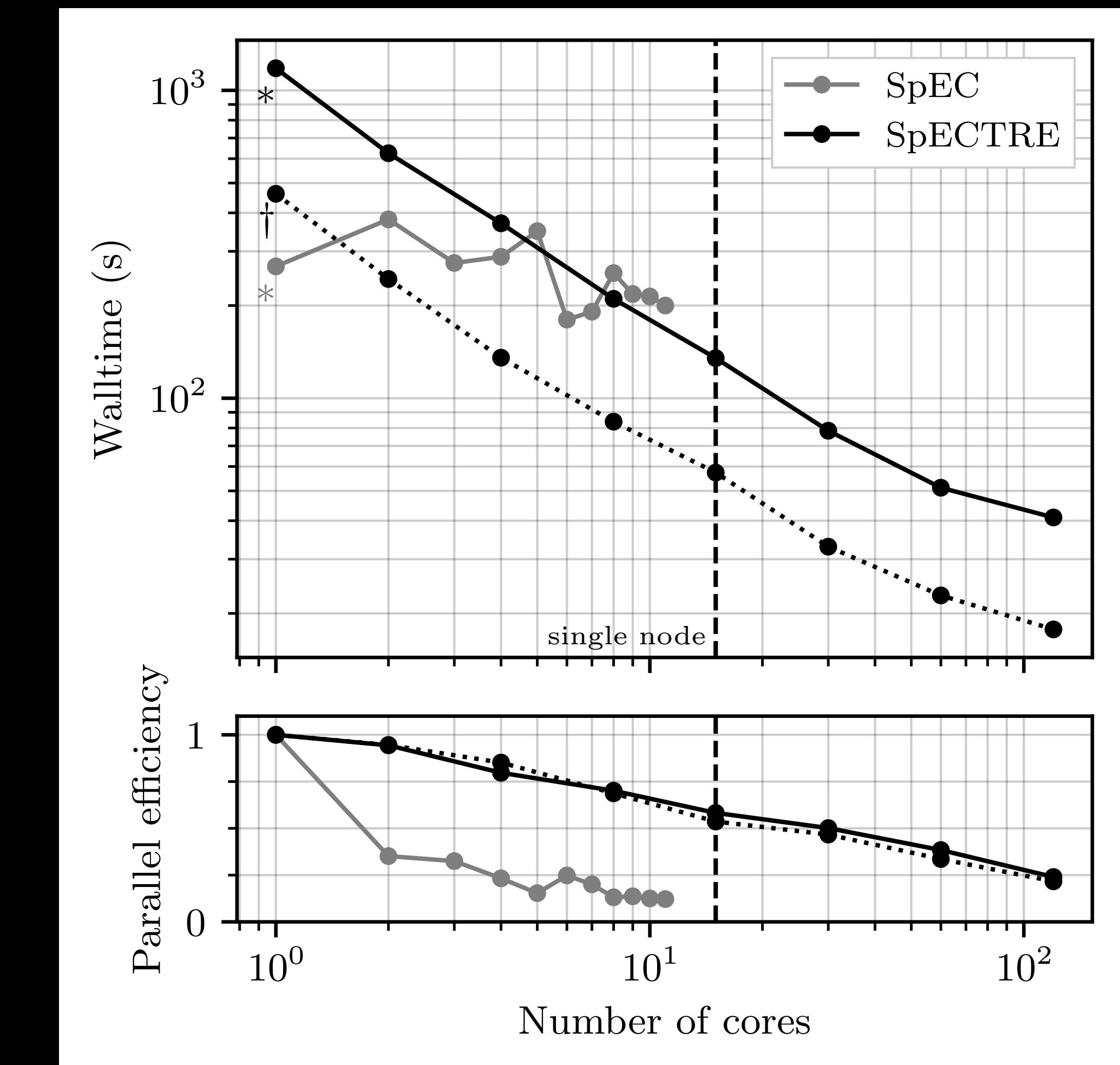
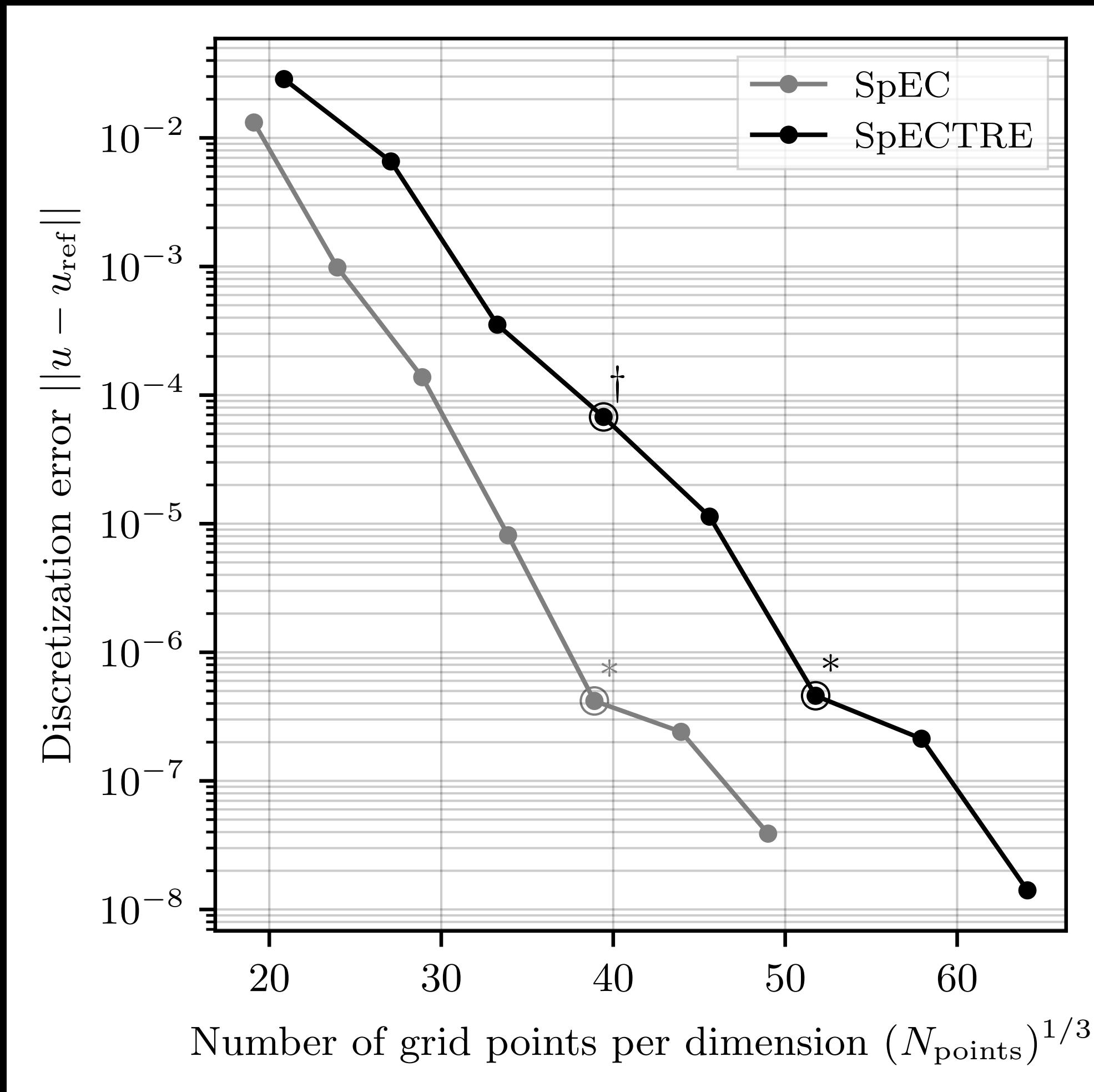
Cool. So what *can* we do?

# Initial Data



Credit: Nils Vu

# Initial Data



# Initial Data

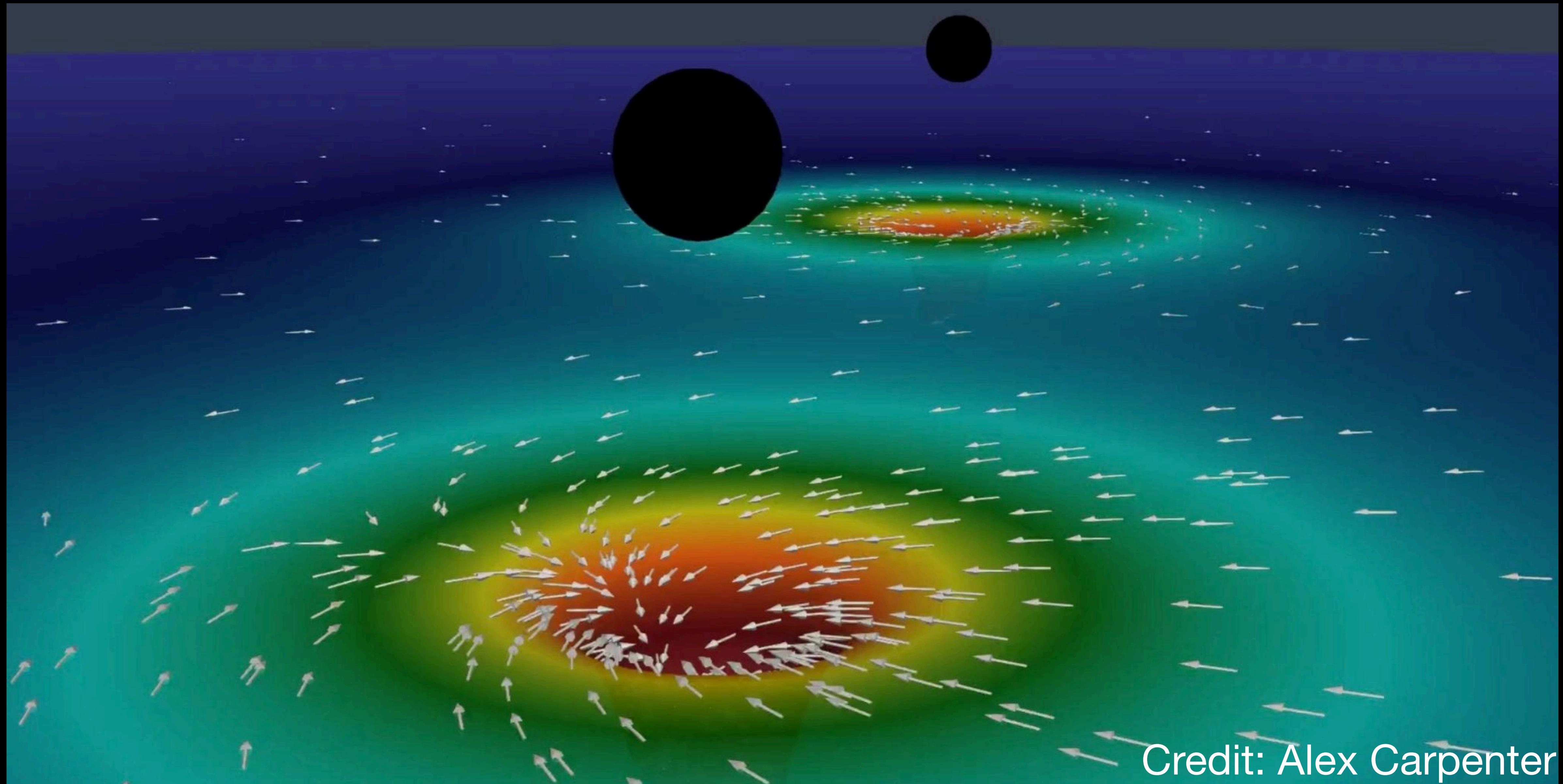
Works:

- Core BBH
- Import to evolution

In progress:

- Eccentricity control
- Parameter control
- BNS

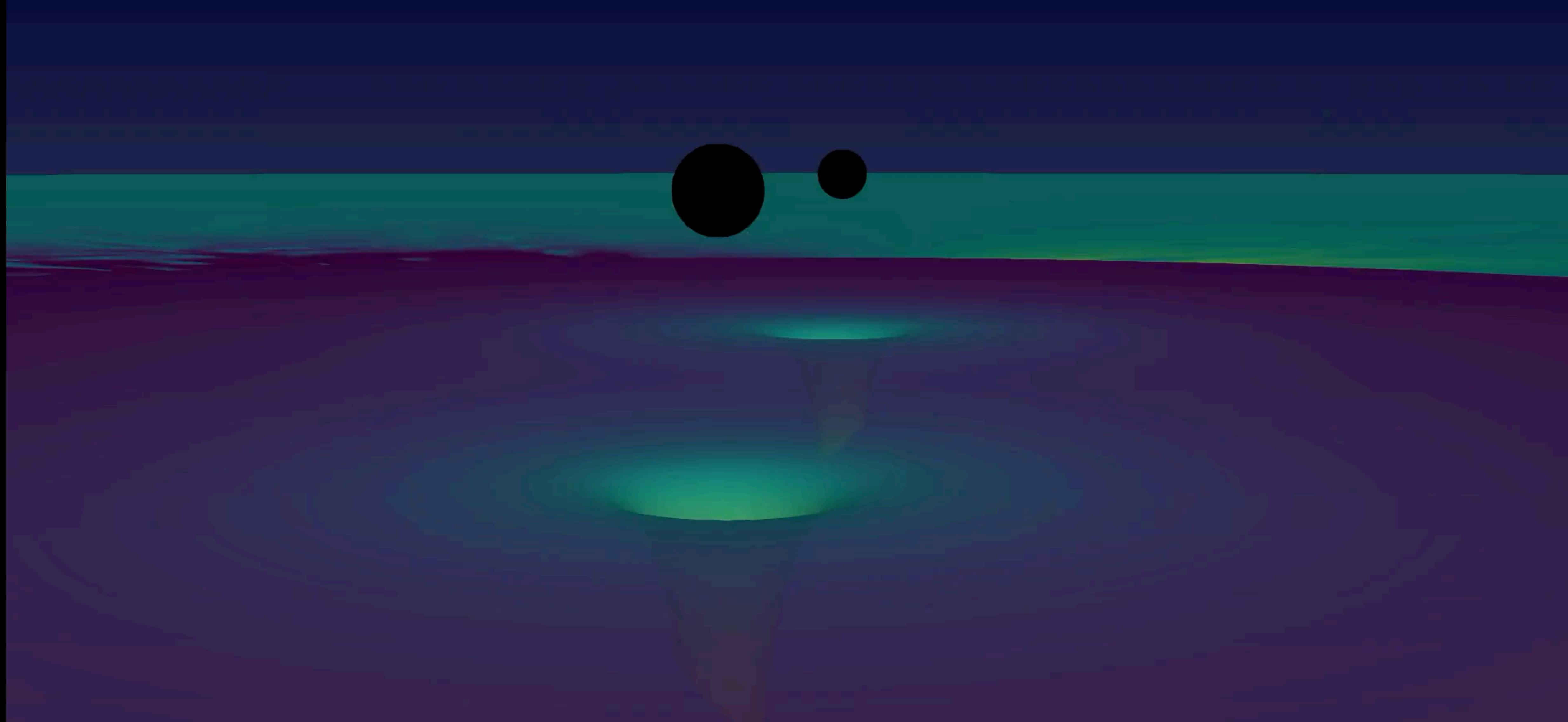
# Binary Black Hole Mergers



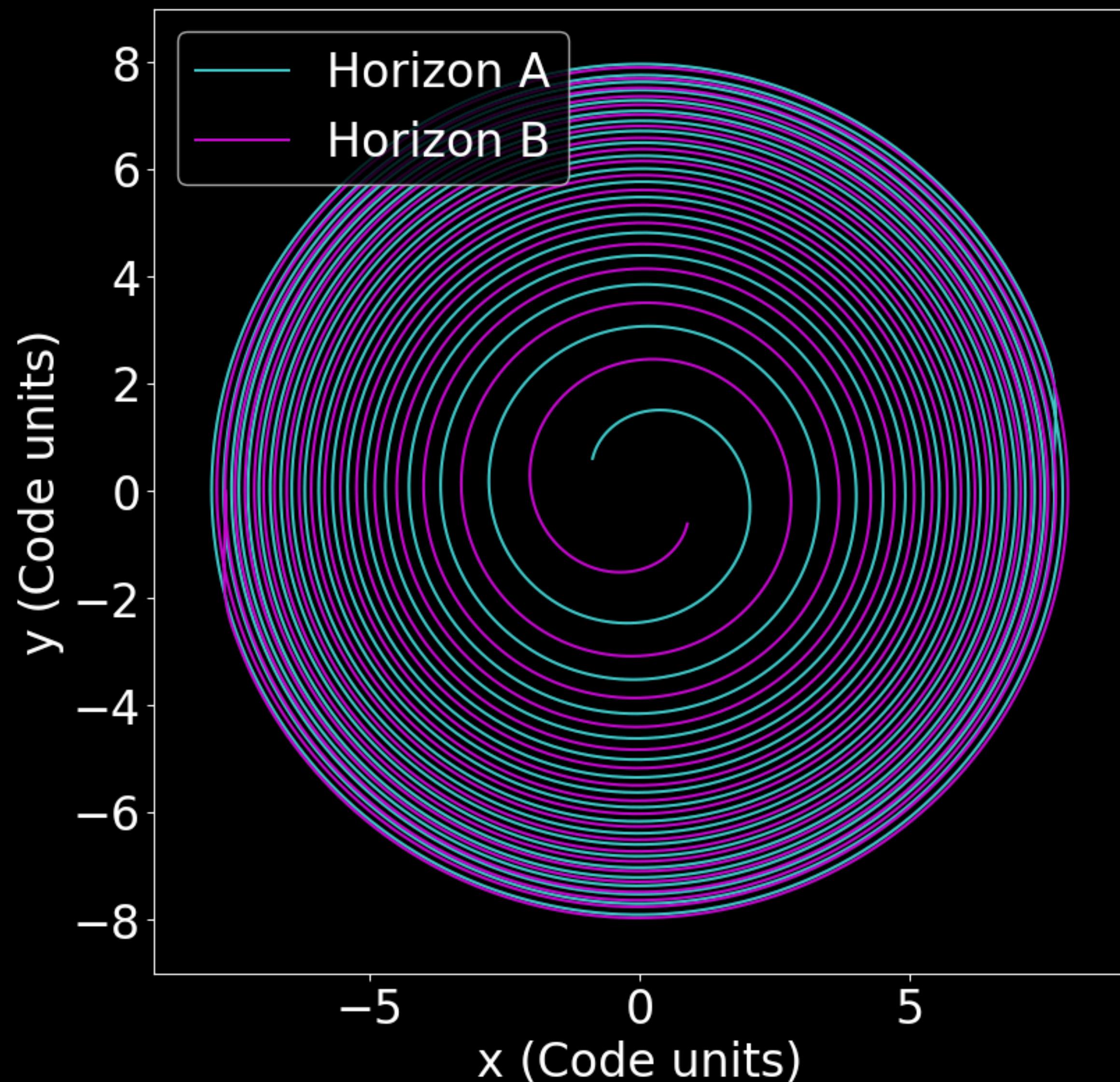
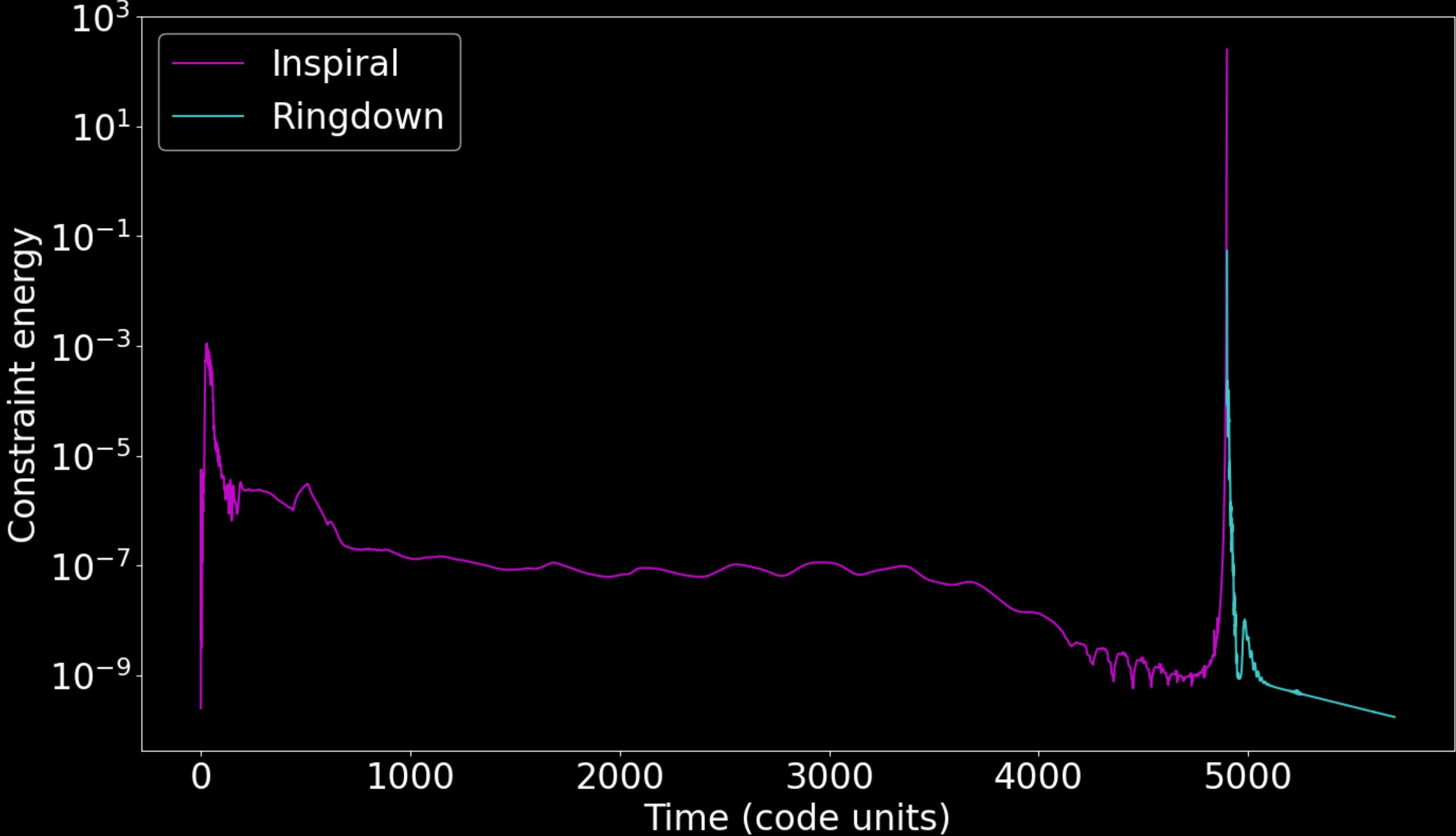
Credit: Alex Carpenter

Time: 0.0M

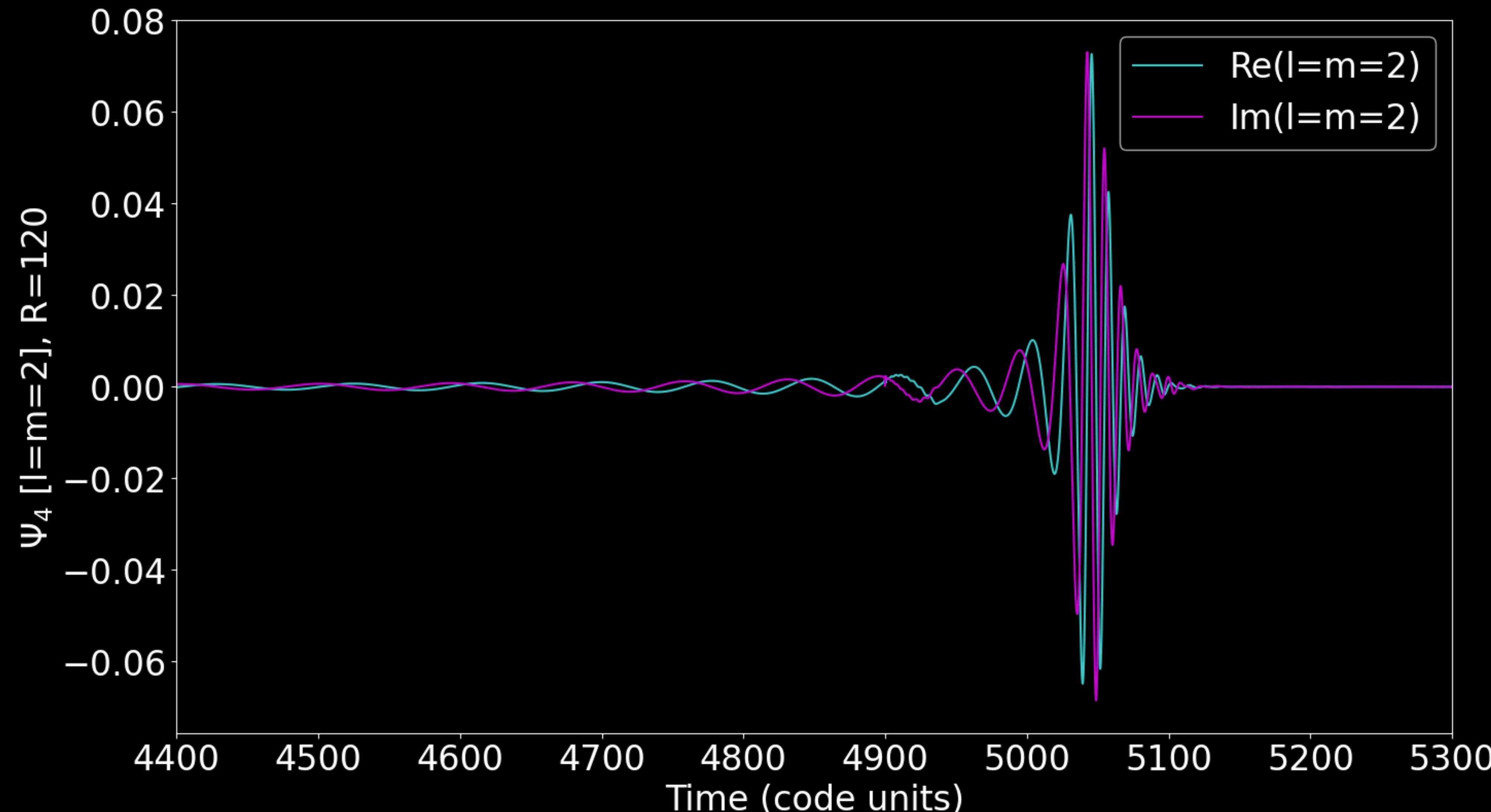
Credit: Alex Carpenter



# Binary Black Hole Mergers



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# Binary Black Hole Mergers

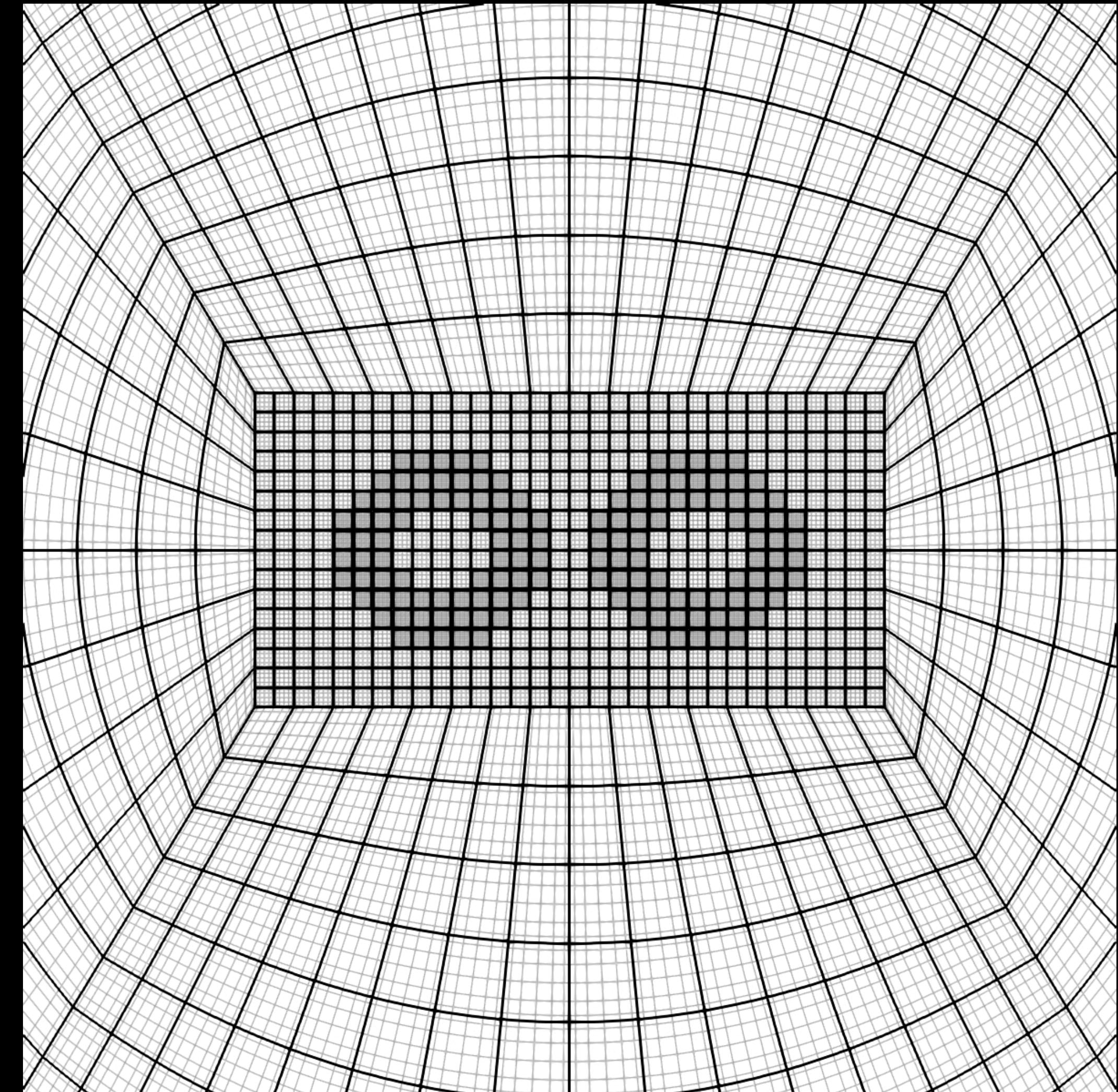
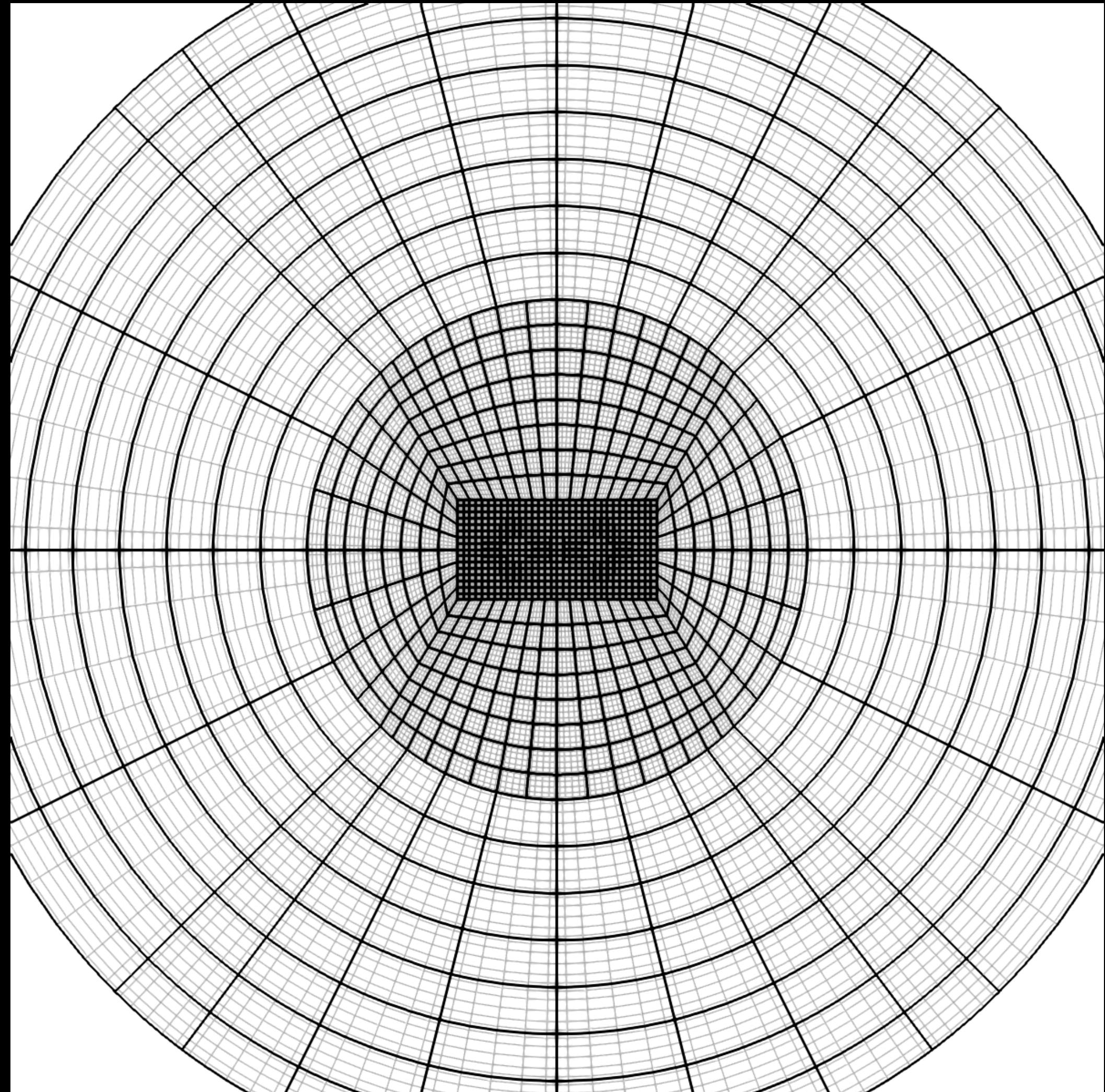
Works:

- Inspiral
- Ringdown

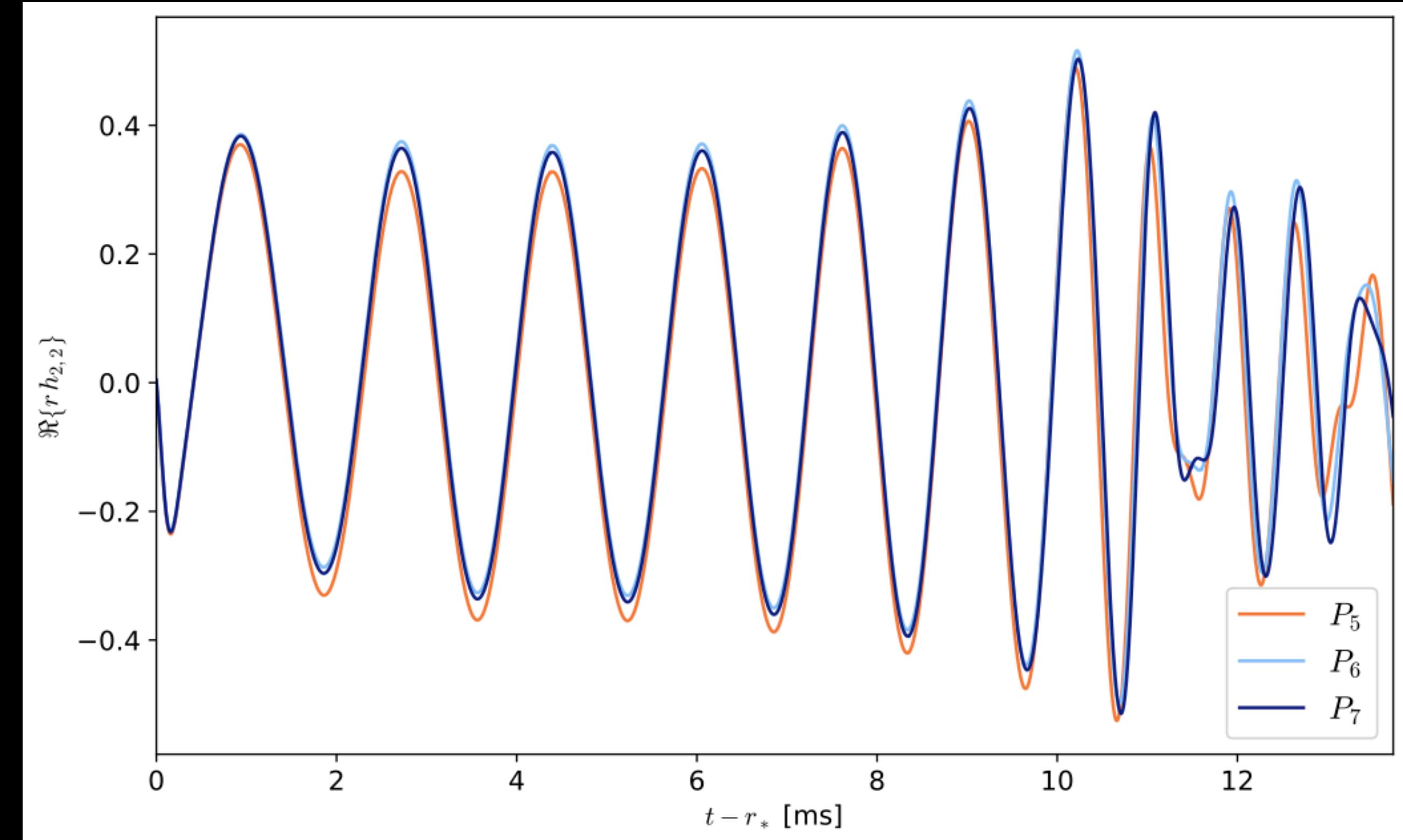
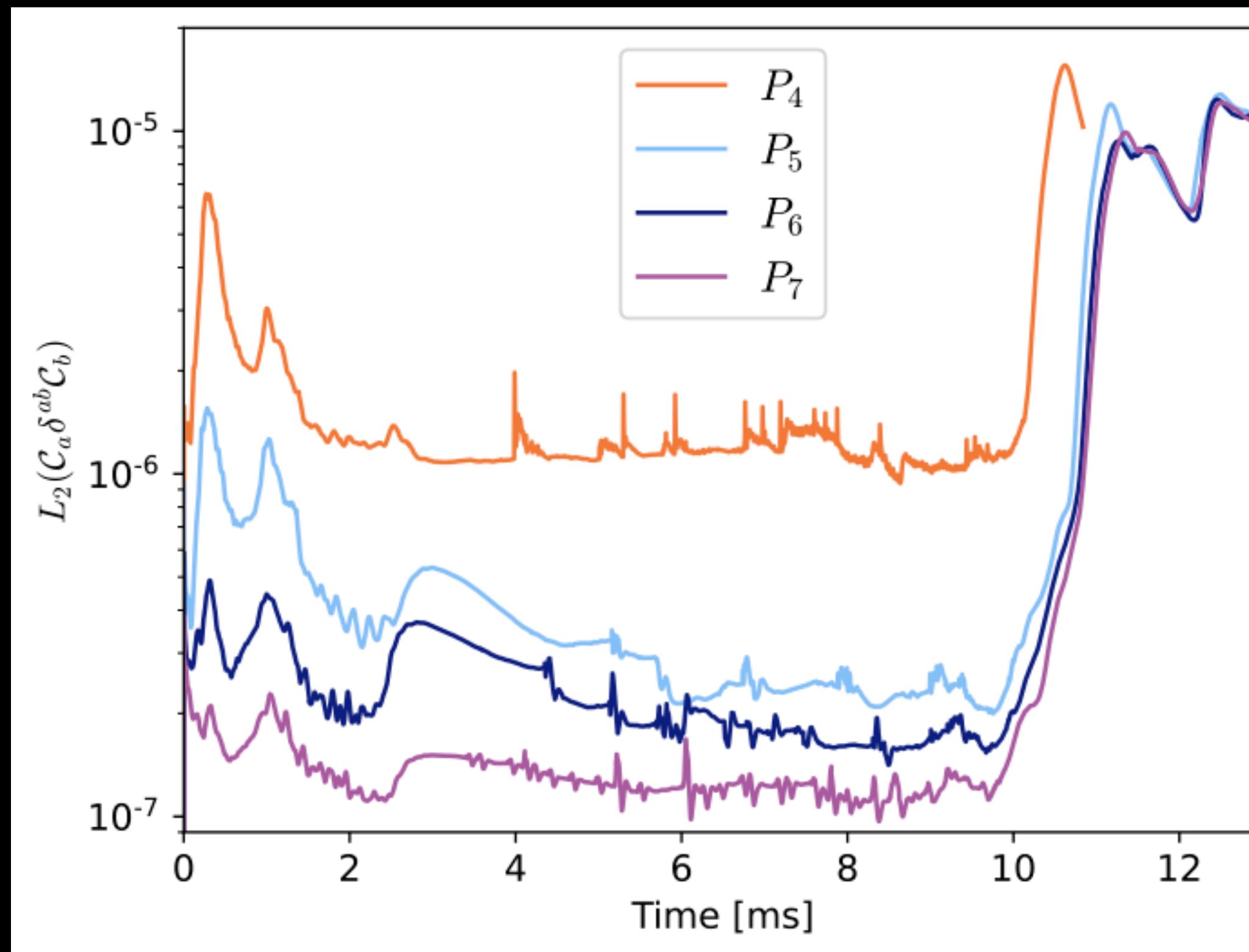
In progress:

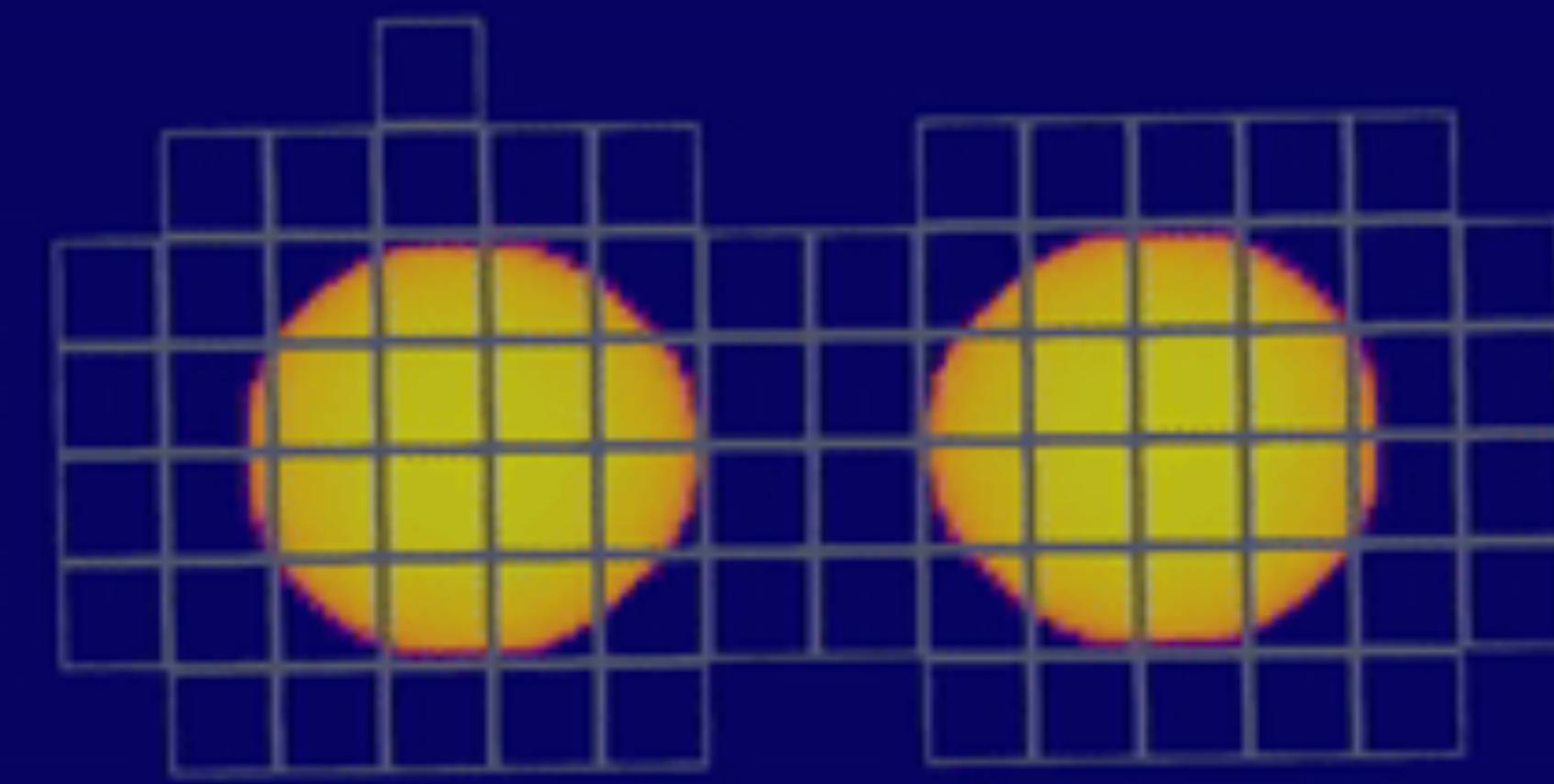
- Merger
- Automatic transition to ringdown

# Binary Neutron Star Mergers



# Binary Neutron Star Mergers





Credit: Francois Foucart

# Binary Black Hole Mergers

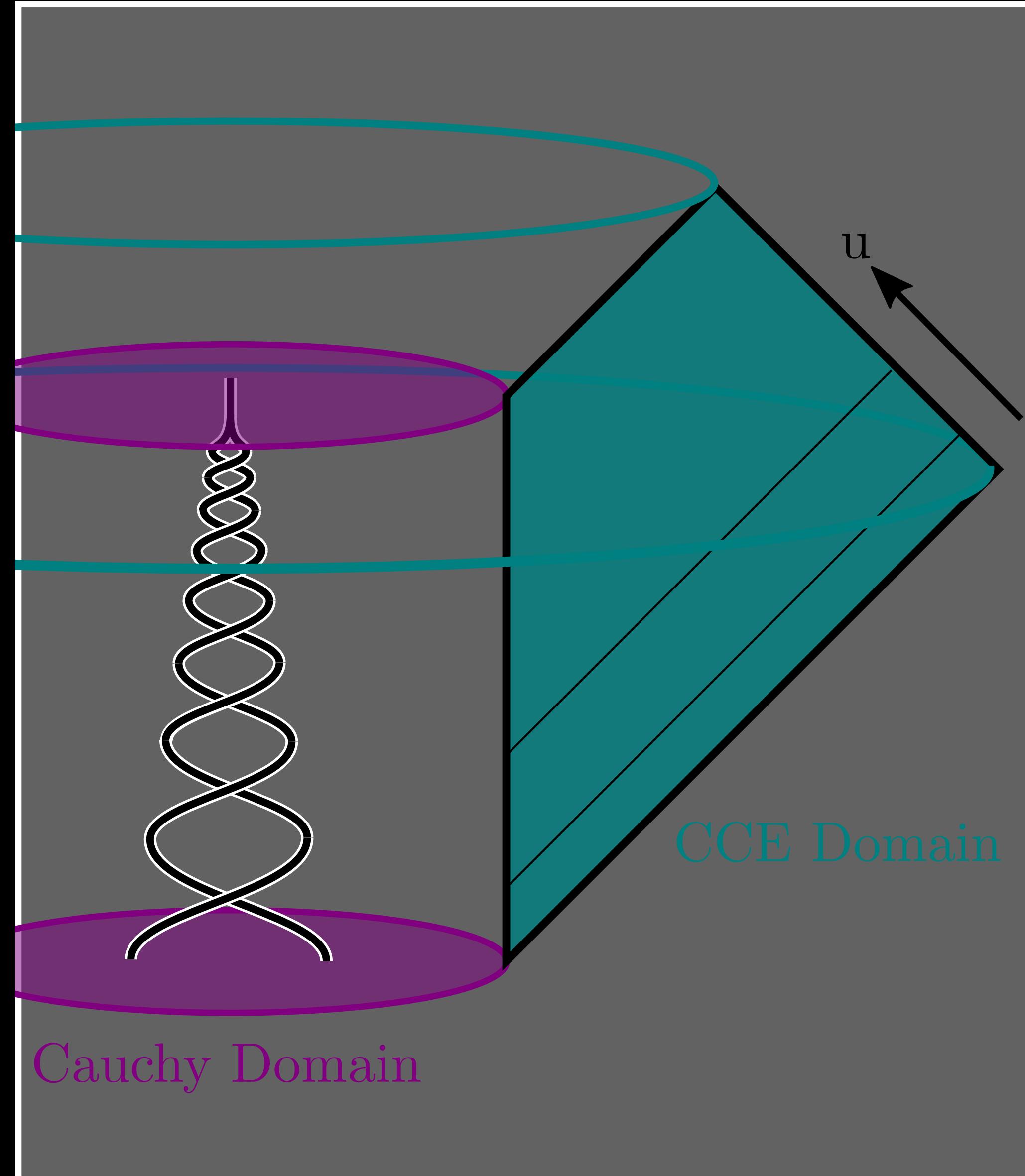
Works:

- Inspiral
- Merger

In progress:

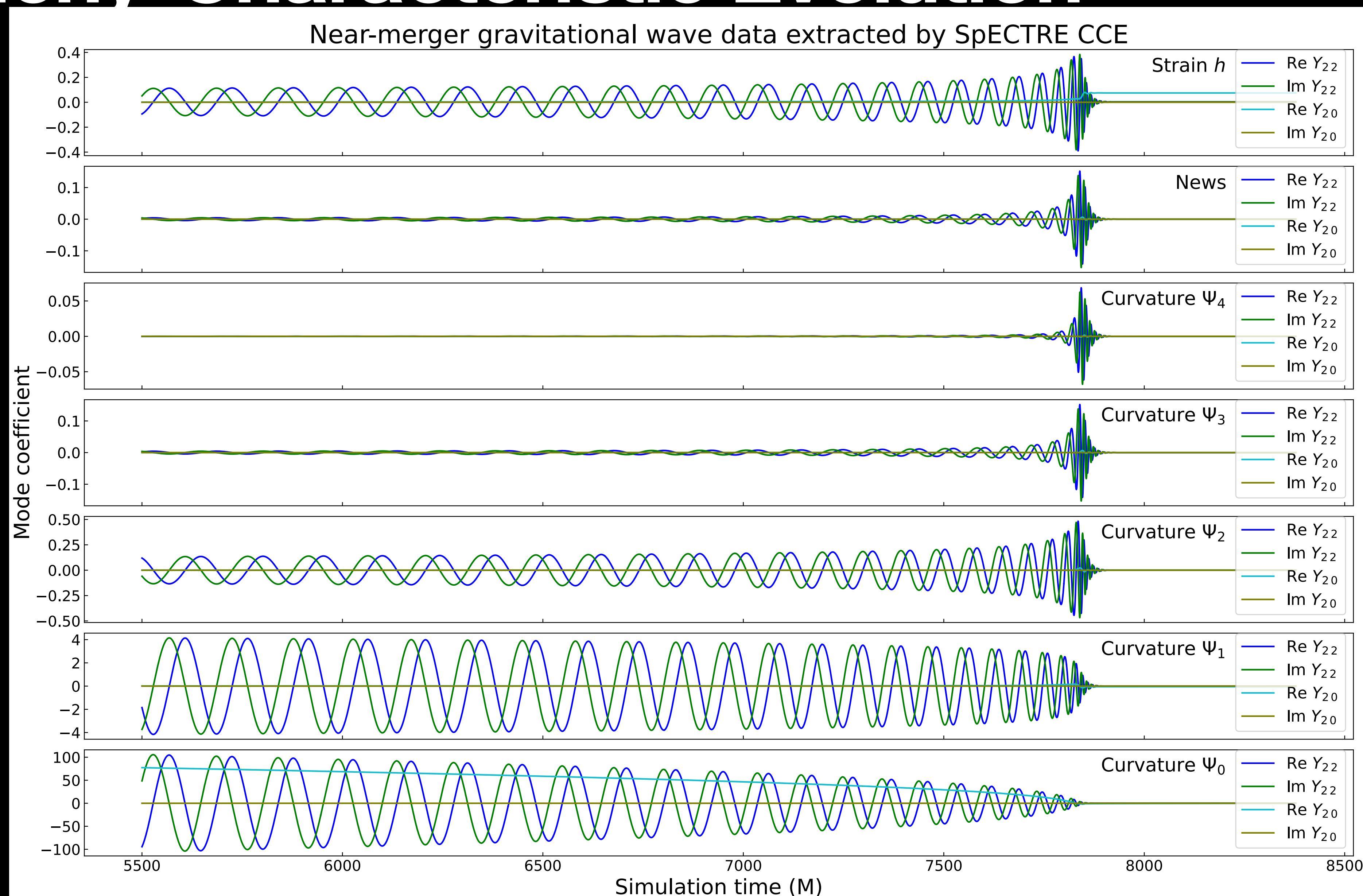
- Post-merger
- Neutrino transport
- Realistic EOS

# Cauchy-Characteristic Evolution



Credit: Jordan Moxon

# Cauchy-Characteristic Evolution



# Cauchy-Characteristic Evolution

▼ Assets 3			
 <a href="#">CceExecutables.tar.xz</a>		54.1 MB	Jun 18
 <a href="#">Source code (zip)</a>			Jun 18
 <a href="#">Source code (tar.gz)</a>			Jun 18

Cauchy-Characteristic Evolution  
Standalone executable

Einstein Toolkit support by Deborah Ferguson  
Interoperate with your code!

# Schedule overview

[https://icerm.brown.edu/topical\\_workshops/tw-24-ses/#workshopschedule](https://icerm.brown.edu/topical_workshops/tw-24-ses/#workshopschedule)

## Monday

- Tech check
- Starting BBH

## Tuesday

- DG+mesh refinement
- Hydro+DG-FD
- Lightning talks

## Wednesday

- Cauchy-Characteristic Evolution
- Gravitational Waveform Data

## Thursday

- Task-based parallelism
- Lightning talks

## Friday

- Initial data
- Publication policies Q&A
- SpECTRE roadmap discussion



Questions?  
Thoughts?  
Comments?

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