



What we heard about numerical relativity

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Things I think I* understood (an outsider's view)

* And some of my data analysis friends, who are not to be blamed for anything I say.



Waveforms!

- Disappointed - had hoped we (LIGO) would be the first to publish waveforms from BH mergers ...
- Comparison of waveforms for the equal-mass non-spinning case is really impressive.
 - » Different groups, algorithms, initial data, boundary conditions, etc. Results appear really robust.
 - » Husa: uncertainties in the NR waveforms are much smaller than the ~5% uncertainties in LIGO calibrations
 - » Saw many plots with matches of 97% +
- Also impressed with ability to model the NR waveforms with analytics (PN theory + QNMs), studies of eccentricity, etc.
 - » Implies not only do we have trustworthy results but we're also starting to *understand* them.

Questions ...

- Why do the various groups get such good agreement when using different techniques?
 - » Brady: Merger dynamics occur on short scales, therefore robust against boundary conditions ... ?
 - » What will happen when integrating for more orbits (dynamic timescale -> radiation reaction timescale)?
- Convergence discussion & Mark Miller's talk: While everyone's equal-mass, non-spinning waveforms agree with good *precision*, do we know that they are *accurate*?
- The spinning, arbitrary mass ratio waveforms will be ready when?

Collaboration!

- Pleased to see interest on NR community's part in delivering data useful for the GW detection community
 - » Husa: "I can give you 40 waveforms tomorrow" - Sutton: "Sounds good!"
 - » Waveforms, yes ...
 - » ... but also error estimates and robustness "guarantees"
- Also saw increasing collaboration *within* NR community
 - » Lots of work comparing waveforms, NR and PN, etc., establishing priorities for future work (NSF session last night).



Collaboration!

- Definitions of terms like “convergence” has to be settled, but the discussion has started.
 - » Really important and highly non-trivial. Will require lots of discussion between data people and num-rels.
- We (data analysts) have to figure out exactly what we require from the NR community, communicate that.
 - » How accurate is “good enough” for detection? for parameter estimation? (with real detectors).
 - » Integrated phase error vs. mismatch.

Matter matters

- Yuk Tung Liu & Josh Faber (UIUC) showed great slides possible evolutions of NS-NS and NS-BH binaries, which could produce both GWs and lead to short hard GRBs.
 - » Significant impact on science from GW detections (e.g. burst searches based on GRBs).
- Yunes, Husa, and others:
 - » Recoil velocities have impact for, e.g., rate estimates.
- Lots of other great presentations ...



Final Suggestions / Questions

- Get these great talks and slides on the web!
- When do we meet again?