



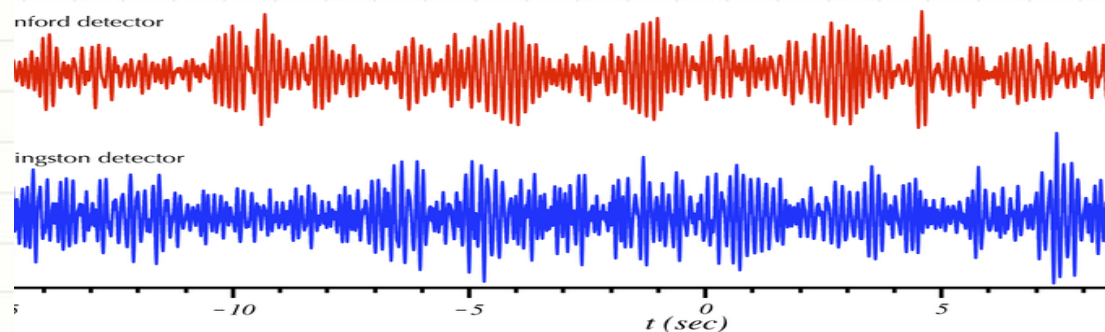
HPC X GAMES

Or, Experiences in going to
eXtreme Scale in HPC Computing



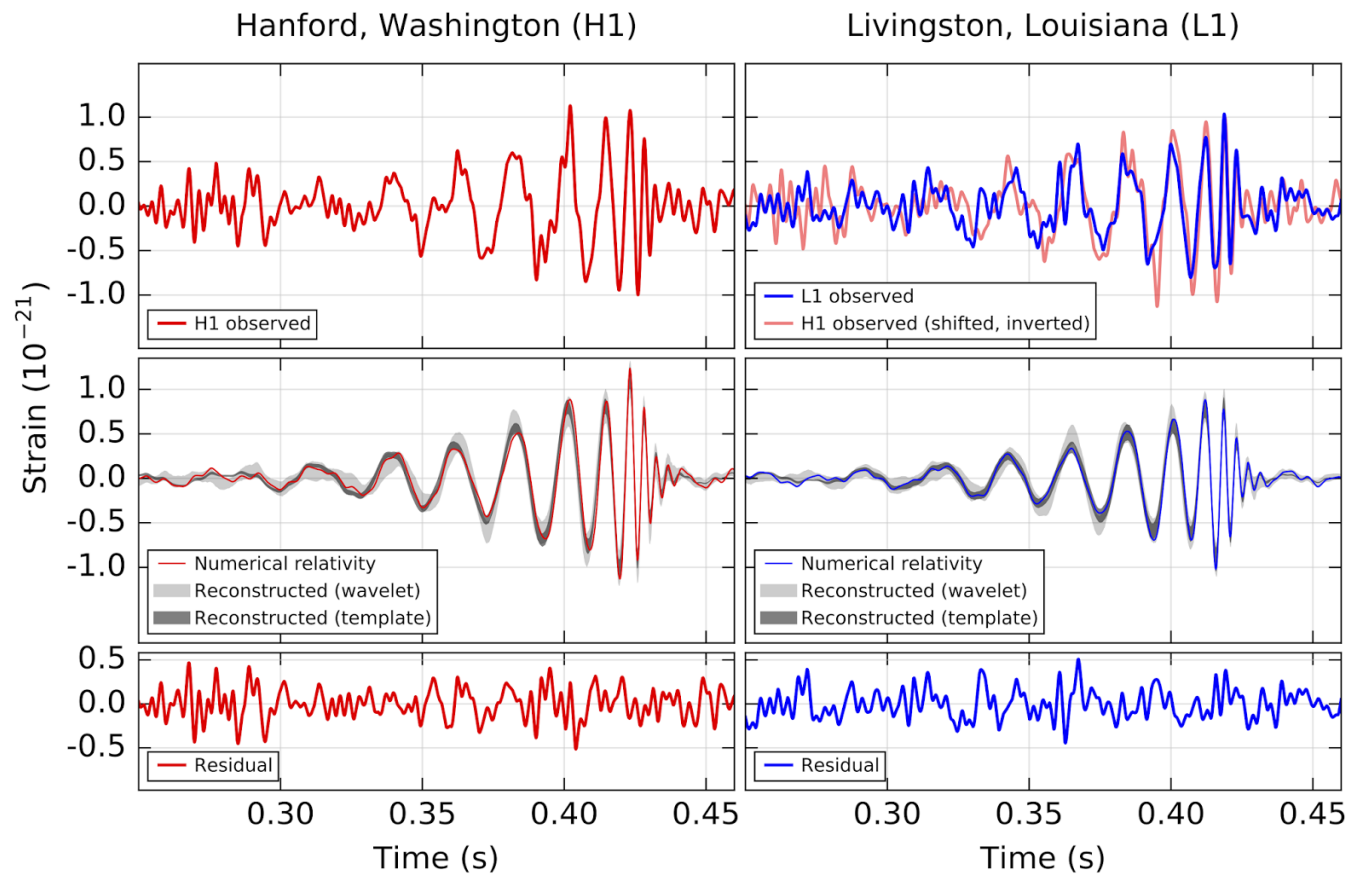
Large Scale Computing Helps to Prove Einstein's Last Untested Prediction: G-Waves

- Laser Interferometer Gravitational-wave Observatory (LIGO)
 - ~5-35 sustained Tera-Flops 24/7
 - Embarrassingly Parallel at $\sim 5 \times 10^4$ cores
 - Massive matched filtering (search) problem



LIGO Detected G-Waves...

14Sep15 and again 26Dec15



Some Questions to Stimulate Discussion

- Is LIGO “HPC” or “Cloud”? What’s the Diff?
- Students
 - Experience writing message passing algorithms?
 - Experience running 10^3 , 10^4 , 10^5 , or 10^6 ranks?
 - Experience profiling or debugging at X scale?
- Panelists
 - What is largest scale your code has run?
 - Does strong scaling matter in practice?
 - What fraction of MPI interface used? Most common calls?
 - What was biggest hurdle in reaching X scale?
 - Ever hit bugs that manifest only at X scale?
 - Are all MPI implementations the same?
 - Parallelizing existing sequential code vs. writing anew?
 - Anything appreciably different in 10^5 vs 10^6 scale?
 - Time vs. Space performance...which is the bigger issue?
 - When should a student use one of these packages vs. rolling their own?