Week 6 Report

Spring 2019

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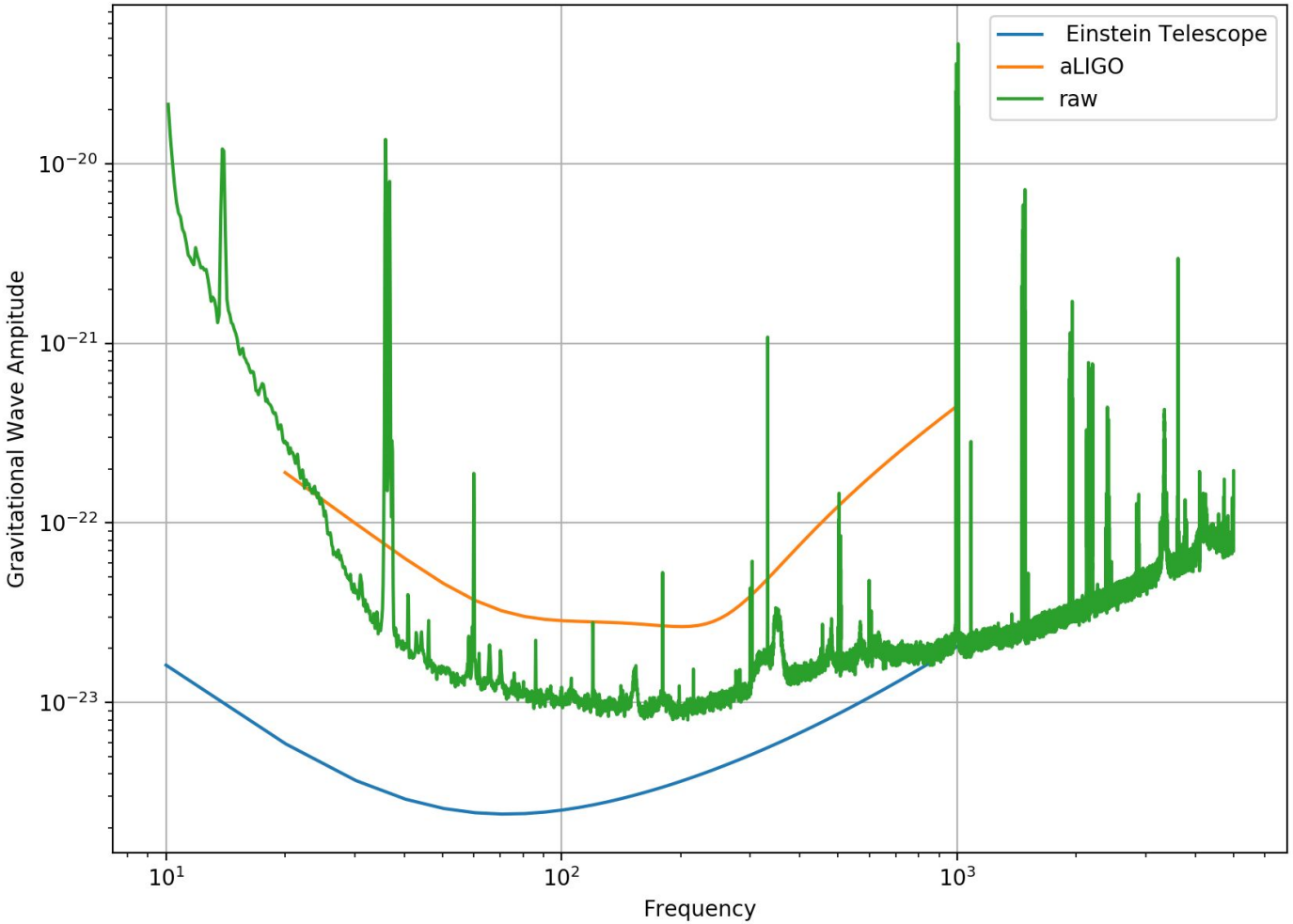
Ellipticity Calculations: Preparation

- Spent time finding sources with similar procedures
  - Gao et al. 2018 - Interesting paper which attempts to compute ellipticity for magnetars via Soft-Gamma Ray Burst sources.
  - May be able to compare results with their findings.
  - Also provides analytic equations for detector wave strain sensitivity for LIGO and the future Einstein Telescope.
  - Added raw, unsmoothed wave strain data of Advanced LIGO via https://dcc.ligo.org/LIGO-G1801949/public

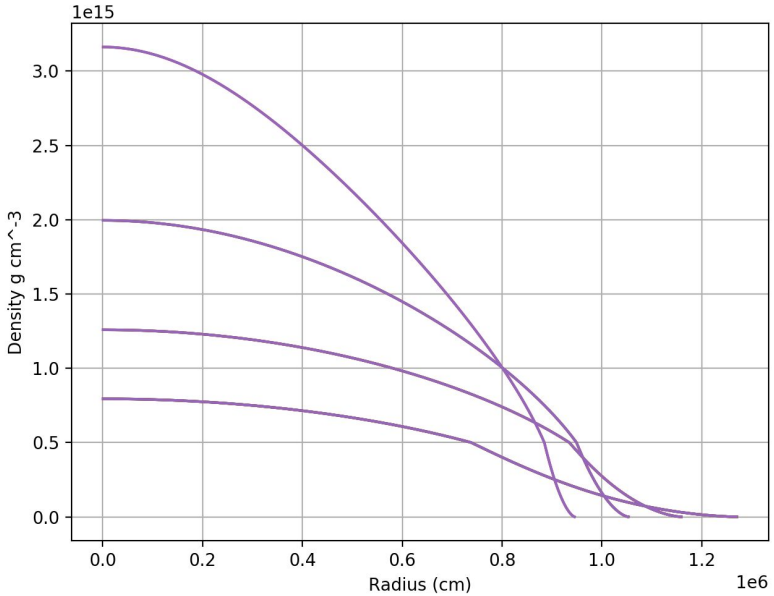

Einstein Telescope
aLIGO
raw
Gravitational Wave Amplitude
10^{-20}
10^{-21}
10^{-22}
10^{-23}
10^{1}
10^{2}
10^{3}
Frequency

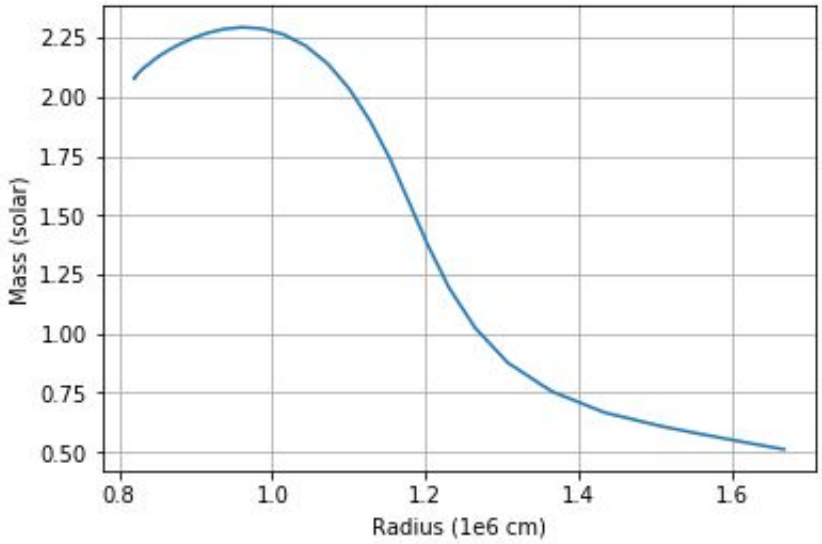
EOS Work

Ideally, I'd like to update the equation of state I use for the computational model in order to be more physically accurate

- Came across TOV solver code via http://www.ictp-saifr.org/schoolgr/Lecture2Creighton.pdf
  - Probably should check to make sure it's okay to use code?
  - Required a bit of modification to get working.
  - Basic premise: Use script to solve TOV equations for a piecewise polytrope and plot output (density and pressure) vs. radius.

Verification of working code:





Analytic Expression for SLy EOS

- Input: log(density)
- Output: log(pressure)
- Because analytic, could be used in place of piecewise polytrope for TOV code.
- Need to find inverse to compute pressure $\longrightarrow$ density
  - Inverse of taylor series expansion in Mathematica

$$\zeta = \frac{a_1 + a_2\xi + a_3\xi^3}{1 + a_4\,\xi} f_0(a_5(\xi - a_6)) + (a_7 + a_8\xi)\, f_0(a_9(a_{10} - \xi)) + (a_{11} + a_{12}\xi)\, f_0(a_{13}(a_{14} - \xi)) + (a_{15} + a_{16}\xi)\, f_0(a_{17}(a_{18} - \xi)).$$