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The analysis of gravitational waves

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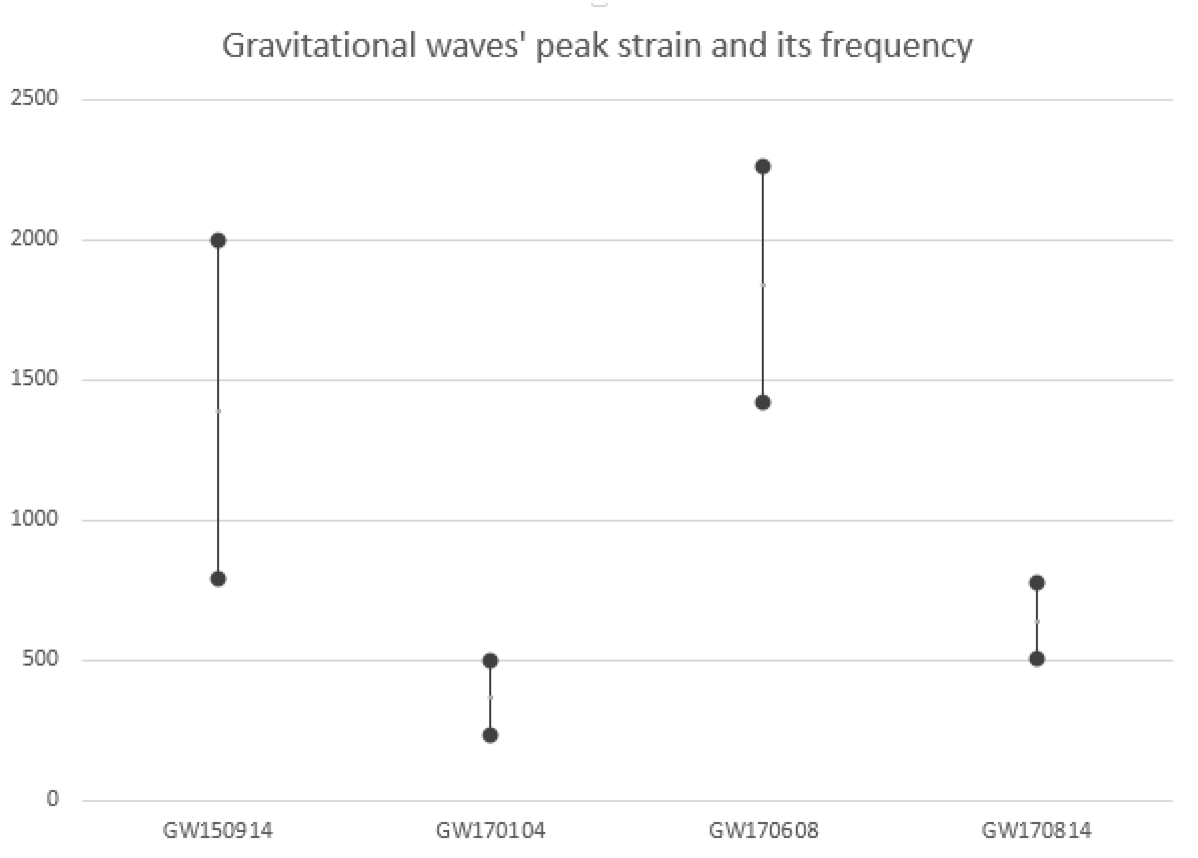
Since the detection of the first gravitational wave (GW) on September 14th, 2015, a series of GWs have been identified. Currently, I am analyzing these waves on the basis of a theoretical paper (http://ryoji.info/theory) that describes a model of GWs at high energies.

The wave described in the paper is represented as E = R/f (energy, R constant, f frequency), which is generated through mass-to-energy conversion events, such as black hole mergers. If we assume that the observed peak of GWs from black hole mergers arises from this conversion process, then we can consider the relationship between frequency and its peak.

Indeed, when we examine the data from the binary neutron star collision GW170817, we do not observe any such peak or excitation, but instead, we see an electromagnetic flash, just as expected from General Relativity.

The graph below depicts a calculation of the peak GW strain and frequency. We assume that the energy of the GW is proportional to its strain, and all the data used for the calculation is sourced from the fact sheet available at gw-openscience.org.



Calculation: Frequency at peak GW strain (Hz) * Peak GW strain (x10^(-22)) / Luminosity distance (Mpc)

These results suggest that the relationship can still be considered as progressive by incorporating additional factors such as the effect of the orbital angle of inclination or other variables, or by refining the variable parameters and calibration through further detection with multiple synchronized detectors.