No neutrinos (yet) accompanying gravitational waves

The detection of gravitational waves is an almost unprecedented success of fundamental science. It not only yields the one yet missing proof of Einstein's Theory of General Relativity, but also opens a totally new observational window to the Universe. The members of the Global Neutrino Network congratulate their colleagues from the Gravitational Wave Community to this fantastic success!

This discovery may remind of another breakthrough which was achieved three years ago – the identification of cosmic neutrinos of highest energy with IceCube, also opening a new window to the cosmos. Therefore it appeared suggestive that LIGO scientists shared their data with the neutrino telescope collaborations, so that physicists from IceCube and ANTARES had the opportunity to check whether these two detectors had registered an excess of neutrinos coinciding in time with GW150914, i.e. with the signal reported by LIGO. A possible joint detection would have conveyed exciting astrophysical insight and could have been be used in targeted electromagnetic follow-up observations, given the significantly better angular resolution of neutrino events compared to gravitational waves.

The investigations were performed on the basis of mutual agreements between the gravitational collaborations LIGO and Virgo on the one side and the two neutrino projects on the other. These agreements include strict confidentiality of the exchanged information. Knowing neither the significance of the LIGO signal nor its approximate position, the IceCube and Antares physicists selected data from a time window of $\pm$500 seconds around GW150914. For IceCube, Thomas Kintscher from DESY in Zeuthen/Germany extracted the data from the stream of data reconstructed online directly at the South Pole and forwarded them to his colleagues Chad Finley from the University Stockholm and Imre Bartos from Columbia University, New York. These two performed the analysis, and only they did know about the approximate position derived from the gravitational data. Similarly, a small group of people acted on the ANTARES side, with Bruny Baret and Alexis Coleiro (both APC Paris) on the front line. Given the character of the source, the result was not totally unexpected: No coincident neutrinos were observed, neither by IceCube nor by ANTARES. The corresponding joint publication can be found at https://dcc.ligo.org/LIGO-P1500271/public.

Resumé: A centennial success for gravitational physics, and a detective story of neutrino physics, which just started and will be continued for the following gravitational wave detections.