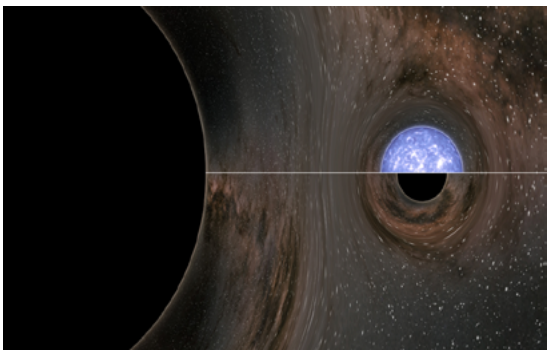

RESEARCH

VIRGO AND LIGO OBSERVE A MYSTERIOUS OBJECT MERGING WITH A BLACK HOLE

For a long time the lack of observations of compact objects with masses ranging from 2.5 to 5 solar masses has left astrophysicists perplexed. This "grey area" is called mass gap: it is a range of masses apparently too light for a black hole and too heavy for a neutron star. Now, the scientific collaborations of the Virgo and LIGO gravitational wave interferometers have announced the first observation of an object that, having a mass of approximately 2.6 solar masses, is in the mass gap, thus questioning it. The nature of the object remains unknown, because observations with gravitational waves alone do not make it possible to distinguish whether it is a black hole or a neutron star. This object was swallowed, 800 million years ago, by a black hole of 23 solar masses, generating a final black hole with a mass of approximately 25 times greater than the mass of the Sun and emitting an intense gravitational wave. Another peculiarity of this event is the relationship, hitherto never observed, between the masses of the two astrophysical objects: one is approximately 9 times heavier than the other. The detection of these new classes of events also pushes theoretical models and analysis tools to their limits. The signal associated with this unusual fusion was detected by Virgo and the two LIGO instruments on 14 August 2019 - that's why it was called GW190814 - and, thanks to the delay between the arrival times of the signal on the different detectors, it was possible to locate its source within an area of approximately 19 square degrees. The astronomical community was immediately alerted: many terrestrial and space telescopes searched for electromagnetic waves, but no one picked up any signals. The study of the event was published on 23 June in The Astrophysical Journal Letters. ■