X-RAY ASTRONOMY 2019
Current Challenges and New Frontiers in the Next Decade
8-13 September 2019
CNR/INAF Research Area, Bologna, Italy

Contribution ID: **205** Type: **Contributed**

A highly ionised disc wind in Hercules X-1

Tuesday, 10 September 2019 10:00 (15 minutes)

Hercules X-1 is one of the best studied accreting neutron star X-ray binaries with a wealth of archival X-ray data. It is well-known for the various time periods in its system: a 35-day period of high, low and short-on flux states, likely caused by a precessing warped accretion disc, a 1.7 day orbital period and a 1.2 sec pulsation period of a neutron star with a ~10^12 G magnetic field. I will present the discovery of a highly ionised disc wind in the X-ray spectrum of Her X-1 when the source is in the high state. The wind detection is statistically significant in nearly all the archival XMM-Newton observations, with velocities ranging from 300 to 900 km/s. Observed features in the iron K band can be explained by both a forest of iron emission lines or by wind absorption. However, we also detect neon and oxygen absorption lines at the same systematic velocity in the high-resolution RGS grating spectra. The very high ionisation degree of the outflowing material (log (ξ/erg cm s-1) = 3.5-4.5) suggests that we are seeing the wind close to its launching point in the accretion disk, and we deduce that the mass outflow rate can be of the same order as the mass accretion rate onto the neutron star. This outflow could be the progenitor of the UV absorption features observed at comparable velocities, but the latter likely originate at much larger distances from the compact object. Possible launching mechanisms will be discussed.

Topic

Compact and diffuse sources in galaxies and in the Galactic Center

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Session Classification: COMPACT AND DIFFUSE SOURCES IN GALAXIES & IN THE GALACTIC CENTER