



Contribution ID: 151

Type: **Talk**

Sub-Eddington accretion in neutron star X-ray binaries

Sunday 6 December 2015 14:50 (30 minutes)

I will present our results of our studies on the spectral properties of neutron star low-mass X-ray binaries when they have accretion luminosities between $1e34$ and $1e36$ erg/s (roughly 0.01 - 1 percent Eddington). We found that their photon index increases with decreasing 0.5-10 keV luminosity (the spectrum softens). Such behaviour has been reported for individual sources, but we now demonstrate that likely most systems behave in a similar manner. When comparing with black-hole systems, it is clear that most black-hole binaries have harder spectra at those luminosities. This suggests that the spectral properties at low luminosities can be used to determine the nature of the accretor in unclassified binaries. We suggest that this difference likely arise from the neutron-star surface becoming dominantly visible. We also suggest that both the thermal component and the non-thermal component might be caused by low-level accretion on the neutron star surface for luminosities below a few times $1e34$ erg/s, contrary to the general believe.

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Session Classification: 15 - Binaries