



# X-RAY ASTRONOMY 2019

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## The unusual broadband X-ray continuum variability seen from Ultraluminous X-ray Sources

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Observational studies of Ultraluminous X-ray Sources (ULXs,  $L > 1e39$  erg/s) have taken on greater significance since the discovery that this population is (primarily) made up of X-ray binaries accreting at super-Eddington rates, a result that has been spectacularly confirmed with the detection of coherent pulsations from a growing number of ULXs (requiring neutron star accretors, despite their extreme luminosities). The *NuSTAR* observatory has played a major role in this effort, initially providing the first view of ULXs in the hard X-ray band ( $E > 10$  keV), contributing the first detection of pulsations in a ULX (M82 X-2), and now allowing broadband spectral variability studies to be undertaken. Throughout 2017 we undertook a major, multi-epoch observing campaign on the well-known 'extreme' ULX ( $L \sim 1e40$  erg/s) NGC1313 X-1, combining *XMM-Newton* (800 ks), *Chandra* (500 ks) and *NuSTAR* (500 ks). I will present early results from this large coordinated campaign, focusing on the unusual broadband spectral variability exhibited. Remarkably, we find evidence that the thermal emission that dominates the  $\sim 2$ -10 keV band exhibits two distinct  $L \sim T^4$  tracks, implying the presence of two stable radii in the inner accretion flow, separated by a factor of  $\sim 4$ . The source appears to jump between these different radii at different epochs. I will discuss possible interpretations for this strange behaviour, and place the broadband variability seen from NGC1313 X-1 in the context of that seen from the broader ULX sample to date.

### Topic

Compact and diffuse sources in galaxies and in the Galactic Center

### Affiliation

University of Cambridge

**Primary authors:** WALTON, Dominic (University of Cambridge); Dr CIRO, Pinto (Cambridge University); Dr NOWAK, Mike (Washington University in St. Louis); ROBERTS, Tim (Durham University); Mr SATHYAPRAKASH, Rajath (Durham University); Dr BACHETTI, Matteo (Osservatorio Astronomico di Cagliari); Dr FÜRST, Felix (ESA); Dr ALSTON, Will (University of Cambridge); Dr KARA, Erin (University of Maryland); KOSEC, Peter (Institute of Astronomy, University of Cambridge); Prof. FABIAN, Andy (University of Cambridge); SORIA, Roberto (UCAS); Dr EARNSHAW, Hannah (Caltech); MIDDLETON, Matthew (University of Southampton); Dr URQUHART, Ryan; Dr GUAINAZZI, Matteo (European Space Agency); Prof. HARRISON, Fiona; Dr STERN, Daniel (Jet Propulsion Laboratory); BARRET, Didier (IRAP); WEBB, Natalie (IRAP); Prof. CANIZARES, Claude (MIT)

**Presenter:** WALTON, Dominic (University of Cambridge)

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