APR08-2008-000650

Abstract for an Invited Paper
for the APR08 Meeting of
the American Physical Society

The complex and puzzling phenomenology of thermonuclear X-ray bursts

DUNCAN GALLOWAY, Monash University

Thirty years of observations of thermonuclear (type-I) bursts from accreting neutron stars have revealed a surprisingly rich spectrum of behavior. A few sources which have been studied intensively offer confirmed examples of the three classes of ignition predicted theoretically, and these systems serve as crucial test-cases for numerical models. However, the behavior of the majority of systems cannot be fully reconciled with theoretical predictions, suggesting there is additional physics at work. Some types of burst behavior are not amenable to study via observations of individual sources, typically because they occur rarely and/or unpredictably. A more promising approach lies in combining data from multiple sources. To date, many thousands of bursts have been detected by various instruments, and new observations are continually adding to the available data. I will describe the results from one such study, involving all the public observations to date made by the *Rossi X-ray Timing Explorer* (*RXTE*), totalling 1185 bursts from 48 sources. The capabilities of the Proportional Counter Array onboard RXTE enable detailed studies of photospheric radius-expansion, weak bursts (including short recurrence time bursts) and burst oscillations. The two most prolific bursters in the sample exhibit distinctly different bursting properties, suggesting different accreted compositions in the accreted fuel, and highlighting the diversity in burst behaviour which must be considered when combining burst samples. Large burst samples can also be used to measure the global variation of burst properties as a fucntion of accretion rate, to compare with theoretica models. I will also describe a successor project, the Multi-Instrument Burst ARchive (MINBAR), which aims to collate all bursts observed by modern instruments to enable comprehensive future studies of rare events and broad-scale behavior.