Analysis of Milli-Hz QPO in the NS LMXB

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Quarks and Compact Stars 2019, Busan

What does it look like ?

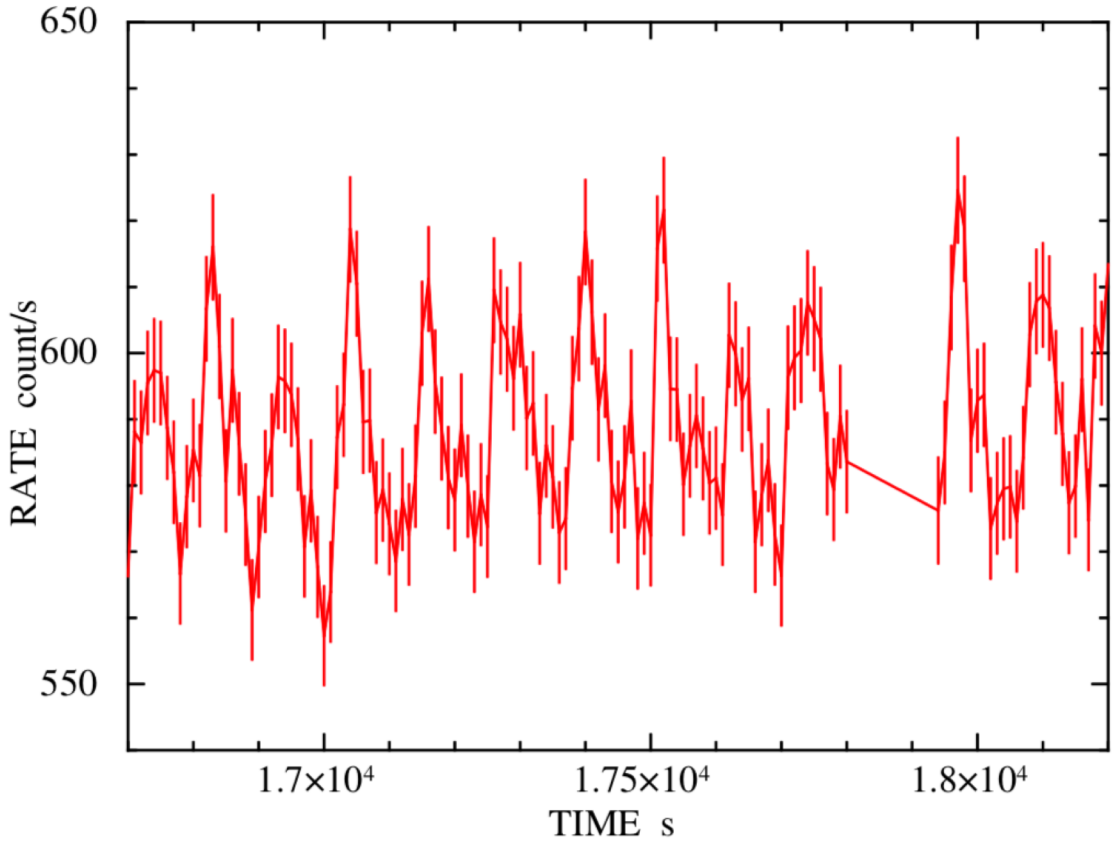


Figure 1. Light curve of 4U 1636–53 with NICER (ObsID:1050080132). The light curve is in the 0.2-5.0 keV energy, with a time resolution of 10 seconds. Significant quasi-periodic oscillations are present at the timescale of ∼110 seconds.

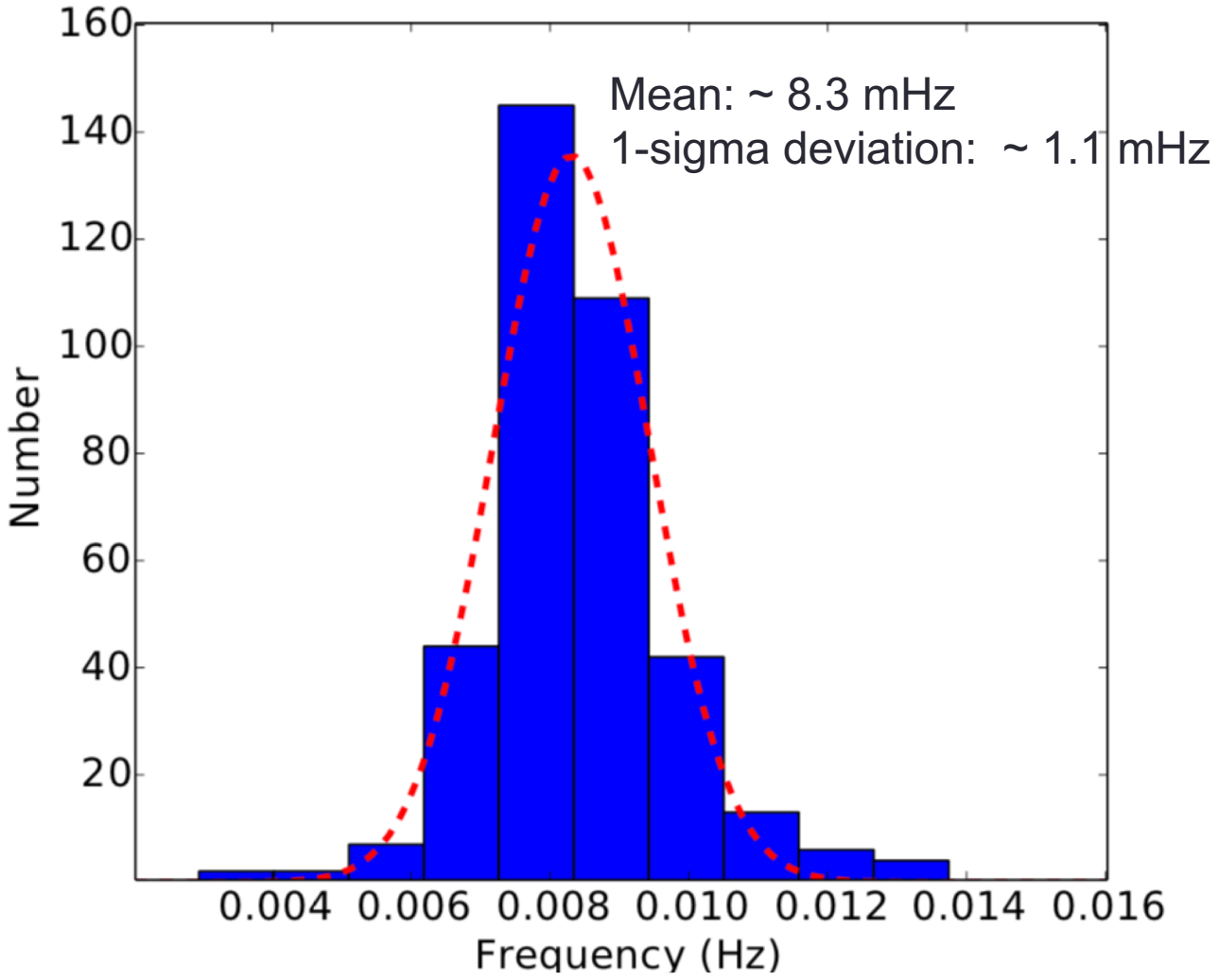
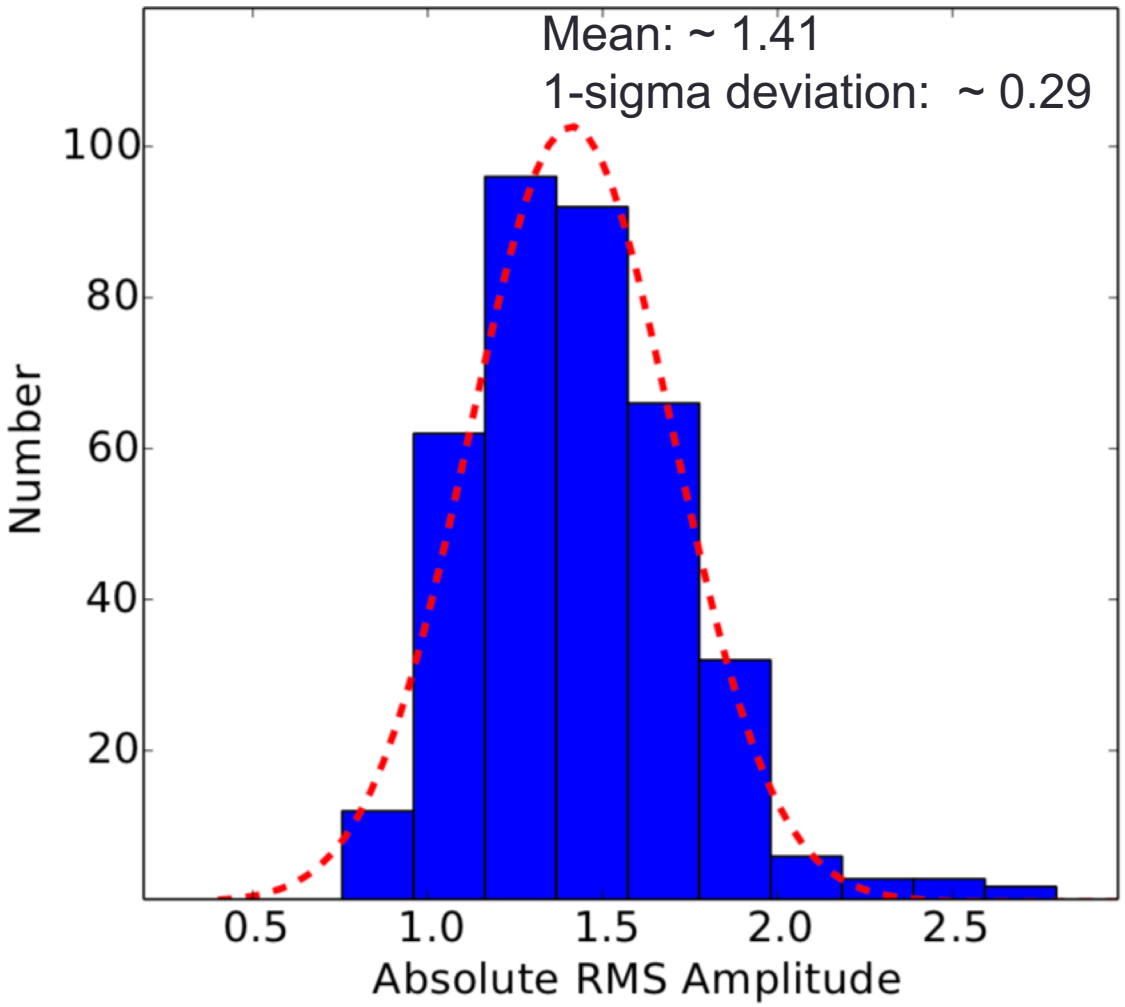
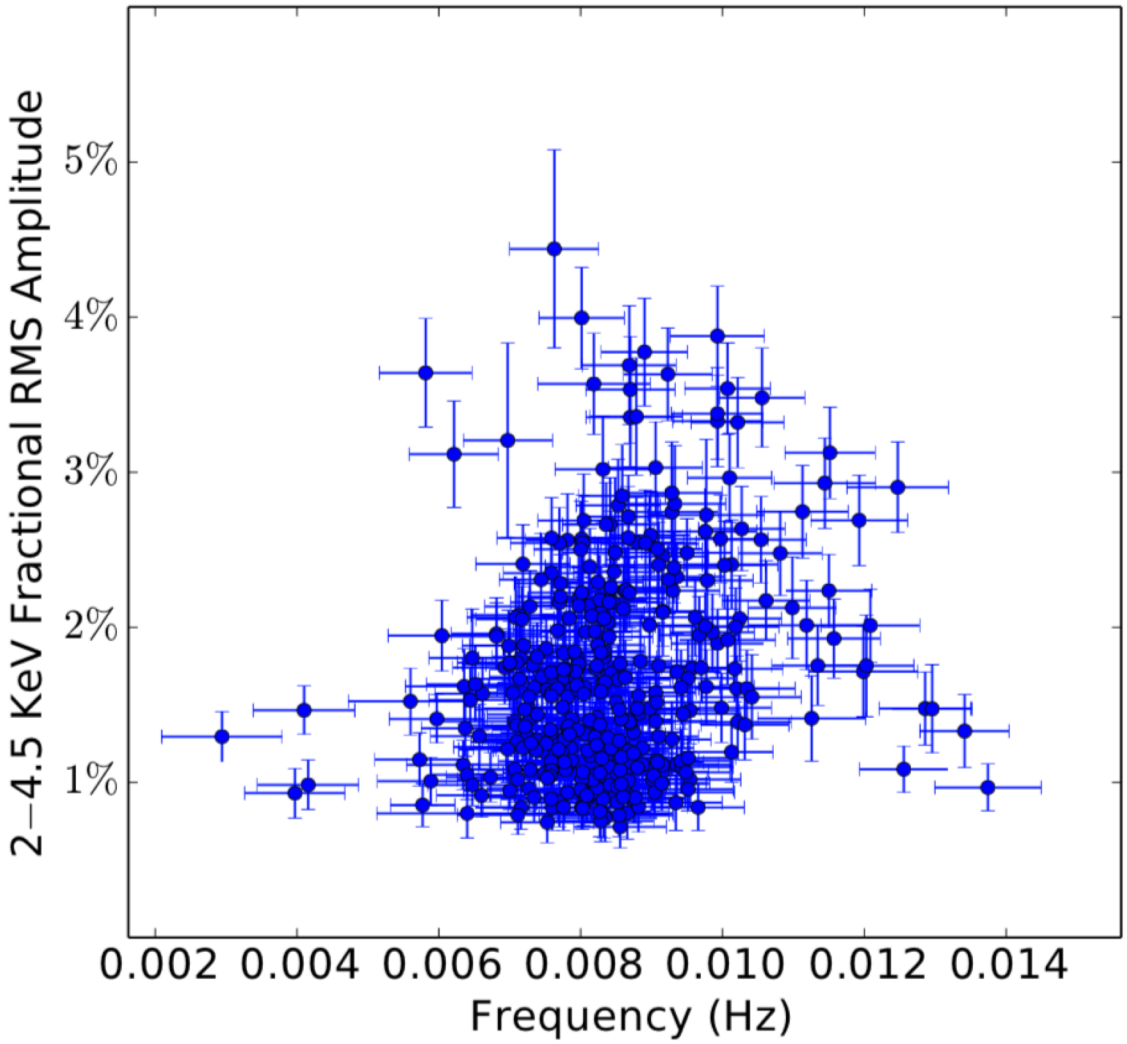


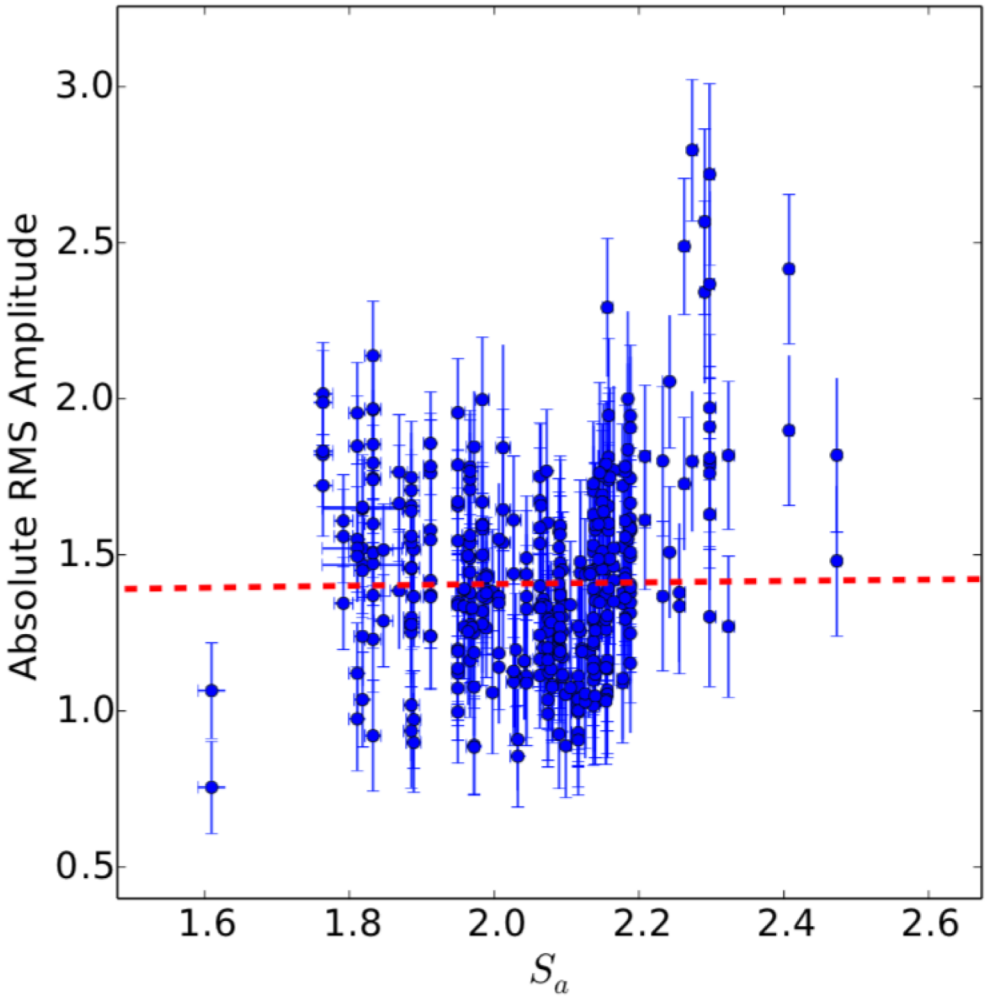
Figure 3. Distribution of the frequency of the mHz QPOs in 4U 1636–53. The red dashed line in the plot corresponds to the best-fitting Gaussian curve to the histogram.



Distribution of Absolute rms amplitude of mHz QPOs in 4U 1636-53



Fractional rms amplitude vs. Frequency in 4U 1636-53

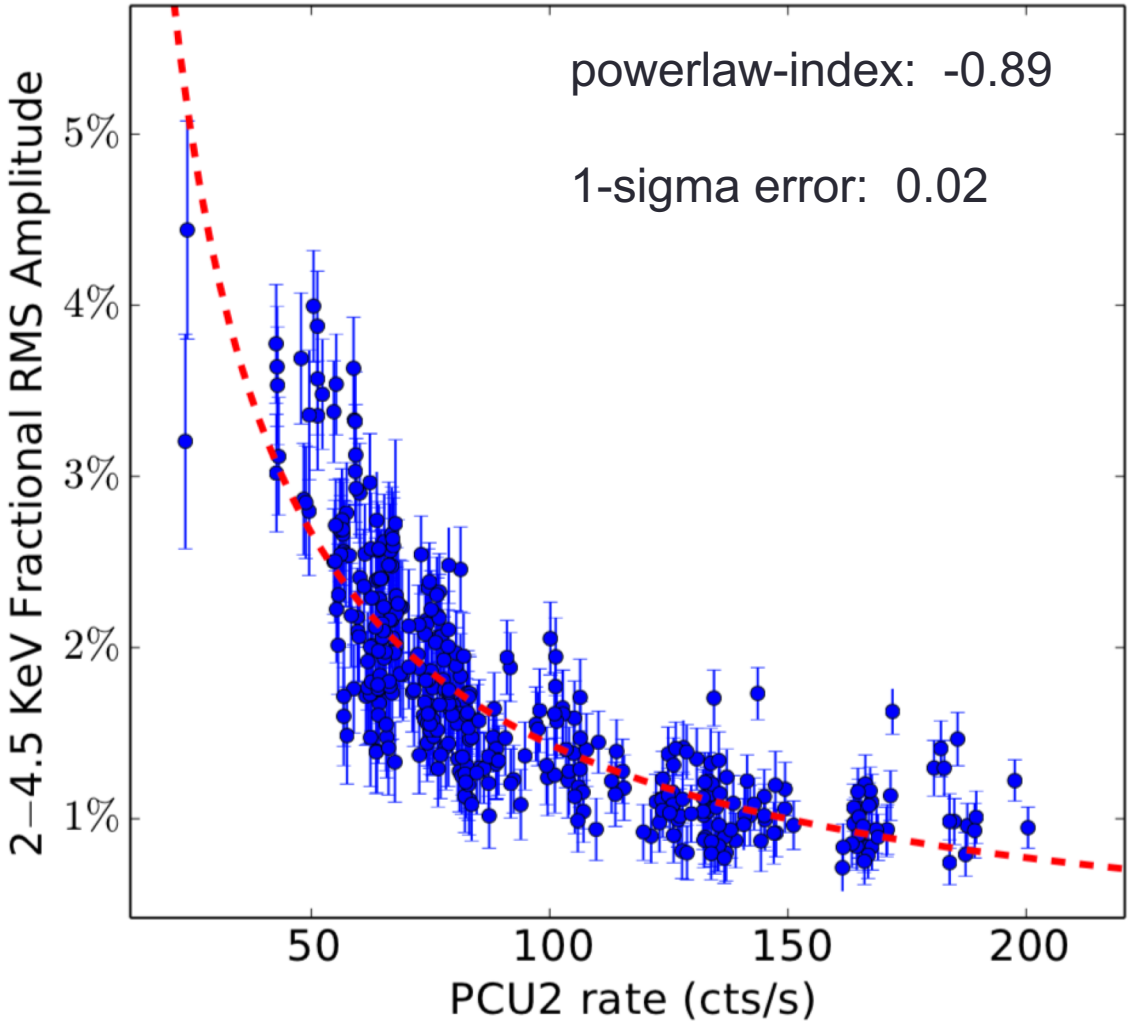


powerlaw-index: 0.04

1-sigma error: 0.10

Absolute rms amplitude vs. Sa in 4U 1636-53

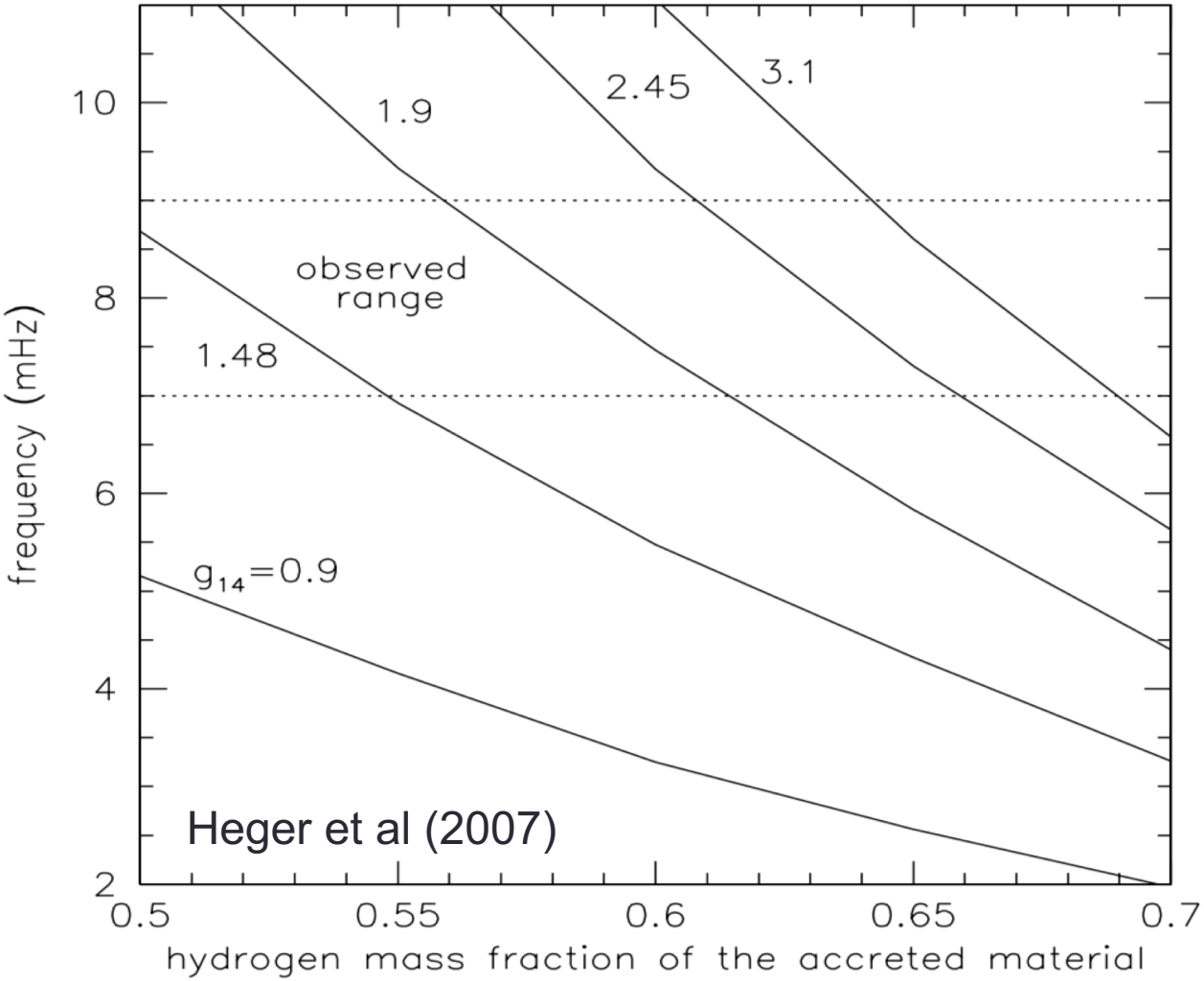
Fractional rms = Absolute rms / PCU2 rate



Fractional rms amplitude vs. rate in 4U 1636-53

Constraining local gravity with mHz QPOs

According to the model, the oscillation period of the mHz QPOs is sensitive to the local gravity g around the region where QPO originate and the chemical abundance X for the nuclear burning (shown in the right plot). **Therefore, when period and X are measured, we can deduce the g around the NS surface.**

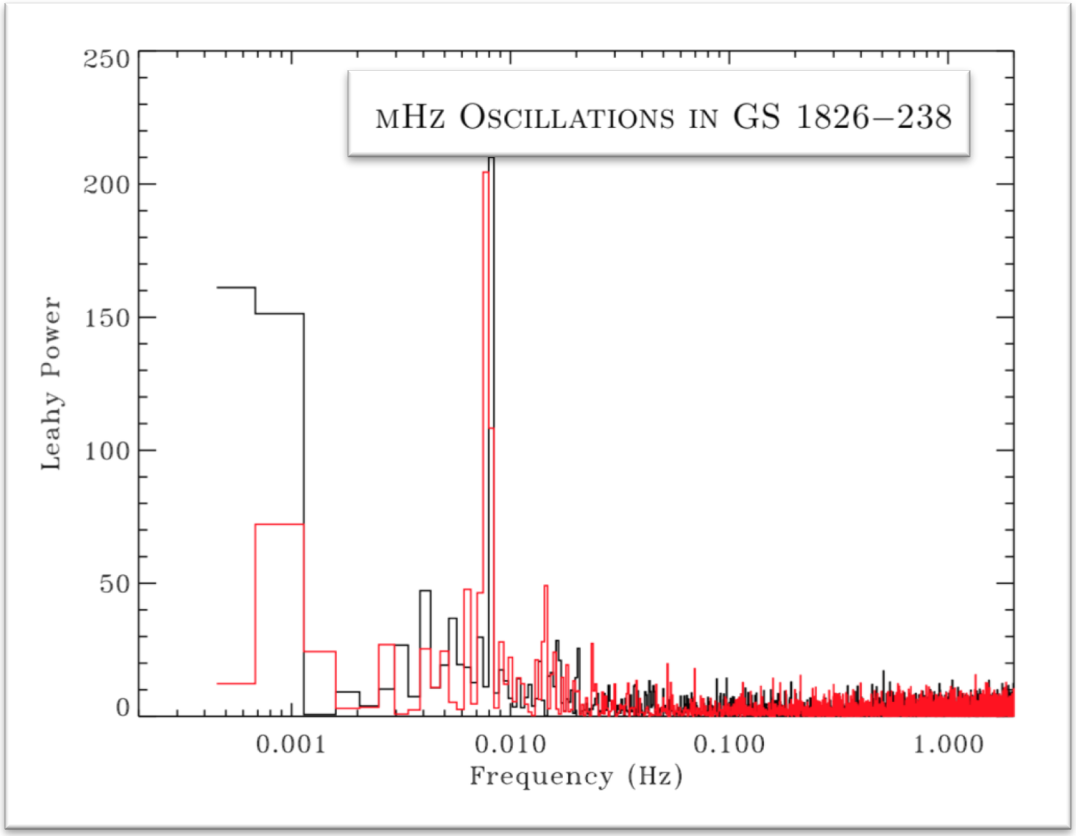


Constraining local gravity with mHz QPOs

A promising mHz QPO source for constraining the gravity is:

GS 1826-238

Which is called “clocked” bursts (Heger et al. 2007; Meisel 2018), suggesting a near so composition for the accreted fuel.



Strohmayer et al. (2018)

Thank you !