

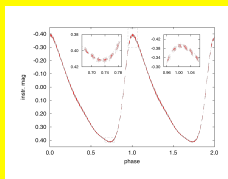
The MOST Accurate Photometry for Cepheid Modes

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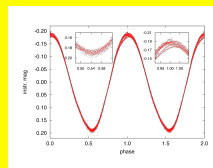
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Aim: Cepheids have famously repeatable light curves. We have obtained month long series of exquisite photometry with the MOST satellite. The aim of the project was to compare the light curves of a fundamental mode pulsator (RT Aur) with a first overtone pulsator (SZ Tau) at this new level of accuracy

RT Aur



SZ Tau



Light Curves

The immediate result of the observations was that overtone SZ Tau had more variation, particularly at maximum light (inset). (Breaks in the light curve of RT Aur are because observations were alternated with another target.)

Fourier Spectra

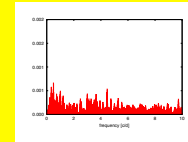
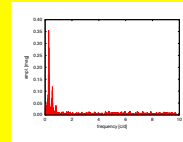
Fourier spectra of the observations. RT Aur (top left) showing the low frequency pulsation peak. The signal prewhitened by 10 frequencies (top right) has been reduced to noise. SZ Tau (bottom left) also has a strong pulsation signal. The spectrum prewhitened by 9 frequencies (bottom right) however, still has a complicated group of pulsation frequencies remaining.

Fourier Spectra

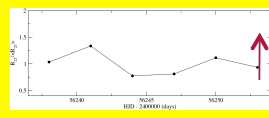
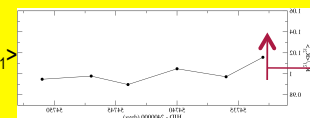
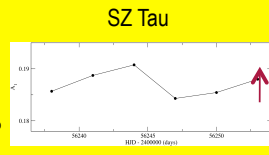
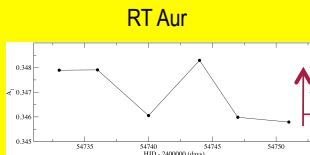
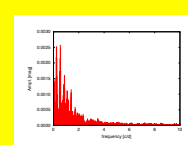
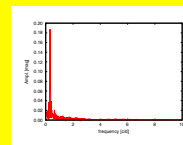
Original

Prewhitened

RT Aur



SZ Tau



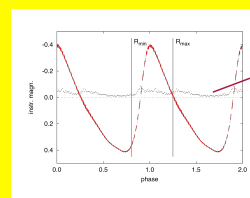
Fourier Parameters

In the MOST data variation in the Fourier parameters from cycle to cycle can be seen (sample shown here of amplitude A_1 and amplitude ratio R_{21}). Again, the overtone pulsator (SZ Tau) shows a much larger fractional variation than the fundamental mode pulsator (RT Aur).

Pulsation Phase s.d.

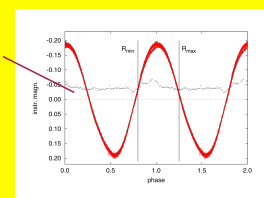
The standard deviation (sd) from cycle to cycle is shown as a function of pulsation phase. Unlike the light curve parameters, the sd has a similar pattern for both the overtone and fundamental mode pulsators. It increases at the time of minimum radius when the envelope is given a "shove" and then decreases after maximum radius.

RT Aur



Standard deviation between cycles

SZ Tau



Summary The high accuracy dense coverage of Cepheids pulsating in the fundamental and first overtone modes (RT Aur and SZ Tau respectively) demonstrate that the overtone pulsation cycle is less stable than that of the fundamental mode. On the other hand, the phase dependence of sd between cycles is not a function of mode