**The GALEX Mission**

GALEX is a NASA Small Explorer satellite, launched in April 2003, and is currently surveying the sky at UV wavelengths from 1350-2800Å.

- Several imaging surveys are in progress:  
  - AIS: All-Sky Survey, 60000 degrees² to AB=20.5 mag.  
  - MDS: Medium Imaging Survey, 1,000 degrees² to AB=23 mag.  
  - DIS: Deep Imaging Survey, 5000 degrees² to AB=25 mag.  
  - Photon-counting detectors enable high time-resolution (~0.01s) UV photometric observations.  
  - Independent detectors simultaneously observe at FUV (1350-1750Å) and NUV (1750-2800Å).  
  - Public releases of GALEX data are available at galex.stsci.edu, at the Multi-Mission Archive at the Space Telescope Science Institute (MAST).

**GALEX RR Lyrae Observations**

- The wide field of view (1.2 degrees), high sensitivity (AB~23 mag in 1500 s), and low background enable GALEX to serendipitously detect many variable and transient sources during its surveys.  
- In the MDS and DIS surveys, GALEX makes repeat visits to star fields; this has proven ideal for producing high-quality RR-Lyrae light curves at FUV and NUV wavelengths.  
- We illustrate GALEX light curves for six RR Lyrae subtype variables that have many observations well distributed in phase (central panels).  
- RR Lyrae vary by 4-6 magnitudes in FUV, and by 2-3 mag in NUV, far more than the ~1 mag variations at visible wavelengths.

**The Pulsation Cycle**

- All sub-type RR Lyrae have a minimum atmospheric temperature of ~4000K, occurring between phases .5 and .85.  
- At maximum light, the peak temperature can reach anywhere from 7000K to 9000K, depending on the mass of the star.  
- The star’s radius reaches a minimum at phase 0.85, just before the rapid brightness rise to maximum, which accounts for the slight dip at this phase.  
- Surface gravity varies as a function of the star’s radius, and also due to radial acceleration during expansion and contraction in the pulsation cycle.

**Kurucz Model Atmospheres in the FUV**

- In the GALEX FUV band (1350-1800Å), Kurucz predicted fluxes are highly sensitive to metallicity and temperature in the 6000-7500K range, but far less sensitive to surface gravity (log g, cgs units).  
- This contrasts with longer wavelengths (4000-10000Å), where the predicted RR Lyrae flux is largely insensitive to metallicity.  
- We explore a range of temperature and metallicity to fit the observed GALEX and visible light curves.

**Fitting Models to the GALEX Light Curves**

- We begin with a temperature variation of 5900-7100K, deduced from visible photometry of ROTSE-I J143753.84+345924.8 (lower right in Fig. 1) by Wheatley et al. (2003).  
- Metallicities ranging from [Fe/H]=0.0 to -1.75 are explored to find the best fit to the ultraviolet light curve.  
- Lower metallicities produce dramatically larger amplitudes in the FUV light curves.  
- The observed 5-6 magnitude FUV variations are consistent with metallicities of -1.0 to -1.5.  
- Model light curves are poorly constrained by UV data alone.  
- Our continuing Lick Observatory photometry program will pinpoint the temperature variations of these stars, allowing more accurate UV-derived metallicities.

**From Visible Observations, A Light Curve Emerges**

In this case, a light curve emerged through a “least string” analysis of the visible Lick data. The light curve suggest this source is an RR Lyrae type “c” or a high-amplitude Delta Scuti star.

**Visible Observations of GALEX Variables**

If only a few GALEX observations exist, as here, visible observations (at the Lick Observatory) are made to confirm & determine the nature and parameters of the variability.

**GALEX Aperture Curves of Growth**

Several stars with a small range of NUV or FUV magnitudes in GALEX fields are examined to produce aperture growth curves. Curves with a small variance are compared to curves for other stars within a selected magnitude range in different exposures to produce a time series to check for variability.

**Conclusions**

- GALEX FUV light curves with amplitudes of 5-6 magnitudes are consistent with Kurucz model atmosphere predictions.  
- Ongoing optical V-band photometry at the Lick Observatory will better constrain the metallicities derived from GALEX data.  
- New UV variable star candidates can be discovered in GALEX observations by a comparative curve-of-growth photometric analysis.  
- Future GALEX observations may produce FUV and NUV light curves of other kinds of pulsating variables, such as Delta Scuti stars.