The GALEX Catalog of UV Sources in the Magellanic Clouds
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Abstract
GALEX has performed uncalibrated imaging surveys of the Magellanic Clouds (MCs) and several areas including the Large Magellanic Cloud (LMC) in near-UV (NUV, 1771-2313Å) and FUV (1344-1780Å). Substantially more area was covered in the NUV than FUV, particularly in the bright central regions, because of the GALEX-FUV detector failure. The FUV depth of the NUV image varies between 20.7 and 22.7 ABmag.

Our imaging provides the first aperitive view of the entire content of hot stars in the Magellanic Clouds, and will serve as the foundation for the performance of future surveys. Large numbers of hot stars populate even in areas with extremely low interstellar extinction, where hot stars are undetectable in the FUV, owing to high sensitivity of the UV data to hot stars.

Crowding limits the quality of source detection and photometry from the standard pipeline processing of the GALEX surveys (AGIS, M5, NGC, GL, etc., Martin et al., 2005). As a result we have been unable to detect many known hot stars in the LMC, owing to high sensitivity of the UV data to hot stars.

The UV source catalog
The GALEX pipeline based on Source Extractor (Bertin & Arnouts 1996) sometimes fails to resolve closely neighboring point sources in crowded fields. A more sophisticated phot-fit-fitting approach is required for photometry in dense fields with point-like overlapping sources. The GALEX PSF varies slightly from visit to visit and slightly as a function of position within the field (Morrissey et al., 2007). We sought to account for this variation by determining the PSF of our observations, and matching and iterative artifact rejection. The apparent LMC UV diameter is \( \sigma = 0.07 \) and \( e = 0.7 \), because the distance to the stars is known, once their positions in the sky are measured, the observed UV luminosity is proportional to the square of the distance, and the observed UV diameter is proportional to the square of the distance. The results depend on the assumed metallicity, and the extinction towards the source, \( E(B-V) \). The results depend on the assumed metallicity, and the extinction towards the source, \( E(B-V) \).

References
Simons et al. (2013), J. Advances in Space Research, in press.
Thilker et al. (2015) prep., for final catalog

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SED-fitting of resolved stars + future optical surveys
GALEX LMC sources with FUV and NUV photometry, and single optical counterparts (at 6.8 μm) from the MIRAC were analyzed with grid of stellar models, reddened progressively assuming a variety of extinction curves (e.g., Bianchi, 2012a and Bianchi, 2012b for details). The major parameters derived from SED fitting (through standard model grids) are the effective temperature, \( T_e \), and the extinction towards the source, \( E(B-V) \). The results depend on the assumed metallicity, and type of selective extinction (\( R_{V} = 3.1 \), the latter may significantly vary across different environments. The MIR fluxes are particularly sensitive to this parameter (e.g., Bianchi et al., 2007 and Bianchi, 2011), and provide critical diagnostics for the hottest \( T_e \). Because the distance to the stars is known, once \( T_e \) and \( E(B-V) \), we can calculate an estimate of the radius, and therefore \( L \), by scaling the best-fit model to the observed fluxes, accounting for extinction. A few examples of stellar LMC and best-fit models are shown in Fig. 8. We plan to expand the work to include all regions of both Clouds, even areas with only NUV coverage, ideally making use of photometry from GALEX (Bianchi et al., 2007) and optical imaging in critical blue bands (e.g., Stetson et al., 1988). Some of the candidate hot stars, but low luminosity, sub-dear stellar populations that can be recovered with our observations are too faint to be detected for the currently available surveys. We plan to pursue deep optical imaging in critical blue bands, (e.g. over the inner MCs), to be obtained with deep optical studies.

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