ABSTRACT

For collating point-source flux measurements derived from multiple infrared passbands of the Spitzer Space Telescope data—e.g., the four wavelength passbands of the Infrared Array Camera (IRAC) and the three wavelength passbands of the Multiband Imaging Photometer for Spitzer (MIPS)—it is best to use the Spitzer Science Center’s “bandmerge” software, rather than the relatively simple method of general source association (GSA). This type of processing is useful for making catalogs relating measurements at multiple wavelengths for a specific target. The former method uses both source positions and positional uncertainties to form a chi-squared statistic that can be thresholded for optimal matching, while the latter method finds sources nearest neighbors across bands that fall within a user-specified radius of the primary source. Our assertion is supported by our study of completeness (C) versus reliability (R) for the two methods, which involved matching MIPS 24 µm and IRAC 3.6 µm point sources in the SWIRE survey Chandra Deep Field South. In this study, completeness is defined as the number of true matches divided by the total number of sources with detections in both passbands, and reliability is defined as one minus the number of false matches divided by the total number of sources (regardless of whether they have detections in both passbands). For optimal matching, while the latter method finds sources nearest neighbors across bands that fall within a user-specified radius of the primary source. This study, completeness is defined as the number of true matches divided by the total number of sources with detections in both passbands, and reliability is defined as one minus the number of false matches divided by the total number of sources (regardless of whether they have detections in both passbands about 0.1% in both C and R for both methods (NT = 97.4% for bandmerge and R = 92.7% for GSA versus the former method). With almost a factor of three in unreliability, bandmerge is the clear winner of this comparison. High reliability is important because astronomers study point-source lists. The scene contains some bright stars, which have the six-point spider-diffraction pattern and appear bluish in color, but are dominated by thousands of barely resolved elliptical-like galaxies, which appear reddish, and PAH-band-emitting spiral-type galaxies, which appear redder. There are also a few asteroids, which appear a deep red color due to their cold temperatures. 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