The Effect of Stellar Contamination on Different Measures of Galaxy Photometry

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Abstract

Stars falling on top of galaxies area major problem for 2MASS and DENIS. If no effort is made to subtract stars, galaxy fluxes are biased high by >10% for 5-30°/0 of galaxies at the pole and for 30-80% of galaxies at b=20 degrees, where the lower number refers to a very local isophotal magnitude and the higher number refers to the total observed magnitude. The bias and number of galaxies affected is nearly independent of galaxy magnitude. We have therefore investigated a number of different star subtraction techniques to derive the least biased measure, We used the observed galaxies from two prototype camera scans through the Coma Cluster as a baseline. We then add artificial stars to these scans and determine the change in the galaxy photometry relative to the actual scans.

For 2MASS, the least biased measure is one that computes a global background and subtracts nearly every detected neighboring source. The bias is less than 1 % even at densities corresponding to b=5 degrees, and the scatter due solely to stellar contamination is ~5%. Doing the same full subtraction at high galactic latitudes causes only 2% of the galaxies to have a flux change of over 5%, and most of these changes are due to distinct stars on top of the galaxies or flux from a neighboring galaxy.

Using a background determined from a local annulus with minimal star subtraction results in photometry with a bias from 3-8% at b=5 degrees and an additional scatter due to stellar contamination of --12Y0. The bias results from the difficulty in subtracting stars to the same true magnitude, for stars in the annulus and those on top of the galaxy. Performing no star subtraction eliminates the bias, but produces photometry with outliers well beyond 10%.