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SDSS Stripe 82 : quasar variability from forced photometry

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ABSTRACT

0.1 Faint Sources

Forced photometry measurement in a single epoch is in fact the mean of a likelihood for the observed flux. We can think of each source as being represented by a Gaussian likelihood centered on the measured flux F_i, with a widh corresponding to the measurement error σ_i. Thus in the flux likelihood space bright sources have very narrow Gaussians, with a width on the level of $1-2\% \approx 0.01-0.02$ mag, whereas faint sources with larger uncertainties have very wide Gaussian tails, that can extend below zero. Such nonzero likelihood for a negative flux measurement is unphysical, given that we know that no source can in reality have a negative flux. Any negative portion of the likelihood stems from the background fluctuation, as described in previous section, or from very large measurement error. We address the issue of negative tails of Gaussian flux likelihood by recalculating the measurement of flux for all sources with less than $'2\sigma'$ detection, i.e. $\langle F_L \rangle < k\sigma$, with $k = 2$. This corresponds to the 2% probability of $F_L < 0$ (in a Gaussian likelihood).

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