ABSTRACT

In this dissertation we aim to study evolution of galaxies over last 6 Gyr by measuring the growth of the stellar mass density of the Universe. We perform extensive study over Stripe 82 region, a ∼300 deg^2 field, with deep data from SDSS and WISE to compute photometric redshifts and stellar masses for the largest multi-wavelength sample that we know - 23 million objects in total, of which 9 million are galaxies. WISE data are essential in order to break the age-color-metallicity degeneracy and determine masses of galaxies in a more reliable way. The key feature of the project is the use of "template fitting" technique in which prior knowledge of morphology and position of a high resolution optical image are used to perform robust flux measurement of a low resolution IR image even in case of blending. Consistent photometric data from seven bands are supplied to SED-fitting codes and photometric redshifts and stellar masses are derived. We do not correct the sample of galaxies for incompleteness and present our results, that are generally consistent with data of other groups, as a low-limit on the stellar mass density in four redshift bins of equal volume up to z ∼0.8.

In the era of advancing new generation IR facilities like JWST, WFIRST and surveys like DES, our estimates shall be used as a constraint on any model of the evolution of the stellar mass density at higher redshifts. We also present a discovery of several thousands of unusual sources that we call "WoDrops". Such sources yet very bright in near-IR are completely undetectable in much deeper optical. In the last part of the dissertation we hypothesize about the nature of such objects and describe our future work.