

Probing Galaxy Build-up at the Edge of the Universe: Insights from Ultra-Deep HST and Spitzer Observations

Pascal Oesch¹

¹ *Yale Center for Astronomy and Astrophysics*

Abstract

The observational frontier of galaxy build-up now lies at only ~ 450 Myr after the Big Bang, at redshifts $z \sim 10-12$. This became possible only thanks to the powerful WFC3/IR camera on the HST. In combination with deep data from Spitzer/IRAC we were able to robustly detect rest-frame optical light of a small sample of $z \sim 10$ galaxies, allowing us to measure the evolution of the stellar mass density over 96% of cosmic history. However, probing galaxies at these early epochs is challenging even for HST and the sample sizes at these redshifts are still very small. Once observational biases are properly accounted for, the ongoing Hubble Frontier Field program is a prime new dataset to improve upon our current extremely sparse sampling of the UV LF at $z > 8$ and to answer some of the most pressing open questions. For instance, even the evolution of the cosmic star-formation rate density at $z > 8$ is still debated. While our measurements based on blank field data indicate that galaxies with $\text{SFR} > 0.7 \text{ M}_{\odot}/\text{yr}$ disappear quickly from the cosmic record between $z \sim 8$ and $z \sim 10$, the results from the CLASH survey favor a more moderate decline. In this talk I will review the recent progress in studying galaxy build-up out to $z \sim 10$ from blank field HST surveys as well as the first completed Frontier Fields and I will provide a future perspective for the JWST era and beyond.