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Dwarf galaxies in deep-wide surveys: a new frontier in the study of galaxy evolution

Dwarf (M < 10^9.5 MSun) galaxies dominate the galaxy number density, making them critical to a complete understanding of galaxy evolution. However, typical dwarfs are not bright enough to be detectable, outside the very local Universe, in past large surveys like the SDSS, because they are too shallow. The dwarfs that do exist in such surveys have extreme star formation rates, which makes them anomalously blue and unrepresentative of dwarfs in general. New deep-wide surveys from the Hyper Suprime-Cam (HSC), LSST and Euclid will revolutionise our understanding of galaxy evolution, by offering unbiased statistical samples of dwarfs out to at least z□0.3. We demonstrate the game-changing potential of such surveys, by exploring four key aspects of galaxy evolution in the dwarf regime (10^8 MSun < M < 10^9.5 MSun), using several thousand dwarfs in the HSC U/deep footprint in COSMOS: star formation, quenching, morphologies and AGN activity.

The fraction of red/quenched dwarfs in HSC U/Deep is around 40%, a factor of 8 higher than what is concluded using the SDSS. Red dwarfs reside in higher-density environments and closer to nodes, large-scale filaments and massive galaxies. However, the probability of dwarfs being red is most strongly correlated with the distance to the nearest massive galaxy. Dwarfs show three principal morphological types: early-type, late-type and a featureless class which lacks both the central concentrations found in early-types or any spiral structure. Dwarf early-types, unlike their massive counterparts, are likely to be shaped by secular processes (not interactions), while the featureless dwarfs are likely created by baryonic feedback. Finally, SED fitting on deep UV to MIR broadband photometry suggests that around a third of dwarfs show signs of AGN activity, suggesting that AGN could be important in this regime, as it is in massive galaxies. Dwarfs represent a vast discovery space for new and future deep-wide surveys like Euclid and LSST which promises new insights into how galaxies form and evolve over cosmic time.

Serdecznie zapraszam,
Luis Suelves, on behalf of the SOC