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Fuelling Star-Formation - The Fate of Halo Baryons?

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The old idea of Spitzer about the infall from gaseous galactic haloes was revived with the discovery of the low-redshift population of Lymann-alpha absorbers and first steps made in understanding of the transition between the high-redshift intergalactic and the low-redshift predominantly galactic population of QSO absorption systems, as well as improved understanding of the nature of so-called high-velocity clouds. Independent results on the cosmological baryon density point in the same direction, indicating that large amounts of "dark" baryons are hidden in haloes of normal luminous galaxies. With this assumption in place, it is only natural to hypothesize about the long-term fate of these baryons which undergo radiative cooling and occasional reheating in mergers throughout the history of galaxies. Ultimately, the baryons are bound to fall in the gravitational potential of the dark halo and coalesce (for spiral galaxies) with the rotationally supported disk. Such aggregates present a potential reservoir of gas not only for solution of the classical gas consumption puzzle in spiral disks, but also as a fuel for the future star formation. We investigate the impact of different models of global gaseous infall onto "normal" spiral disks on their gas consumption time scales. We present results of analyses performed on the sample of 61 "normal" spiral galaxies used by Kennicutt (1998) for studying the form of global star formation law. Adopting the Schmidt star formation law with index n = 1.3 (the average value of a sample of observational surveys), we compare the consumption time scales of the galaxies from the sample for two scenarios of their evolution: "naive" model with neither recycling of interstellar gas nor gas infall from galactic haloes, and a more realistic one with parameters that control the recycling and infall of gas. We conclude that the infall resolves the classical gas consumption puzzle, and that ultimately - in the physical eschatological limit - most of the baryons in the universe will be processed through stars.

BDMH 2004 – Baryons in Dark Matter Halos
5–9 October 2004
Novigrad (Croatia)

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PoS(BDMH2004)078

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