Contribution ID: **30** Type: **Talk**

Hot filamentary large scale structures in the universe

Tuesday, 27 September 2022 11:25 (25 minutes)

During the Universe's childhood (from age ~0.5-2 billion years), most of its, still pristine, baryonic matter permeated the Intergalactic medium (IGM), filling the space between gently forming galaxies, nurturing them and in turn receiving heating photons from newly born stars and the first quasars.
In this early phase of the Universe's growth, a fraction of these primordial baryons concentrates in the immediate surroundings of assembling galaxies, providing fuel for their formation and in turn getting enriched by the first metals produced by massive stars and ejected out via supernova explosions and, presumably, quasars winds. The majority of them, however, is still diffuse in the IGM and imprints a forest of HI Lyα absorption lines in the optical spectra of high-z quasars, and this is how we know of their presence, amount, location and physical state.
At the age of only ~2 billion years, however, puberty impetuously bursted in and the Universe's growth became frantic: galaxies began growing quickly in size, by devouring material from the surrounding space at higher and higher rates, phagocytizing nearby companions and grouping with close friends.
According to hydro-dynamical simulations for the formation of structures in the Universe, this activity was accompanied by a metamorphosis of the tenuous photo-ionized material filling the space between galaxies and feeding their growth: baryons in the IGM were more and more violently pulled towards the growing gravitational potential wells of virialized structures and shrunk into a web of sheets and filaments getting shock-heated to temperatures of $T \approx 10^5$-10^7 K and so becoming virtually invisible in HI absorption. At the same time, freshly metal-enriched baryons started roaming out of galaxy's disks, pushed out by powerful supernovae and Active Galactic Nuclei (AGN) winds, wandering into and metal-polluting the Circum-Galactic medium (CGM). This cycle of baryons and metals in and out of galaxies proceeded till our day, and most of the Universe's ordinary matter today should therefore not be in galaxies' disks (which are indeed missing both metals and baryons) but diffuse in galaxies' CGM, in a highly ionized state and heavily metal-enriched.
In this talk I will review the 2-decade-long search for the missing baryons in the diffuse Warm-Hot Intergalactic Medium (WHIM) and in the CGM of galaxies, and present preliminary results on our search (in stacked high-resolution X-ray spectra) for the hot baryonic counterparts of Lyman-Lymit Systems (LSSs) at redshift <1. I will then conclude by highlighting the future prospects of these studies with upcoming large X-ray facilities.

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Session Classification: Astrophysics/Cosmology