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IS THE DARK MATTER MADE OF PRIMORDIAL BLACK HOLES?

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I discuss a number of other phenomena, which could be significantly affected by the PBH accretion. Magnetic fields are an essential ingredient in the Bondi capture process, and I argue that the PBH can play an important role in amplifying magnetic seed fields in the early universe and maintaining them until the galactic dynamo processes set in. Next I study the contribution of the assumed PBH population to the re-ionization history of the universe and find that they do not conflict with the stringent ionization limits set by the most recent Planck measurements. X-ray heating from the PBH population can provide a contribution to the entropy floor observed in groups of galaxies. The tantalizing redshifted 21-cm absorption line feature observed by EDGES could well be connected to the radio emission contributed by PBH to the cosmic background radiation. Finally, the number of intermediate-mass black holes and the diffuse X-ray emission in the Galactic Center region are not violated by the assumed PBH dark matter, on the contrary, some of the discrete sources resolved in the deepest Chandra observations of the Galactic Ridge could indeed be accreting PBH.

The recent interpretation of cold dark matter as the sum of contributions of different mass Primordial Black Hole (PBH) families could explain a number of so far unsolved mysteries, like e.g. the massive seed black holes required to create the supermassive black holes in the earliest QSOs, the ubiquitous massive LIGO/VIRGO massive binary black holes, or even the putative "Planet X" PBH in our Solar System. The most abundant family of PBH should be around the Chandrasekhar mass (1.4 Msun). This prediction may already have been vindicated by the recent OGLE/GAIA discovery of a sizeable population of putative black holes in the mass range 1-10 Msun.

PBH can also have an important contribution to the extragalactic background light in several wavebands. To check this hypothesis I assume a realistic 1E-8 -1E10 Msun PBH mass distribution providing the bulk of the dark matter, consistent with all observational constraints. I estimate the contribution of baryon accretion onto this PBH population to various cosmic background radiations, concentrating first on the cross-correlation signal between the Cosmic X-ray and the Cosmic infrared background fluctuations discovered in deep Chandra and Spitzer surveys. I assume Bondi capture and advection dominated disk accretion with reasonable parameters like baryon density and effective relative velocity between baryons and PBH, as well as appropriate accretion and radiation efficiencies, and integrate these over the PBH mass spectrum and cosmic time. The prediction of the PBH contribution in X-rays is indeed consistent with the residual X-ray background signal and the X-ray/infrared fluctuation signal. The predicted flux peaks at z~17-30, consistent with other constraints requiring the signal to come from such high redshifts. The PBH contribution to the 2-5 micron cosmic infrared background fluctuations is only about 1%, so that these likely come from star formation processes in regions associated with the PBH.