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Edoardo Vitagliano: Exploring Primordial Black Holes from Multiverse with Optical Telescopes

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Primordial black holes (PBHs) have long been considered a viable candidate for the dark matter. While the abundance of PBHs with large masses has been constrained with a multitude of astrophysical observations, recent re-analyses of bounds on smaller PBHs have opened a significant window of the previously excluded parameter space for PBHs to constitute the dark matter (DM). In light of this, we revisit and generalize the treatment of PBHs generated by vacuum bubble nucleation during inflation that can constitute all of the DM. The resulting PBHs have a broad mass spectrum distribution with an extended tail that could be detected with optical surveys and that can naturally explain the candidate event in Subaru Hyper Suprime-Cam (HSC) data. Future observations of HSC and other optical surveys such as LSST will be able to not only probe the formation epoch of such black holes, but entirely rule out this generic formation mechanism as the dominant source of PBH dark matter.