

Primordial black holes - The possibilities and pitfalls of studying something that may not exist

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C. Rampf

Nordita

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2016

Outline

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 - What are primordial black holes?
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Black holes formed in the early Universe – Primordial black holes

- Quantum fluctuations of inflation seed structure
- New modes reenter horizon
- What if an overdensity had $R_S > R_H$?
- Violent early processes
- These are primordial black holes

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- Could be dark matter
- Probe inflation
- Phase transitions
- Seed very large black holes?
- Detectable Hawking radiation?
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- Phase transition can lower threshold
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- Monochromatic spectrum
- $M \approx \frac{c^3 t}{G} \approx 10^{15} \left(\frac{t}{10^{-23} \text{s}} \right) g$
- $\delta_c \approx w$
- Gaussian perturbations
- Spherical collapse
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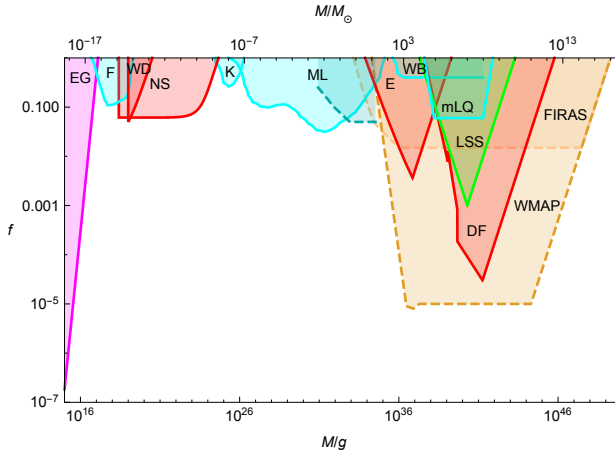
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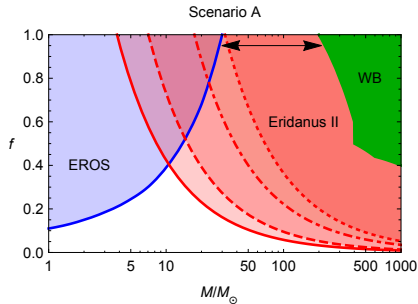
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Observable constraints



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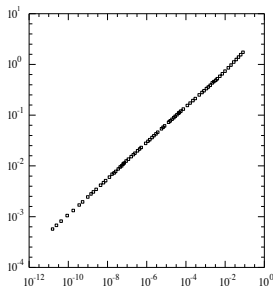
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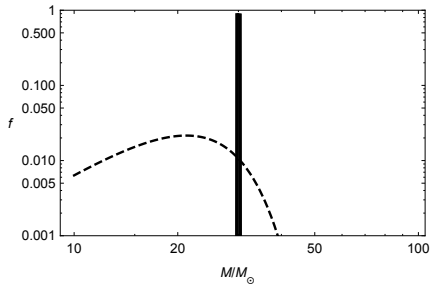
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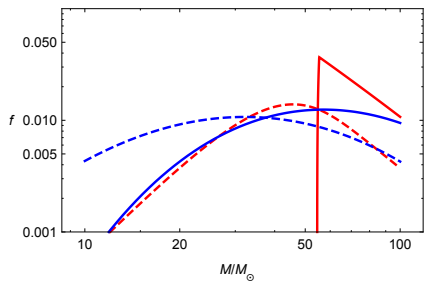


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- Large isocurvature in CMB
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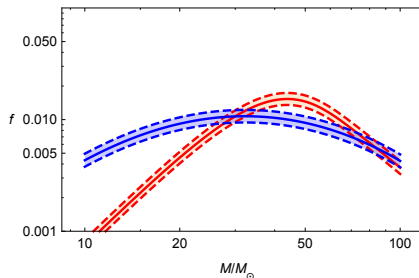
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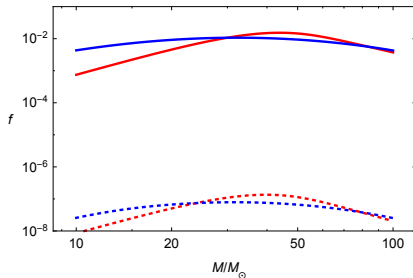
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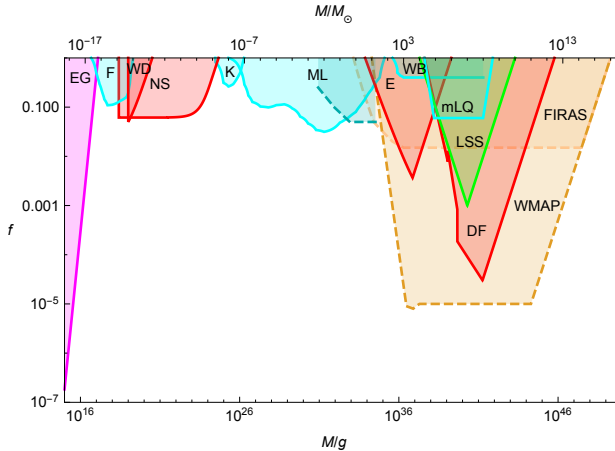
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