Primordial black holes and how to produce them

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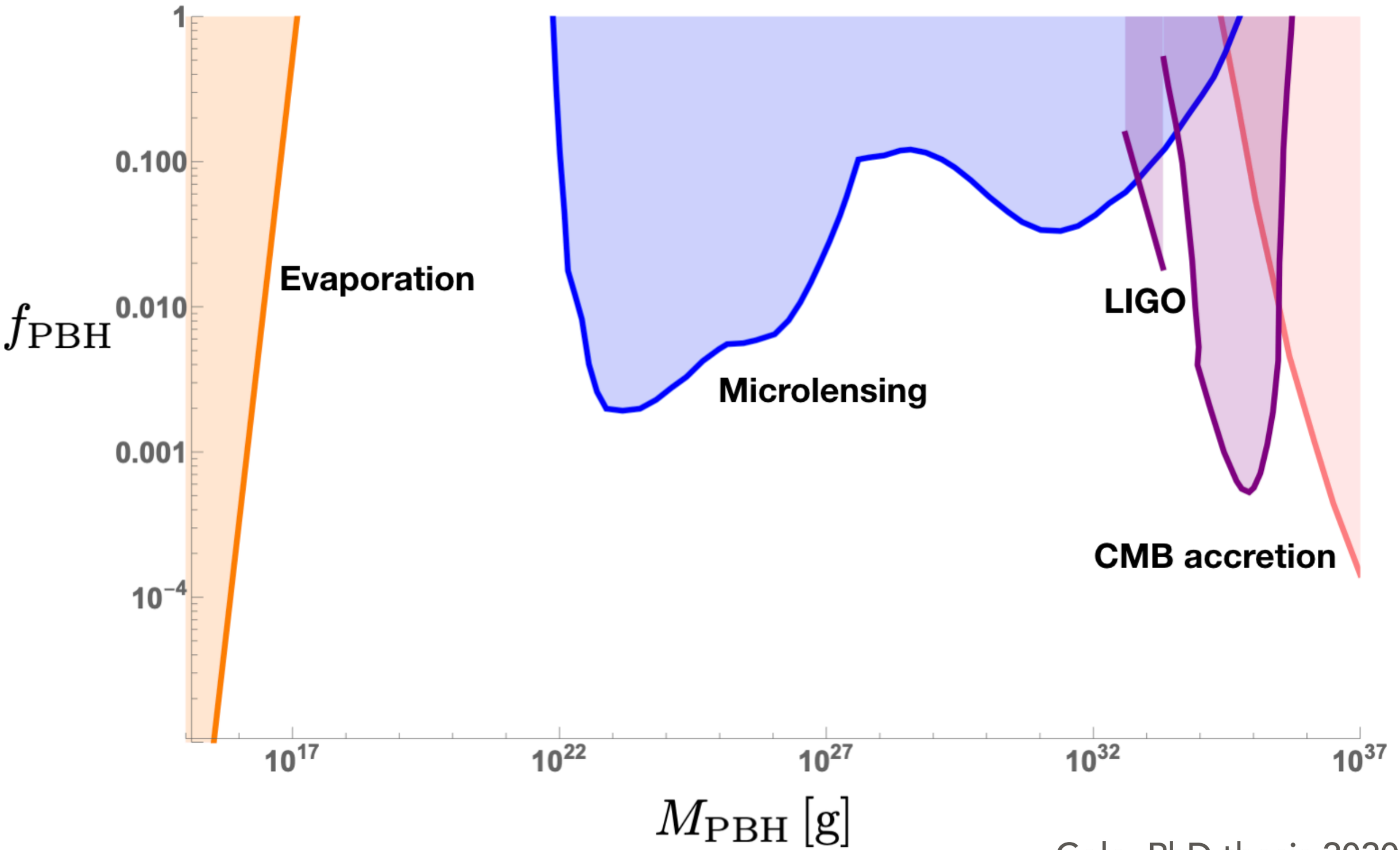
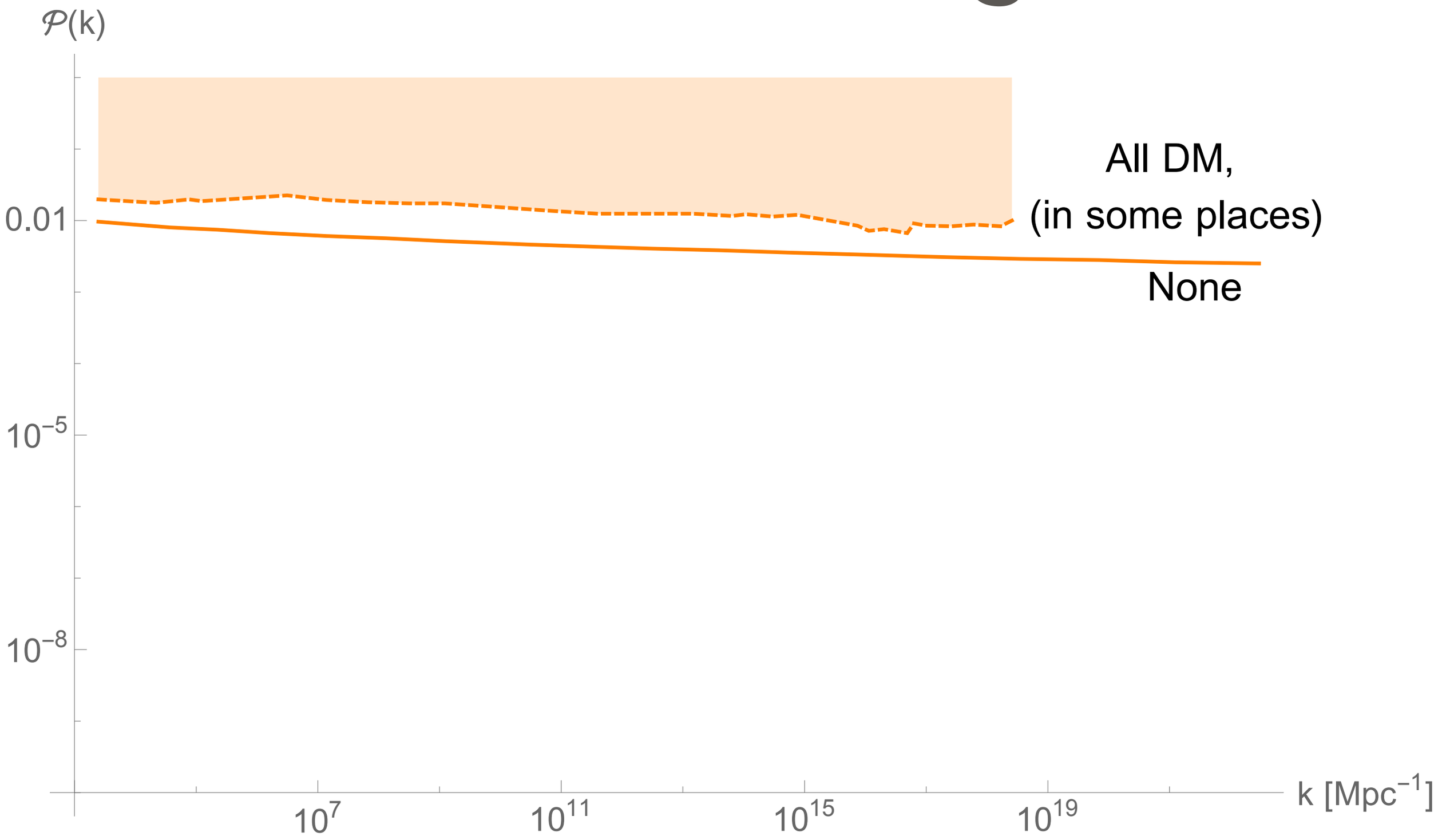
arXiv:2008.03289
arXiv:1912.02171
arXiv:1811.11158
arXiv:1706.10288

Why might we want PBHs?



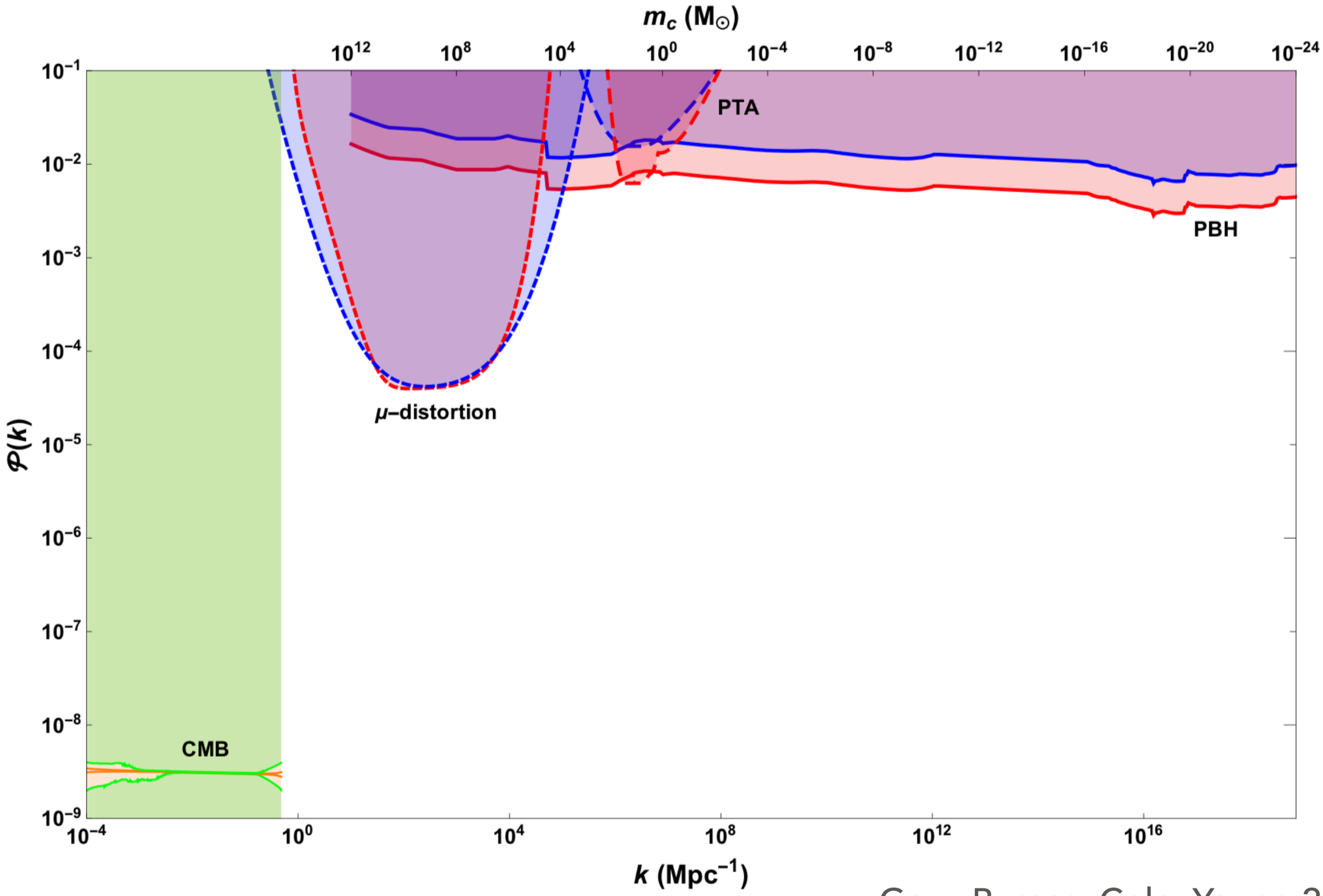
Cole, PhD thesis 2020

All or nothing



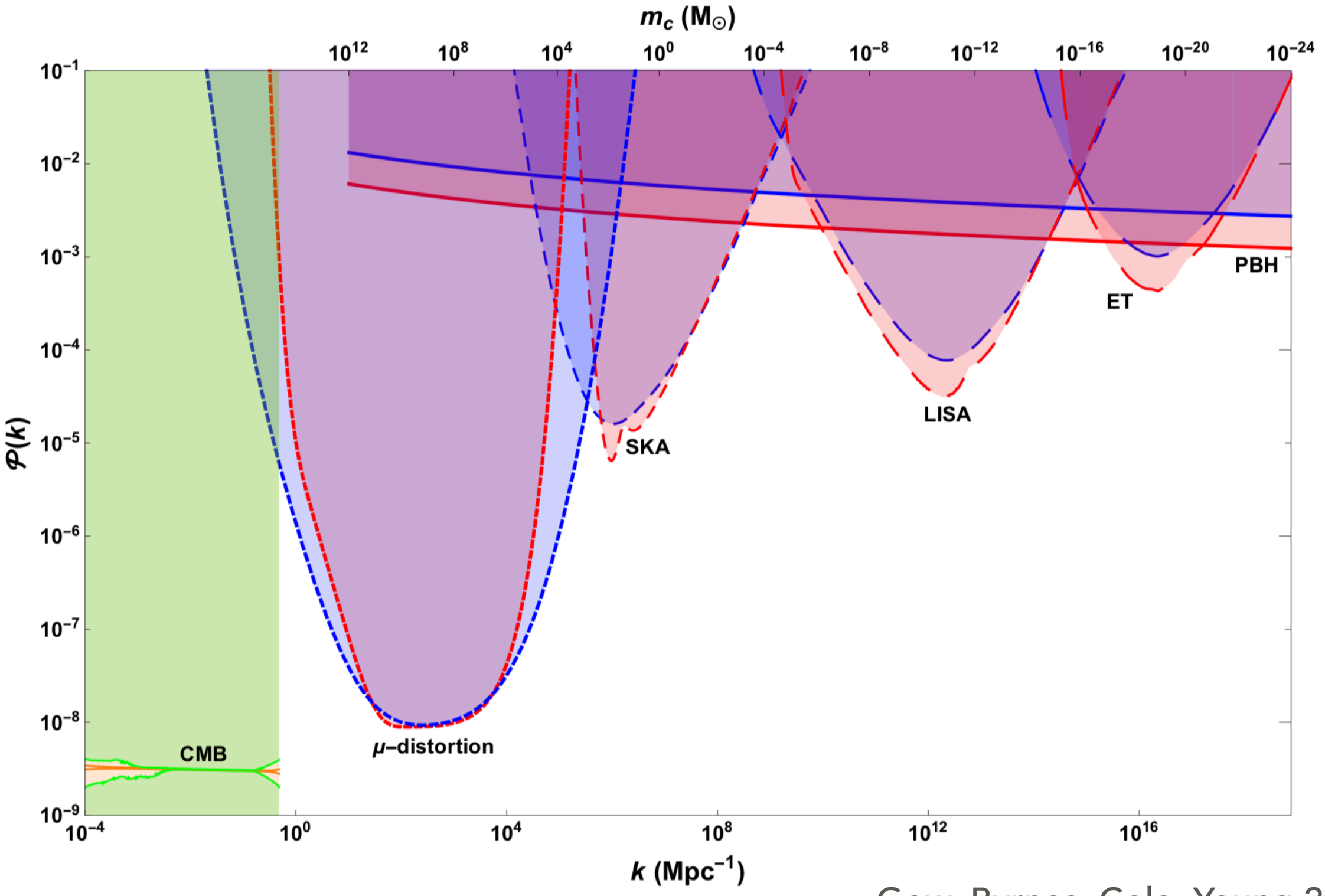
Adapted from Cole, Byrnes 2017

Secondarily produced GWs very powerful, indirect probe of PBHs



Gow, Byrnes, Cole, Young 2020

And future GW detectors will rule out large areas of parameter space for even one PBH



Gow, Byrnes, Cole, Young 2020

Take home messages

- Even producing one PBH is difficult
- But that makes finding one exciting, or prescriptive of inflation at least, even if they're not all of the DM
- SKA, LISA, and ET might be able to rule out any PBHs existing on a wide range of scales through probing the GW background

If we see just 1, that's still exciting, but how will we know it's primordial?

If not all of the DM, then expect a DM spike to surround them - can we see this in the gravitational waveform?