



SPECOLA VATICANA

# Birefringence in CMB anisotropies due to cosmological pseudoscalar fields

Matteo Galaverni *Specola Vaticana (Vatican Observatory), V-00120, Vatican City State*  
*INAF/OAS Bologna, Via Gobetti 101, I-40129 Bologna, Italy*



Based on a work with **Fabio Finelli** and **Daniela Paoletti**, for more details see:  
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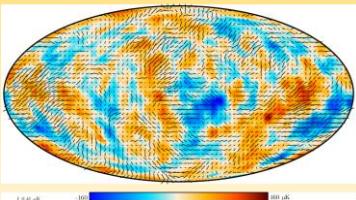
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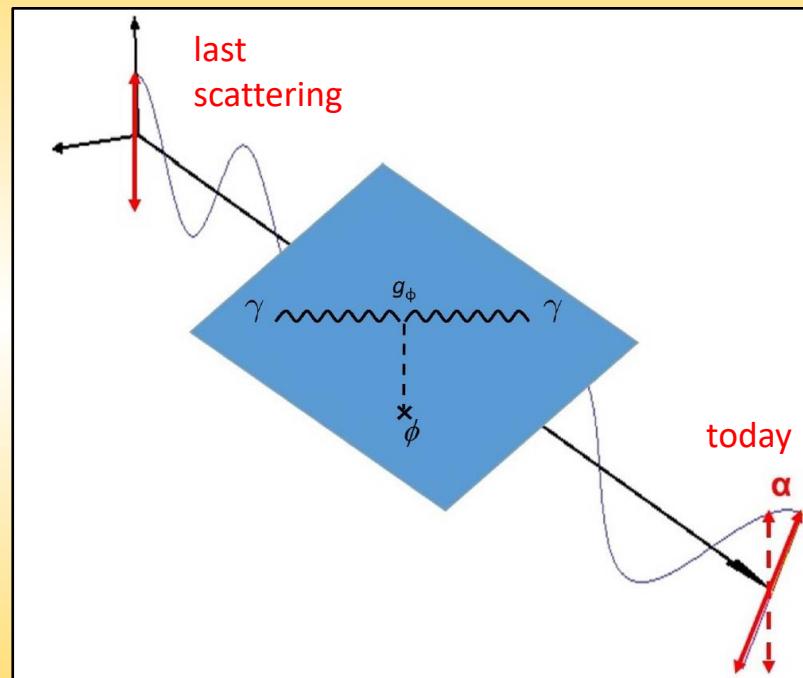


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Planck 2018 map  
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CMB anisotropies.

$$\mathcal{L} \supset -\frac{g_\phi}{4} \phi F_{\mu\nu} \tilde{F}^{\mu\nu},$$



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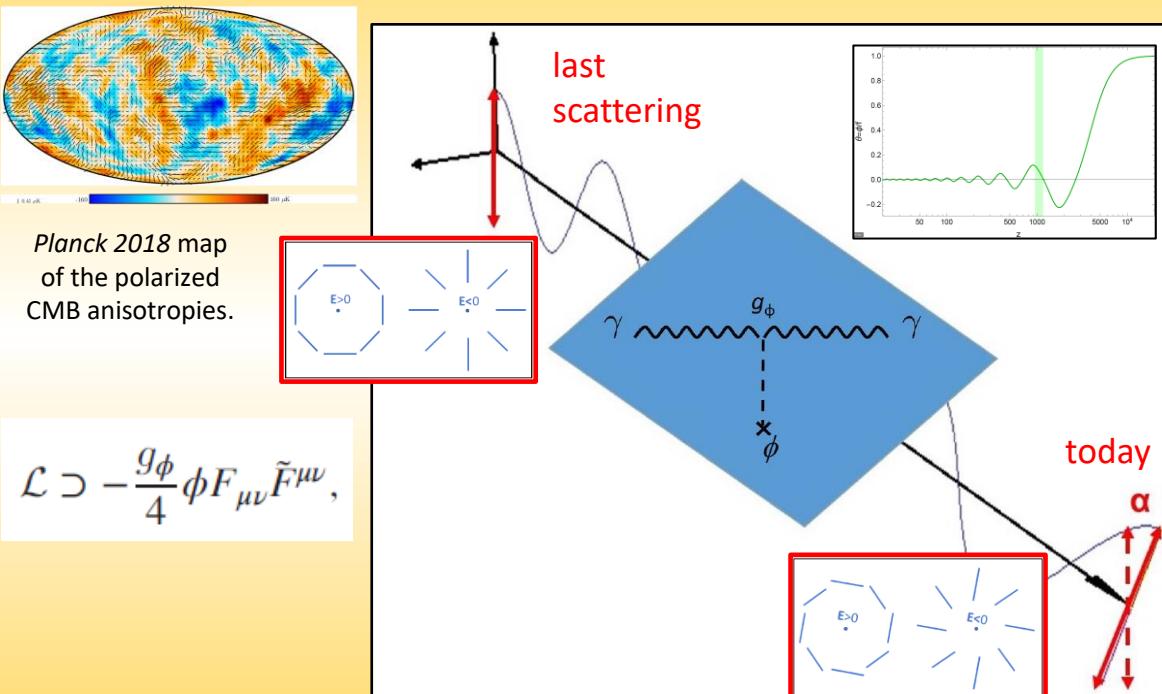
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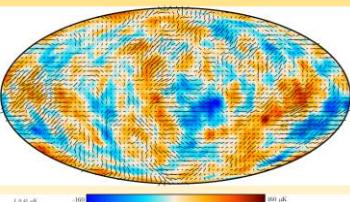
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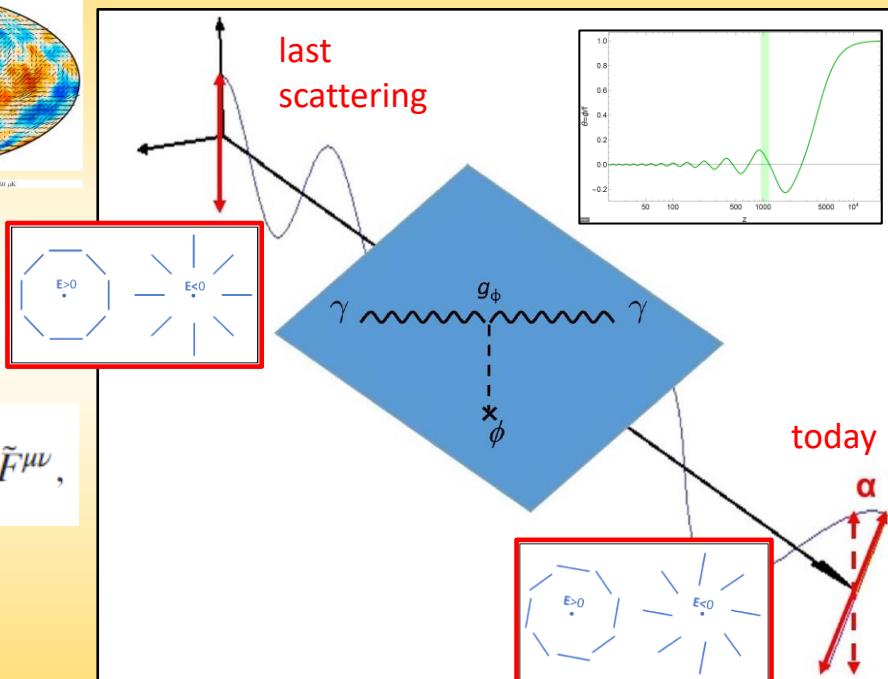
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The **redshift dependence** of the pseudoscalar field induces a **multipole dependence of the cosmological birefringence effect in the CMB power spectra:**

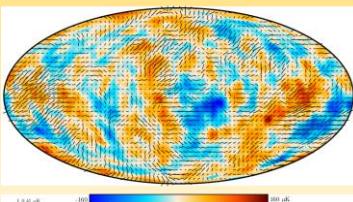
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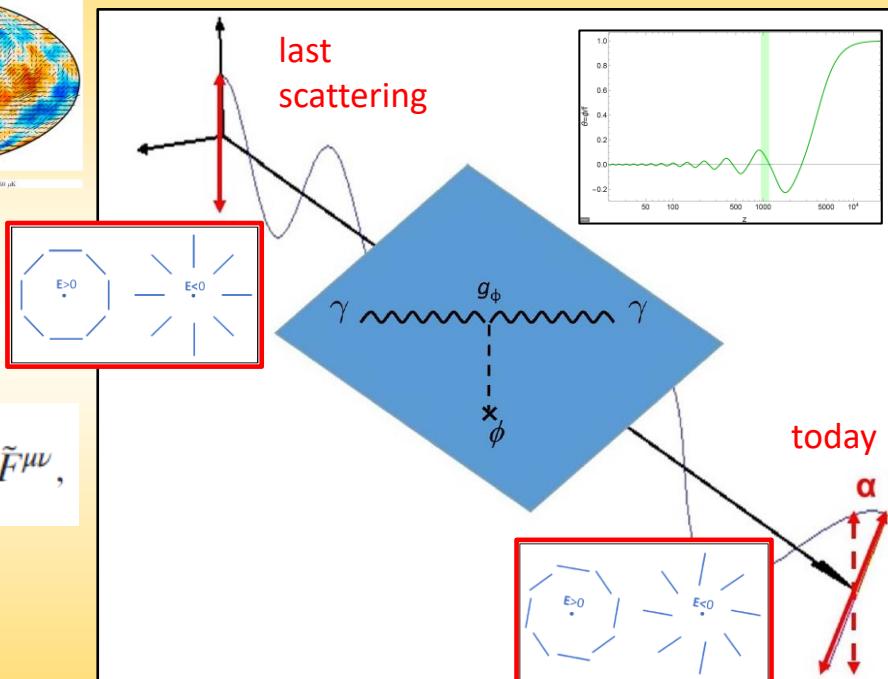
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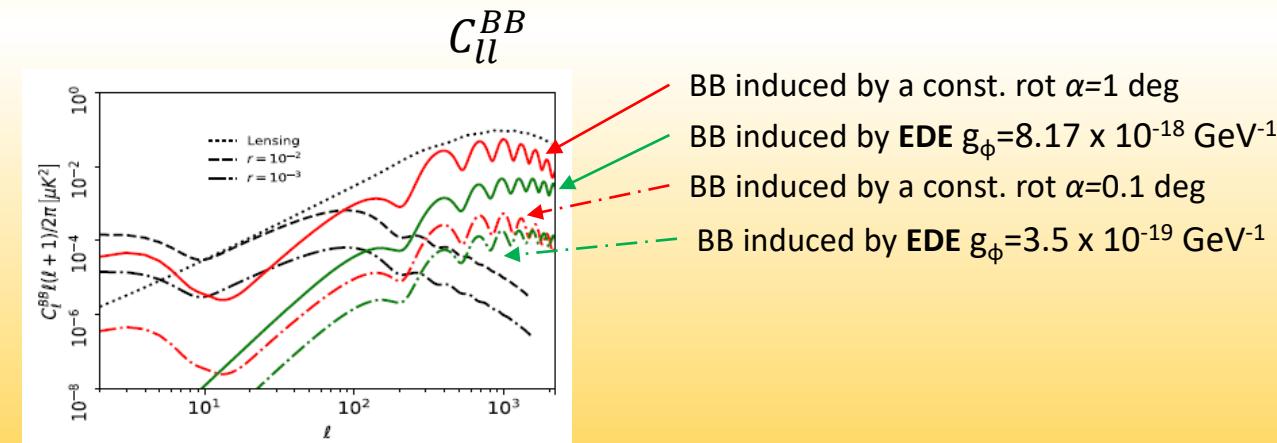
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The **redshift dependence** of the pseudoscalar field induces a **multipole dependence of the cosmological birefringence effect in the CMB power spectra**:

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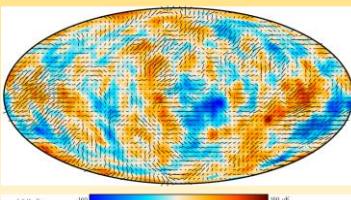


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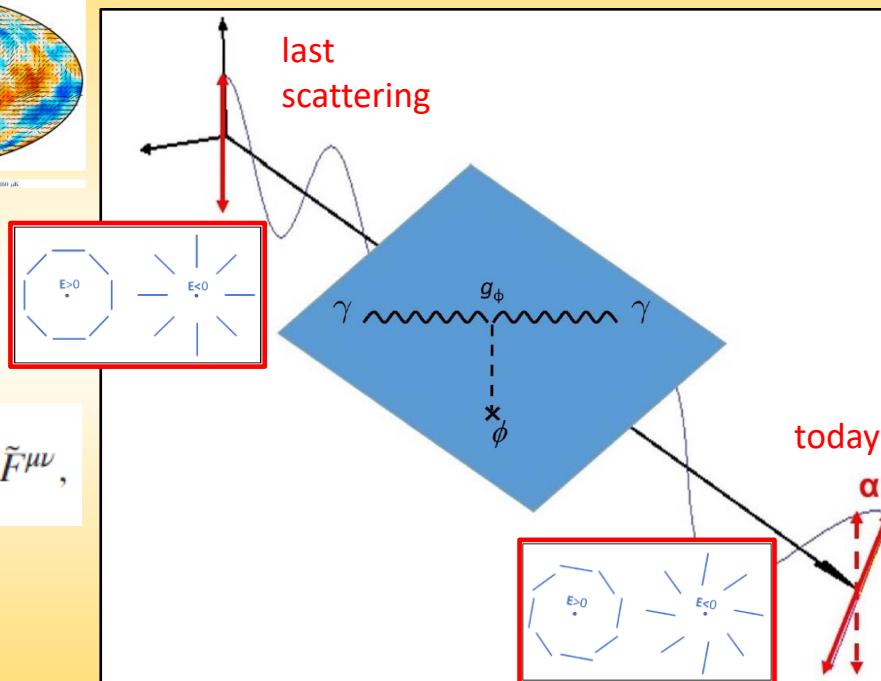
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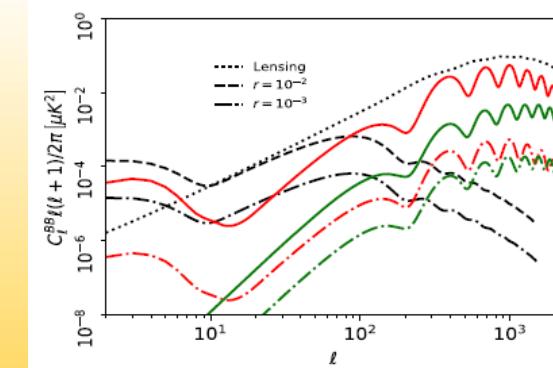
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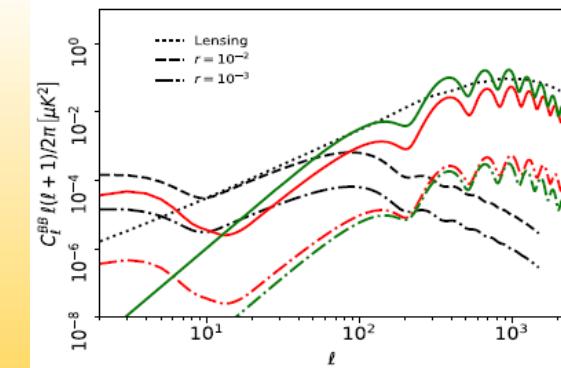
$$C_{ll}^{BB}$$



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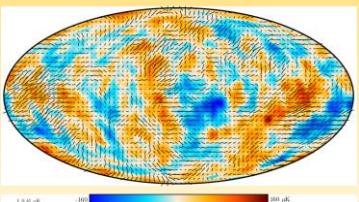
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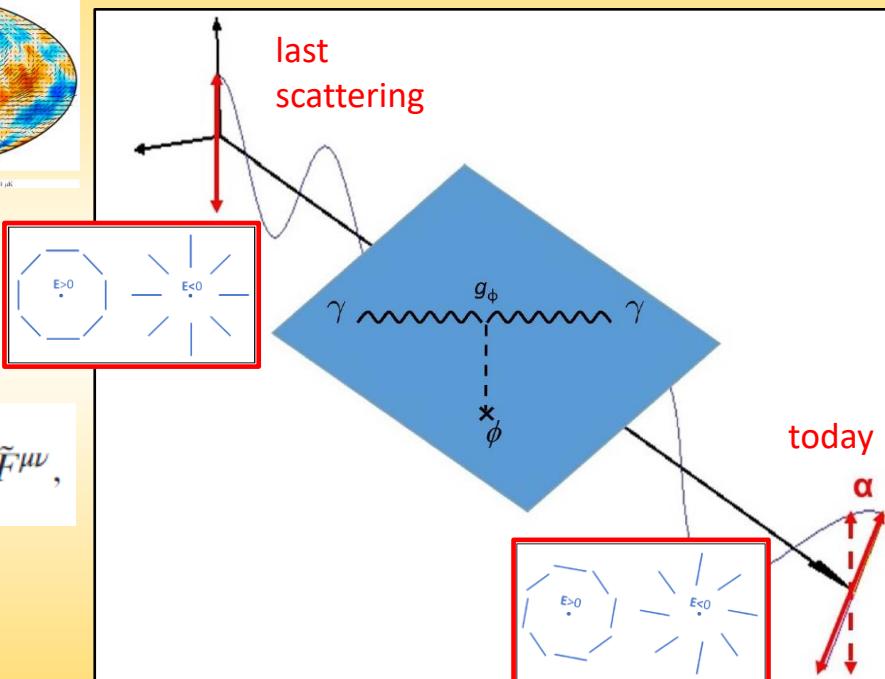
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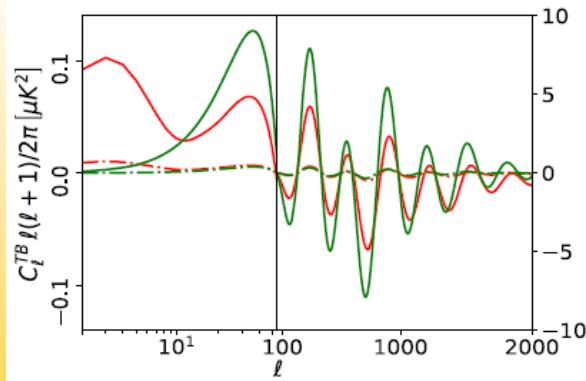
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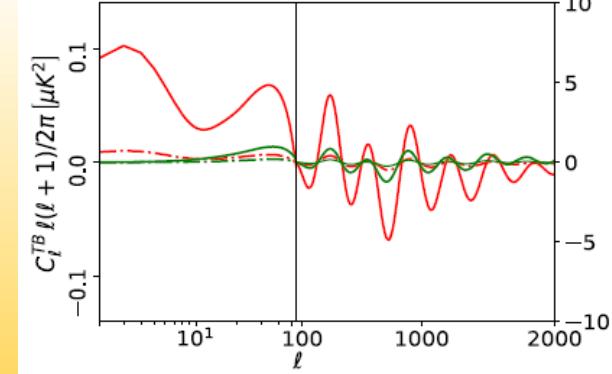
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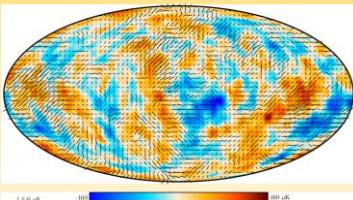


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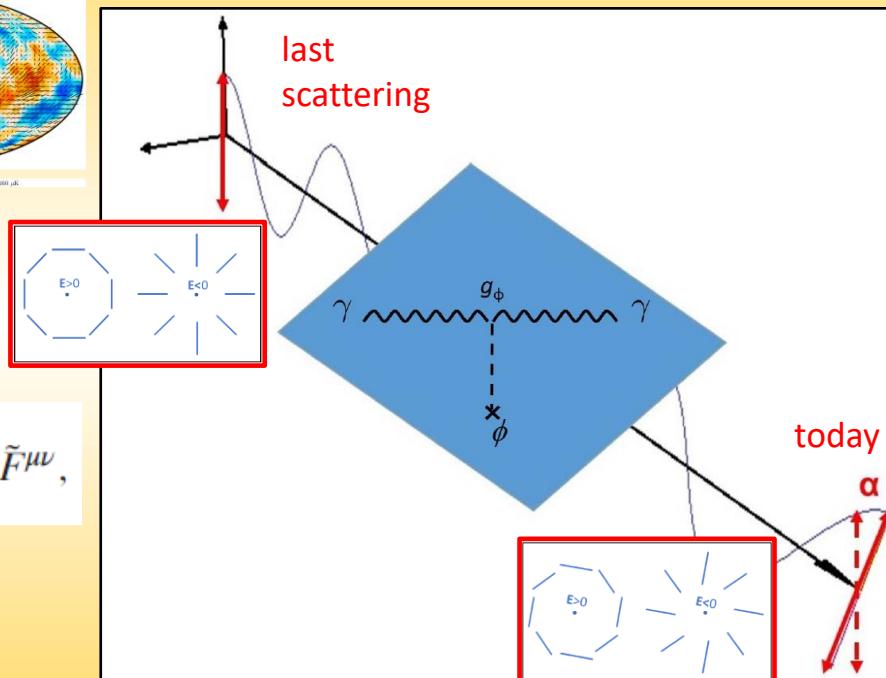
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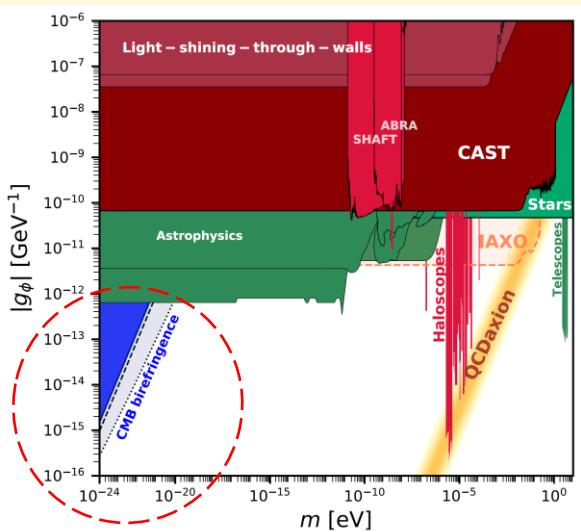


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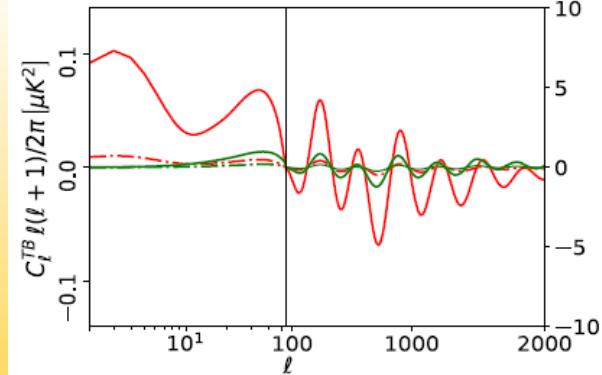
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