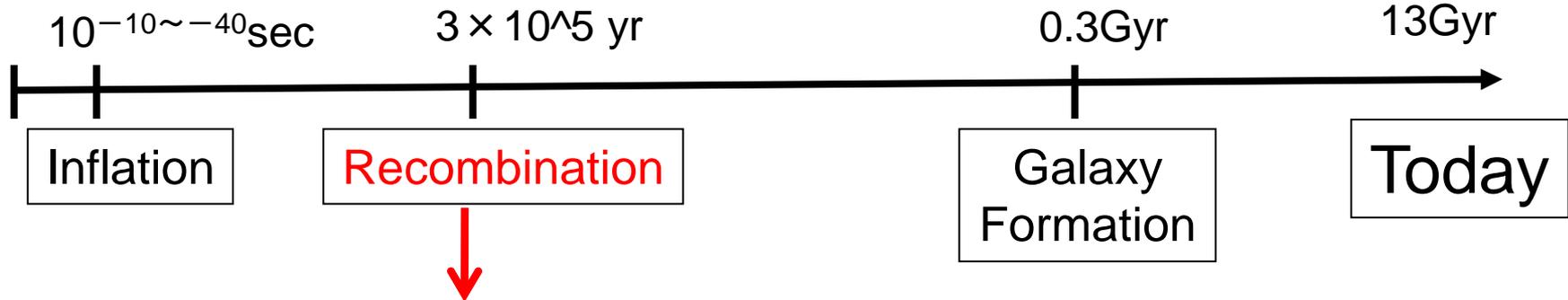# The power spectrum of the magnetic fields generated by the second-order perturbations during the pre-recombination era

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Previous results

$10^{-10\sim-40}$sec	3×10^5 yr	0.3Gyr	13Gyr
Inflation	Recombination	Galaxy Formation	Today

The magnetic fields generated by the second-order perturbations and the Thomson scattering.

➡ <u>Evolution equation of the magnetic fields</u>

$$(a^3 B^i)' = \frac{1-\beta^3}{1+\beta} \frac{\sigma_T}{e} a^2 \rho_\gamma^{(0)} \left[2 \frac{H}{\alpha^{(0)}} a^2 \omega^{(2)i} + \varepsilon^{ijk} \frac{R^{(0)} \partial_j \Delta_b^{(I,1)}}{1+R^{(0)}} \delta v_{(\gamma b)k}^{(I,1)} \right]$$

Vorticity term   Slip term

$$\begin{bmatrix} ': \text{derivative of the conformal time} \\ \beta = m_e / m_p \\ \omega^{i(2)}: \text{a vorticity of the photon} \end{bmatrix}$$

Δ_b : density perturbations of the baryon

$$\delta v_{(\gamma b)i}^{(I,1)} = \frac{1}{\alpha^{(0)}} \left[H v_i^{(1)} - \frac{1}{4} \frac{\partial_i \delta \rho_\gamma^{(1)}}{\rho_\gamma^{(0)}} \right]$$

Results

•The power spectrum of the magnetic fields by slip terms