Reconstruction and denoising of dark matter map based on Multigrid Method from Weak Lensing Data

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Résumé

Current cosmology proves that the Universe is dominated by the the dark matter and dark energy, which haven't been well understood so far. The weak gravitational lensing provides a unique way to map directly the distribution of dark matter in the Universe. Furthermore, it is believed to be the most promising tool to understand the nature of dark matter and dark energy and then to constrain the cosmological model. However, the dark matter map reconstruction is not an easy inverse problem. The classical method to map the distribution of dark matter using a global inversion of the weak lensing equation based on the FFT causes the boundary effect problems and is not easy to extend to an arbitrary geometry of the telescope survey. Thus, in this talk, based on the Poisson equation solution, a Multigrid method integrated with the Finite Difference Method is proposed and the preliminary results demonstrate the high-efficiency and high-resolution of dark matter map reconstruction. Besides, concerned with the issue of denoising, the data preprocessing is dealt with linear and nonlinear filters.

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