U13b An Iterative Data Reconstruction Method for Incomplete Measurements in All-Sky Surveys

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Implementation of an iterative algorithm is proposed to reconstruct data from incomplete measurements in the sky. Spherical harmonic analysis is employed in cosmology with all-sky measurements since information can be regarded as fluctuations on an isotropic sphere, for example, analysis of the cosmic microwave background and density maps of large-scale structures. A physical limitation for such a study is the foreground noise of the Galaxy (Zone of Avoidance) resulting in obscuring the lower S/N ratio region. Previously proposed work to deal with spatially incomplete data are either limited by length scales or are machine-based. This proposed method is able to successfully reconstruct the masked region under the assumption that the Fourier decomposition of the underlying fluctuations have a finite degree N of spherical harmonic coefficients (mode-limited). By iterations, the algorithm reduces the error of the reconstructed spherical harmonic coefficients and converges to the coefficients of the original fluctuations. We explore the speed of convergence and its dependance of the degree N of spherical harmonic coefficients and of the initial unmasked fractional sky area. We test the suitability of the iterative algorithm for our purpose of reconstructing missing regions in masked cosmological all-sky maps.