The cosmic microwave background (CMB) power spectrum is a powerful cosmological probe as it entails almost all the statistical information of the CMB perturbations. Having access to only one sky, the CMB power spectrum measured by our experiments is only a realization of the true underlying angular power spectrum. In this paper we aim to recover the true underlying CMB power spectrum from the one realization that we have without a need to know the cosmological parameters. The CMB power spectrum is very sparse in two dictionaries; Discrete Cosine Transform (DCT) and Wavelet Transform (WT), and can be recovered with only a few percentage of the coefficients. Using the two dictionaries we develop a technique that estimates the true underlying CMB power spectrum from data alone, i.e. without a need to know the cosmological parameters.

This smooth estimated spectrum can be used to simulate CMB maps with similar properties to the true CMB simulations with the correct cosmological parameters. The developed IDL code, TOUSI, for Theoretical pOwer spectrUm using Sparse estimation, will be released with the next version of ISAP cpu.

http://jstarck.free.fr/isap.html