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New model of Planck polarized dust maps using Cross Wavelet Scattering Transform

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The fine measurement of the polarized emission of the CMB is intimately linked to the ability to separate it from the Galactic foregrounds. A specific difficulty for this goal is to take into account the spatial non-Gaussian structure of these foregrounds. In this work, we propose a new method that is able to extract the non-Gaussian features of the galactic dust emission from noisy observations, that we apply to a full-sky map from the SRoll2 HFI-Planck data at 353Ghz. This method introduces in particular the Cross Wavelet Scattering Transform (CWST). These statistics, which are able to characterize non-Gaussian statistical dependencies between different processes, play a crucial role in extracting the features of the dust emission from two halfmissions with different noise realizations. This statistical separation of components allows to recover the statistics of the dust emission, including its non-Gaussian properties, until close to lmax~800, where the noise dominates in power by a factor 100 in power spectrum (fsky=0.5), as well as to generate new realizations of the foregrounds with reproduce these statistical properties up to the same scale. Thanks to their realistic non-Gaussian features, we expect these new models of galactic dust emission to play a strategic role for future CMB analyses.

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