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ForSE+: Simulating non-Gaussian CMB foregrounds at 3 arcminutes in a stochastic way basing on GAN

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We present ForSE+ package to produce non-Gaussian diffuse Galactic thermal dust emission maps at arcminute angular scales along with the capacity to generate random realizations of small scales. This work is based on ForSE (Foreground Scale Extender) package, which was recently proposed to simulate non-Gaussian small scales of thermal dust emission at 12′ using Generative Adversarial Networks (GANs). These new realistic maps will be used in the future to understand the impact of non-Gaussian foregrounds on the measurements of the Cosmic Microwave Background (CMB) signal, in particularly on the lensing reconstruction, de-lensing and the detection of cosmological Gravitational Waves in CMB polarization B-modes. With the input of the large-scale polarization maps from observation, ForSE+ is trained to produce realistic polarized small scales at 3'following the statis-
tical properties, mainly the non-Gaussianity, of observed intensity small scales, which are evaluated through Minkowski functionals. Furthermore, by adding different realization of random component
to the large-scale foregrounds, we show that ForSE+ is able to generate small scales in a stochastic way. In both cases the output small scales have a similar level of non-Gaussianity compared with
real observation and correct amplitude scaling as a power law.

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