

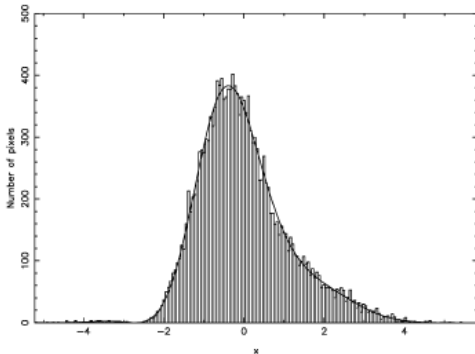
Topic: Methods

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Foregrounds, lensing and NG

- Simulations of foregrounds with MHD for small patches and full-sky available
 - Potentially computational expensive to generate Monte Carlos of MHD simulations
- For CMB purposes it might suffice to generate FG maps that reproduce the statistical characteristics of the MHD simulations (its Non-Gaussianity) either 3D or the 2d projection, one example:
 - Estimate the moments of the distribution from the MHD maps
 - Generate the FG maps resorting to a NG pdf constructed with the estimated moments
- Similar procedure was used to generate Non-Gaussian CMB skies - NGsims (in HEALpix) (*Rocha et al 2005, MNRAS 357*) – NG pdf based on the wavefunctions of the energy eigenstates of a linear harmonic oscillator – correlations introduced via C_l



$$p(x) = |\psi|^2 = e^{-x^2/(2\sigma_0^2)} \left| \sum_n \alpha_n C_n H_n \left(\frac{x}{\sqrt{2}\sigma_0} \right) \right|^2,$$

Systematics

- The architecture of most future CMB polarization experiments (space and ground-based) involves large number of detectors
 - Large number of jack-knives and null-tests to perform → large number of pairwise differencing and data splits
- Q: how can we flag out problematic detectors in a effective fashion?
 - Compare single detector maps to an average or to a map generated with all detectors and look for differences – still large number of differencing maps to inspect – we will need to resort to techniques such as:
 - Pattern recognition algorithms
 - along with machine learning or neural networks

Detection and characterization of compact sources

- Blind and non-blind detection using eg [PowelSnakes](#) (Bayesian framework)
- A test exercise with PWS for blind detection was applied for Planck polarised maps
 - No a priori threshold – set in the detection step – is a byproduct of the method
 - **Q:** what should be considered for the priors (eg for position, radius, flux, number counts, how the polarised flux depends on the frequency and intensity flux etc..)
 - Uncertainties on the sources parameters eg. polarized flux , etc..how far do we want to go
 - Incorporate the proper beam in the detection and characterization step e in Planck using the effective beams – a la FEBEflux.
 - Etc..

Carvalho, Rocha & Hobson, MNRAS, 393, 681C, 2009; Carvalho, Rocha, Hobson & Lasenby, MNRAS, 427, 2011; Rocha, in preparation