Non-Gaussianity from Inflation (WP 8-6X2)

Michele Liguori
Univ. Padova. Dipartimento di Fisica e Astronomia

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Scientific goals.

Main goals:

- Improve over current (*Planck*) CMB bispectrum and trispectrum NG constraints and consider new shapes (e.g. tensor-scalar).
- Study new observables: spectral distortions and CIB.
- Combine with power spectrum (T,E,B) results to shed light on Inflationary and Early Universe Physics.

Ancillary goals (contributions to other WP):

- Apply NG statistics to non-primordial components.
  - ✓ Foregrounds. Can lead to improved component separation algorithms
  - ✓ SZ. Can be used to test Modified Gravity and neutrino masses.

Tasks, people

Task 1. Primordial NG from CMB bispectrum and trispectrum. New shapes (e.g. fnl running, tensor-scalar bispectra, parity-odd models, PMF) and joint power spectrum-bispectrum.
People: N. Bartolo, M. Ballardini, F. Finelli, A. Gruppuso, M. Liguori, S. Matarrese, F. Oppizzi, G. Orlando, A. Renzi

Task 2. NG from foregrounds. Foreground contamination of PNG and NG-based component separation.
People: C. Baccigalupi, C. Burigana, M. Liguori, D. Marinucci, F. Oppizzi, A. Renzi

Task 3. Primordial NG with spectral distortions.
People: N. Bartolo, C. Burigana, G. Cabass, M. Liguori, A. Melchiorri.

Task 4. Primordial NG with the Cosmic Infrared Background .
People: N. Bartolo, C. Burigana, M. Liguori

Task 5. New and alternative techniques for PNG estimation: wavelets, needlets, MFs.
People: M. Liguori, D. Marinucci, F. Oppizzi, A. Renzi, A. Troja

Organization

General philosophy: do more science than telecons.

- Group mailing list
- Short monthly telecons for progress reports.
- People within specific tasks are expected to communicate often. Groups involved so far in the WP activities already have active ongoing collaborations on relevant subjects
- Shared dropbox folder to include relevant literature, results, drafts, questions

Interactions with other WPs

Clear interactions with:

- WP8-6X1 (Inflationary GW). Joint B-mode + bispectrum studies. TTB bispectra. NG-based foreground cleaning aimed at B-mode

- WP9-6X1 (foreground modeling) for component separation methods, which characterize and exploit foreground NG.

- WP1-6X1 (SZ signal extraction from future CMB data). Studies of NG and cross-correlation signals involving Compton-y maps for MG and neutrino masses.

We are already in touch and exchanging information with these WP.

Summary of current results

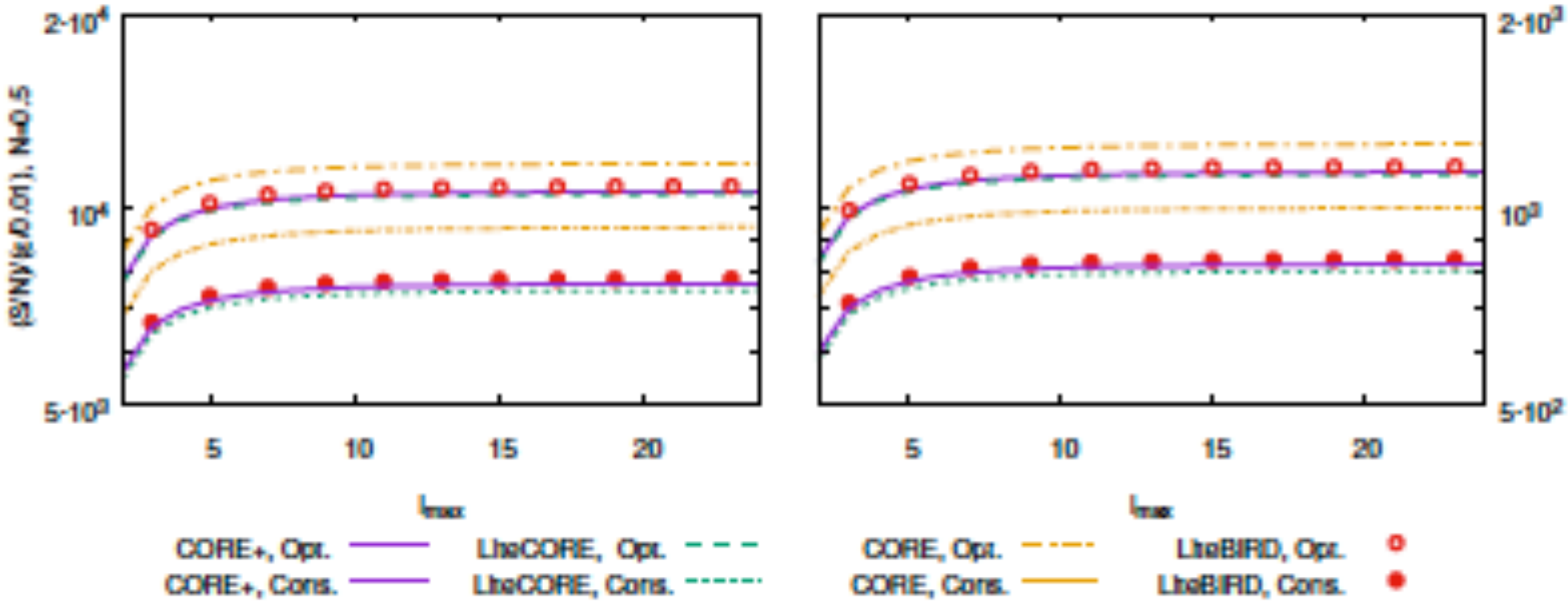
Task 1. New shapes and estimator calibration. Development and calibration of new pipelines for running NG: forecasts, CMB simulations and Estimator (F. Oppizzi)

Task 2. NG from foregrounds. Characterization of NG distribution of needlet Coefficients from simple templates. (F. Oppizzi)

Task 3. Primordial NG with spectral distortions. Forecasts for future full-sky surveys And excited initial state models with “super-squeezed” signals. Distortions-polarization cross-correlation study (μ-E, y-E). (A. Ravenni)

Task 4. Primordial NG with CIB. Forecasts for future full-sky CMB surveys.

Task 5. Needlet trispectrum estimator in progress. (A. Troja, A. Renzi)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l_max
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CORE, Cons.
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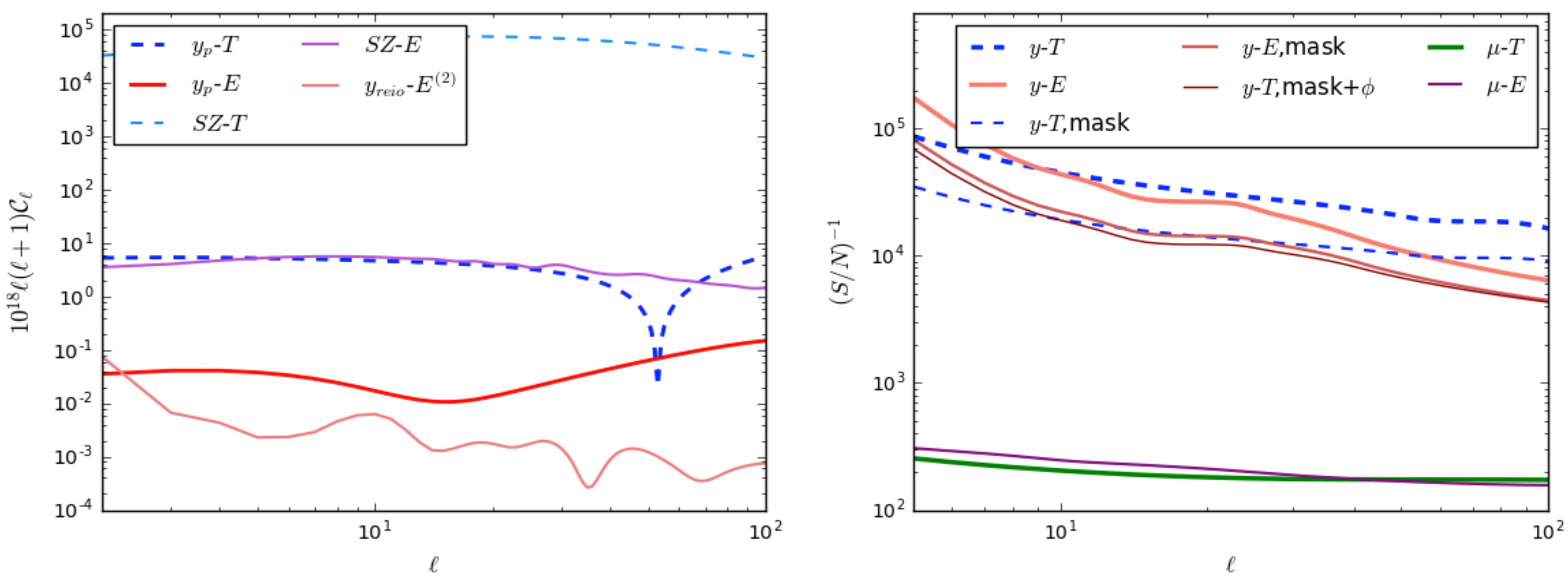
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y_p-E
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SZ-E
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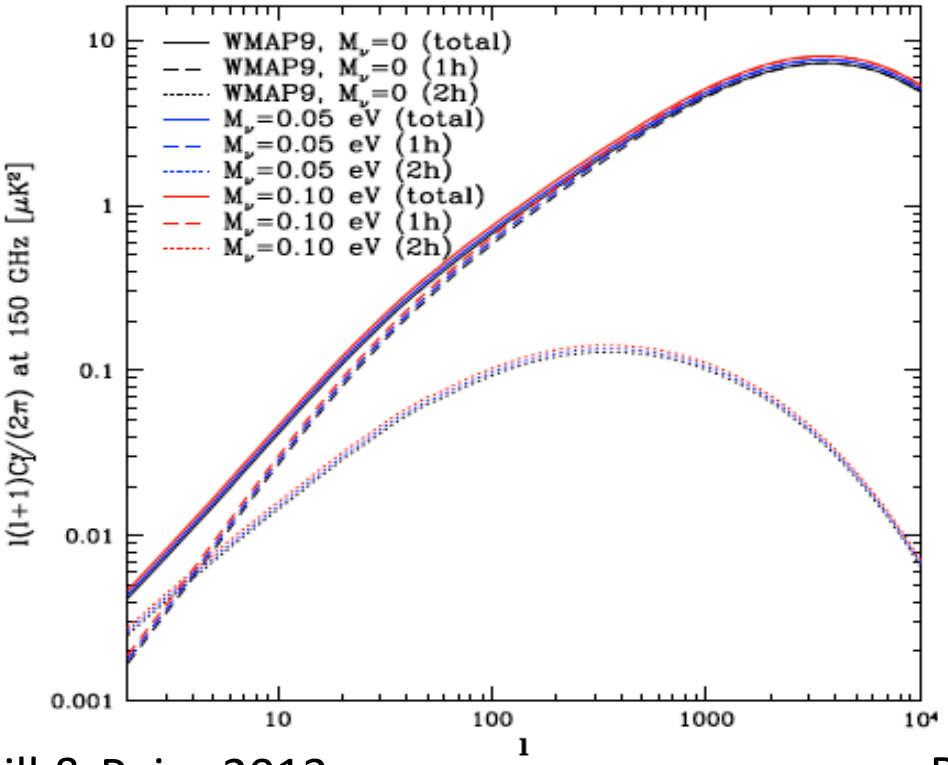
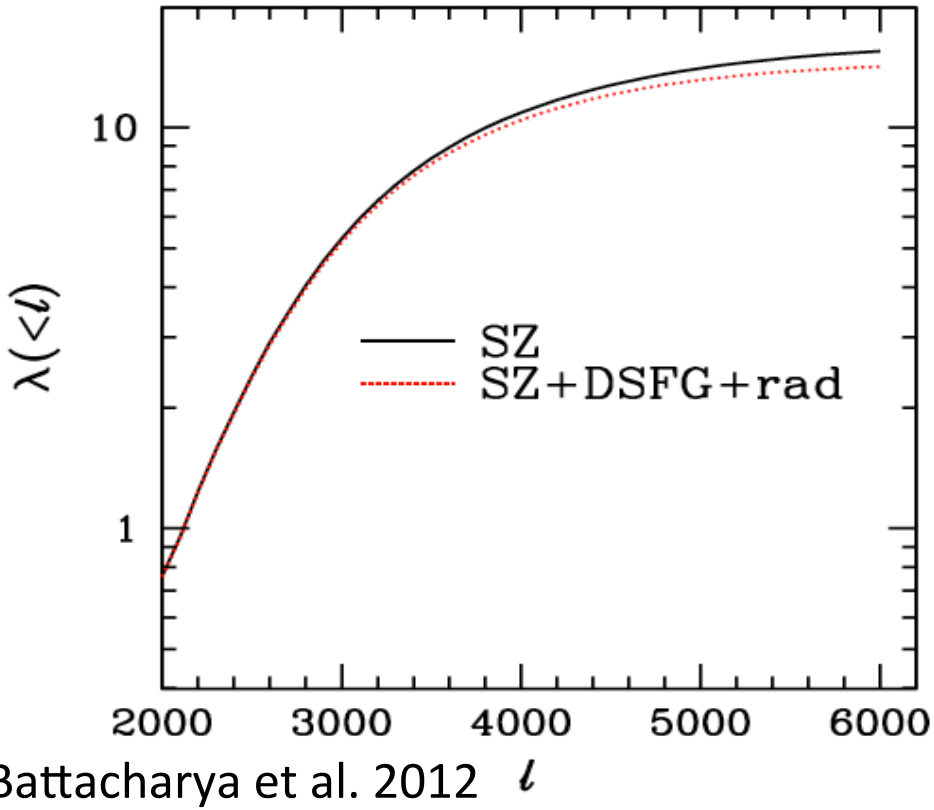
y-T
y-E
y-T,mask
y-E,mask
y-T,mask+ϕ
μ-T
μ-E

Testing Modified Gravity with the Compton-y map

- The power spectrum, bispectrum and higher-order cumulants of the Compton-y signal depend on mass function and cluster gas profile. Therefore they can be used to constrain MG scenarios, as well as neutrino masses and fNL.
- Besides yy and yyy, we can also consider several cross-correlations e.g. Ty, Ey, ϕy.
- Need predictions of profiles and mass functions in MG!
- Some neutrino-mass halo-model based predictions can be found in the literature, in standard GR. Nothing about MG and current works on yyy in standard GR are incomplete.
- We have tools readily available to extract yyy from real data.



Hill & Pajer 2013



Battacharya et al. 2012