Brief Summary from "NIRB and EoR" Workshop

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May 15, 2012

Revised and endorsed by SOC

May 25, 2012

Developing Consensus

- We are fortunate to have almost everyone working on NIRB/EBL in this room.
- Let's develop some consensus.

Consensus#1.1

- Do the measurements of the total sky brightness agree?
- **Yes**, *before subtracting foreground*.
  - Wright [DIRBE]; Matsumoto [IRTS]; Thompson [NICMOS]; Matsuura [CIBER]
- **No**, *after subtracting foreground*.
  - Different models of Zodiacal Light, ranging from DIRBE/Kelsall to DIRBE/Wright, give different Extra-galactic Background Light residuals in the 1-2μm range. At lower levels Galactic foregrounds must also be better understood.

Consensus#1.2

- Do the measurements of the power spectrum agree?
- **Yes**, *on the angular scales and wavelengths where they overlap and are trusted.*
    - Kashlinsky [Spitzer]; Thompson [NICMOS]; Smidt [Spitzer; HST/CANDELS]; Matsumoto [AKARI]; Who's actually overlapping?

Community Crash ;)

- Infrared people [Thompson; Matsumoto; Kashlinsky; Ferrara]: $q^2P(q)$ as a function of $(2\pi)/q$ [arcsec]
- CMB people [Cooray; Komatsu]: l^2C_l as a function of l

- It is unlikely that either side would change their notation; thus... let's get used to the conversion!
    - $l=10^4$ -> $(2\pi)/q=130$ arcsec
    - $l=10^3$ -> $(2\pi)/q=1300$ arcsec

Consensus#1.3

- Will a measurement of a Fraunhofer line give us final words on Zodi?
- **Not a final word**, but it will help. Uncertainties include:
    - Raman scattering; extended red emission; unresolved star light; Diffuse Galactic Light
- But, monitoring several Fraunhofer lines would help.
- It may be possible to quantify these uncertainties.

Consensus#2.1

- **IF**:

  1. Secondary gamma-rays from cosmic-ray protons produced by blazars do not contribute; **and**
  2. There exists a lower bound on the photon index, Γ_{min}=1.5 (e.g., $dN_\gamma/dE \sim E^{-\Gamma}$ with $\Gamma \geq 1.5$)

THEN

- The current data on spectra of TeV gamma-rays from blazars indicate that most of the claimed "near infrared background *excess*" is not EBL but something like Zodi.

Consensus#2.2

- **IF**:

  1. Secondary gamma-rays from cosmic-ray protons produced by blazars **DO** contribute

THEN

- The current data on spectra of TeV gamma-rays from blazars are unable to place upper bounds on EBL.

Consensus#2.3

- Gamma-ray photons coincident with GRB cannot be explained by secondary gamma-rays from cosmic-ray protons.
- Therefore, GRBs would play an important role in deciding whether most of the claimed “near infrared background *excess*” is EBL or something like Zodi.

Consensus#3.1

- Does the source-subtracted NIRB/EBL come from z>6 or z<6?

- We do not know.
  - Color of the NICMOS data suggest z<8 (Thompson)
  - Current low-z galaxy data suggest z>6 (Kashlinsky)
  - Current high-z galaxy data (UV luminosity function at z=6-8) cannot explain it (Cooray)

Consensus#3.2

- None of the existing models [Cooray; Ferrara; Fernandez] are able to explain the observed power spectrum on large scales (**l<5000; θ>260”**)
  - Both the amplitude (model lower than data) and color (model redder than data, $1/\lambda^3$) are off.
  - It may be possible to fit the power spectrum at one or two wavelengths, but not the others.

- We do not know what to do.

Consensus#3.3

- The current low-z galaxy data fail to explain the power spectrum, P(q), at (2π)/q > 30” measured from the Spitzer data at 3.6 and 4.5μm.

Status of fluctuations: Summary

- Current fluctuation measurements show an excess over clustering from known galaxies, and the origin of these fluctuations is unknown.
- The SED of current fluctuation measurements is approximately Rayleigh-Jeans ($\nu I_\nu \sim \nu^3 \sim 1/\lambda^3$)
- Improved fluctuations and absolute background measurements going from the infrared into the optical are critical tests of the origin of fluctuations.

Sources?

- Known galaxy populations (z<6)
- Faint, so-far-unresolved galaxies (but not first galaxies) responsible for reionization at z~6-7
- Faint, so-far-unresolved quasars
- First galaxies (metal-free)
- First quasars

- Thank y’all for coming! Hope you enjoyed the workshop, food, and peacock.