Highlights of Astronomy, Volume 14
IAU XXVI General Assembly, 14-25 August 2006
Karel A. van der Hucht, ed.

doi:10.1017/S1743921307010496

Anisotropies of the infrared background and primordial galaxies

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Abstract. We discuss anisotropies in the near-IR background between 1 to a few microns. This background is expected to contain a signature of primordial galaxies. We have measured fluctuations of resolved galaxies with Spitzer imaging data and we are developing a rocket-borne instrument (the *Cosmic Infrared Background ExpeRiment*, or *CIBER*) to search for signatures of primordial galaxy formation in the cosmic near-infrared extra-galactic background.

Keywords. large scale structure of Universe, diffuse radiation, infrared: galaxies

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The intensity of the cosmic near-infrared background (IRB) is a measure of the total light emitted by stars and galaxies in the universe. While the absolute background has been estimated by space-based experiments, such as the *Diffuse Infrared Background Experiment (DIRBE)*, the total IRB intensity measured still remains fully unaccounted for by sources. Primordial galaxies at redshifts 8 and higher, especially those involving Population III stars, are generally invoked to explain the missing IR flux between 1 μm and 2 μm, with most of the intensity associated with red-shifted Lyman-α emission during re-ionization, though there are difficulties with such an assumption.

As pointed out in Cooray *et al.* (2004), if a high-redshift population contributes significantly to the IRB, then these sources are expected to leave a distinct signal in the anisotropy fluctuations of the near-IR intensity, when compared to the anisotropy spectrum associated with low-redshift sources. In Sullivan *et al.* (2007), we presented clustering measurements at 3.6 μm in several fields of *Spitzer*-IRAC data and we refer the reader to this work for more details and implications.

We are also developing a rocket-borne instrument (the *Cosmic Infrared Background ExpeRiment*, or *CIBER*) to search for signatures of primordial galaxy formation in the cosmic near-infrared extra-galactic background. *CIBER* consists of a wide-field two-color camera, a low-resolution absolute spectrometer, and a high-resolution narrow-band imaging spectrometer. The cameras will search for spatial fluctuations in the background on angular scales from 7 arcseconds to 2 degrees. In a short rocket flight, *CIBER* has sensitivity to probe fluctuations 100 times fainter than *DIRBE*. By jointly observing regions of the sky studied by *Spitzer* and *Akari*, *CIBER* will build a multi-color view of the near-infrared background, allowing a deep and comprehensive survey for first-light galaxy background fluctuations. The low-resolution spectrometer will search for a redshifted Lyman cutoff feature between 0.8 - 2.0 μm. The high-resolution spectrometer will trace zodiacal light using the intensity of scattered Fraunhofer lines, providing an independent measurement of the zodiacal emission.

References

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