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The Ultraviolet Diffuse Cosmic Background

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In every wavelength range there is a cosmic celestial background against which any and all astronomical objects and point sources must be detected. But the cosmic background itself can be of the greatest scientific interest—study of the microwave background in particular has resulted in Nobel prizes. What of the ultraviolet background? I present a broad review of the status of observation and interpretation of the diffuse cosmic ultraviolet background radiation.

Noise can make study of the ultraviolet background very difficult indeed: the sun orbits the Galactic center, and the solar chromosphere emits very strong Lyman series ultraviolet emission lines. As the sun progresses, that very strong solar Lyman line emission is scattered from the interstellar hydrogen that is currently passing through the solar system. However, for example by using a calcium fluoride filter, all of that scattered solar shorter wavelength radiation can be excluded from the spectrometer, and measurements of the diffuse cosmic background can be successfully carried out, despite the strong solar flux.

In the wavelengths near and shortward of Lyman α, however, measurement of the diffuse background offers very great difficulty indeed. While many observations of the diffuse ultraviolet background have been made longward of ~1300 Å, there are few shortward of that wavelength. Outstanding among those are the measurements of Holberg (1986) and of Murthy, Hall, Earl, Henry, & Holberg (1999), using spectrometers aboard the two Voyager spacecraft. But even the Murthy et al. work involved just 431 observations, leaving room for substantial uncertainty regarding the robustness of the reported results. Those two Voyager spacecraft are, today, both well beyond the distance of Pluto from the sun, thus greatly diminishing the solar-system-scattered ultraviolet noise, and also, many more observations have been made. Now that the two UV spectrometers aboard the Voyagers have ended their observations, Murthy, Henry, & Holberg (2012) have reduced and published all of the 1943 observations that were made of the diffuse UV background over the full 35 year period of Voyager observation. I describe and discuss their new result. The new and very much larger number of observations allows detection of systematic errors that went previously undetected, resulting in a new value (Henry, Murthy, and Holberg 2012) for the cosmic diffuse background shortward of Lyman α that is in excellent accord with the minimum value that has been previously measured by many observers longward of Lyman α.

I will also present a mass of new results on the diffuse UV background longward of Lyman α, from the GALEX mission. These observations are "imaging only," and thus require great care in their interpretation. They have the great virtue of covering, for the first time in the ultraviolet, a very large fraction of the sky. I have modeled the ultraviolet starlight scattered from dust that is expected (e.g. Bowyer 1991) to dominate the observations. A first-look at these data has been presented by Murthy, Henry, and Sujatha (2010), and discovery of dust-scattered ultraviolet stellar halos has been reported by Murthy and Henry (2011). I will emphasize examination of the UV background at the highest galactic latitudes, and I will compare with the predictions of my dust-scattered starlight models for such emission.

S. Bowyer 1991, "Cosmic Far Ultraviolet Background," ARAA, 29, 59

R. C. Henry, J. Murthy, & J. B. Holberg 2012, in preparation

J. B. Holberg 1986, "Far-ultraviolet background observations at high galactic latitude. II – Diffuse emission," ApJ, 311, 969

J. Murthy, D. Hall, M. Earl, R. C. Henry, & J. B. Holberg 1999, "An Analysis of 17 Years of Voyager Observations," ApJ, 522, 904

J. Murthy, Richard Conn Henry, & N. V. Sujatha 2010, "Mapping the Diffuse Ultraviolet Sky with the *GALAXY EVOLUTION EXPLORER*," ApJ, 724, 1389

J. Murthy, & Richard Conn Henry 2011, "Diffuse Ultraviolet Halos around Bright Stars," Astrophysical Journal, ApJ, 734, 13

J. Murthy, Richard Conn Henry, & Jay B. Holberg 2012, "Voyager Observations of the Diffuse FUV Radiation Field," ApJ Suppl, 199:11