The Local Interstellar Ultraviolet Radiation Field

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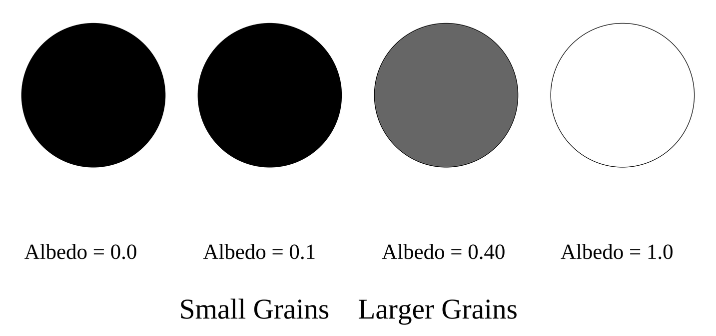
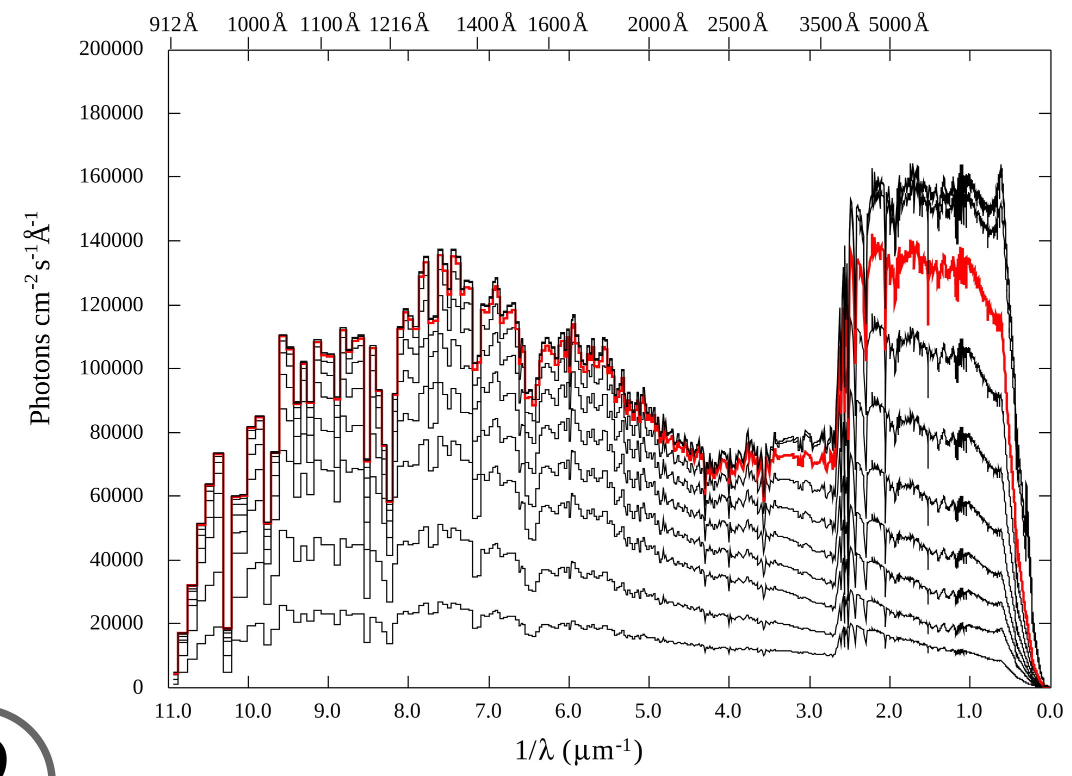


Appearance of an Interstellar Grain in the Far Ultraviolet

1

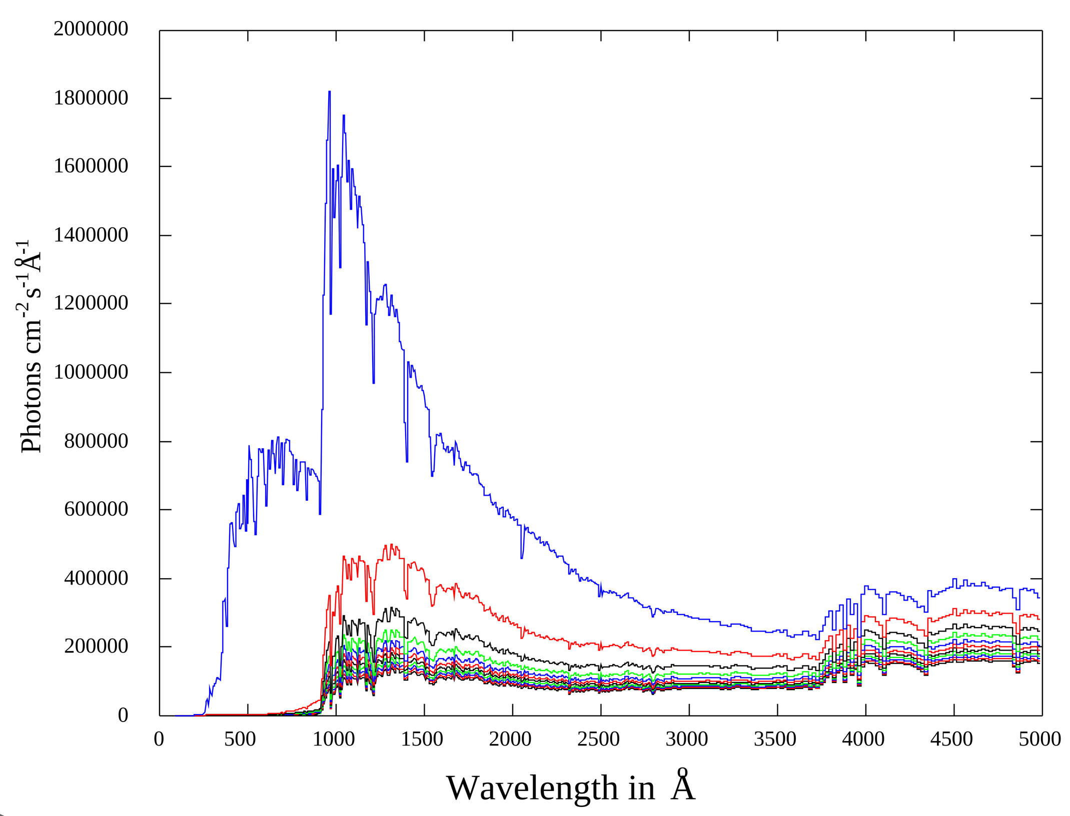
My new result is that the albedo of the Interstellar Grains in the far ultraviolet is *much lower* than is widely believed:

a = 0.4 at 1500 Å and *a = 0.1* at still shorter wavelengths.



2

I *got* my result by integrating the *Hipparcos Input Catalog*, and *Kurucz models*. I compared the resulting predicted radiation field with observations of the radiation field from Apollo 17. *This* plot shows that *the catalog goes deep enough to converge*: plots are for V = 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0 (red), 9.0, 10.0, plus "entire catalog."



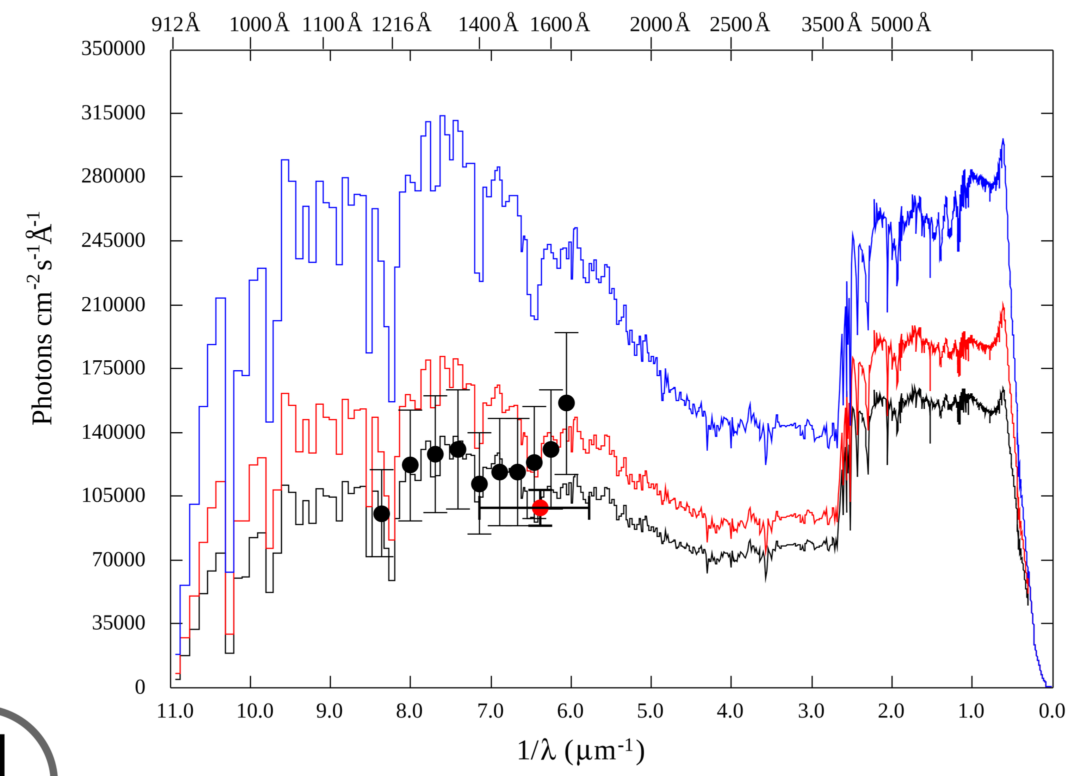
3

Here is the *predicted interstellar radiation field*, for various assumed values of the albedo of the interstellar grains (taken to be independent of wavelength): top curve: albedo = 1.0 (*all* the extincted light is returned to the beam), next curve: albedo = 0.9... and so on, in steps of 0.1 in the albedo, to the bottom curve albedo = 0.0 (the extincted light is 100% absorbed).

ABSTRACT astro-ph/0201033 (ApJ, in press)

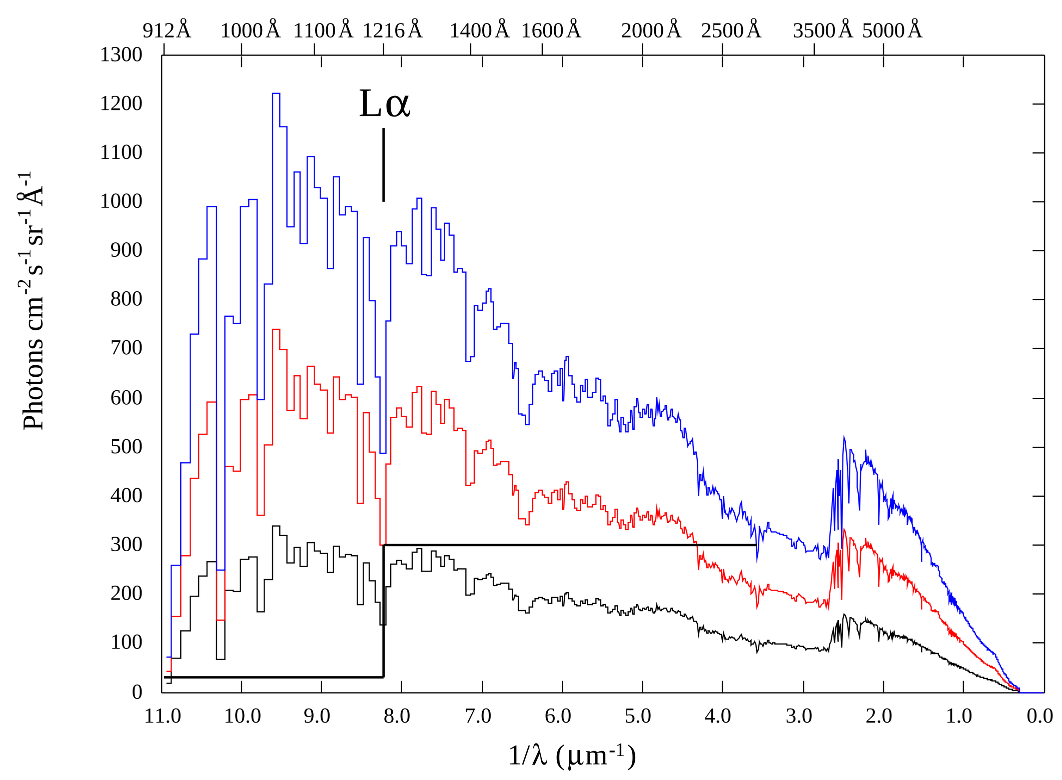
I have used the Hipparcos Input Catalog, together with Kurucz model stellar atmospheres, and information on the strength of the interstellar extinction, to create a model of the expected intensity and spectral distribution of the local interstellar ultraviolet radiation field, under various assumptions concerning the albedo *a* of the interstellar grains. (This ultraviolet radiation field is of particular interest because of the fact that ultraviolet radiation is capable of profoundly affecting the chemistry of the interstellar medium.) By comparing my models with the observations, I am able to conclude that the albedo of the interstellar grains in the far ultraviolet is very low, perhaps *a* = 0.1. I also advance arguments that my present determination of this albedo is much more reliable than any of the many previous (and conflicting) ultraviolet interstellar grain albedo determinations. Beyond this, I show that the ultraviolet background radiation that is observed at high galactic latitudes must be extragalactic in origin, as the present work demonstrates that it cannot be the backscatter of the interstellar radiation field.

Acknowledgements: This work was supported by NASA's Maryland Space Grant Consortium



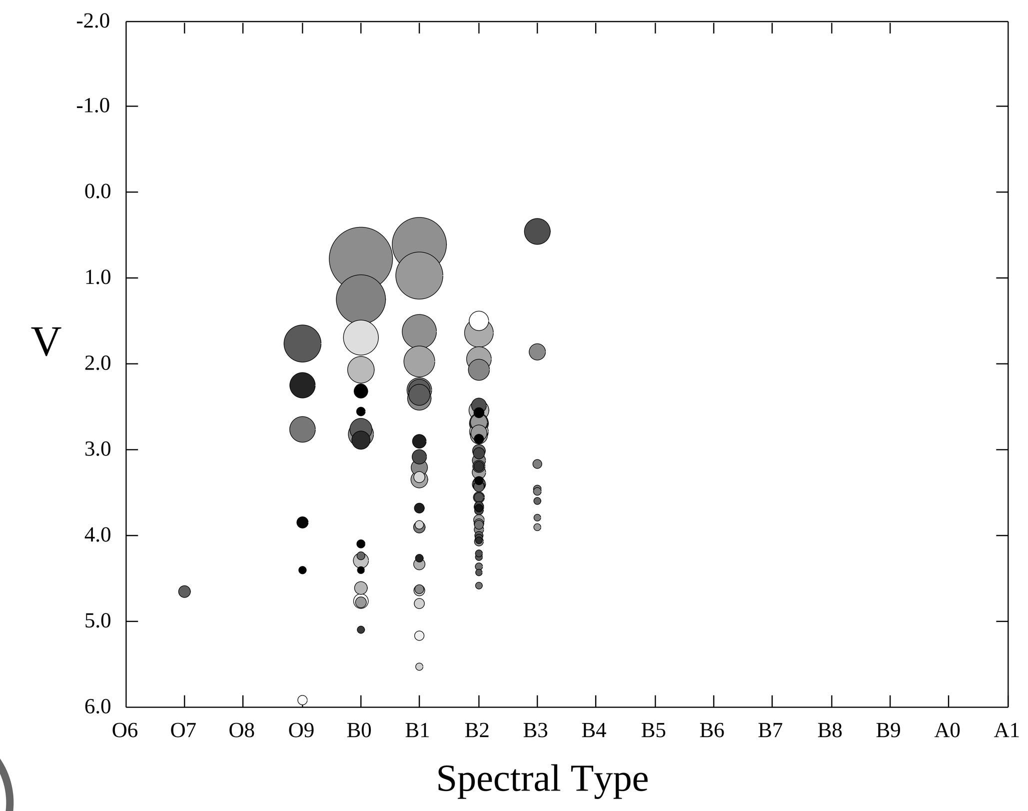
4

The *filled black circles* are the *Apollo 17* observations. They lie nicely on the radiation field model with **albedo = 0.0** There is a rise in albedo, to *a* = 0.4 (red curve) at ~1600 Å . (The blue curve represents an albedo of 0.8). Ask me about the RED DATA POINT!



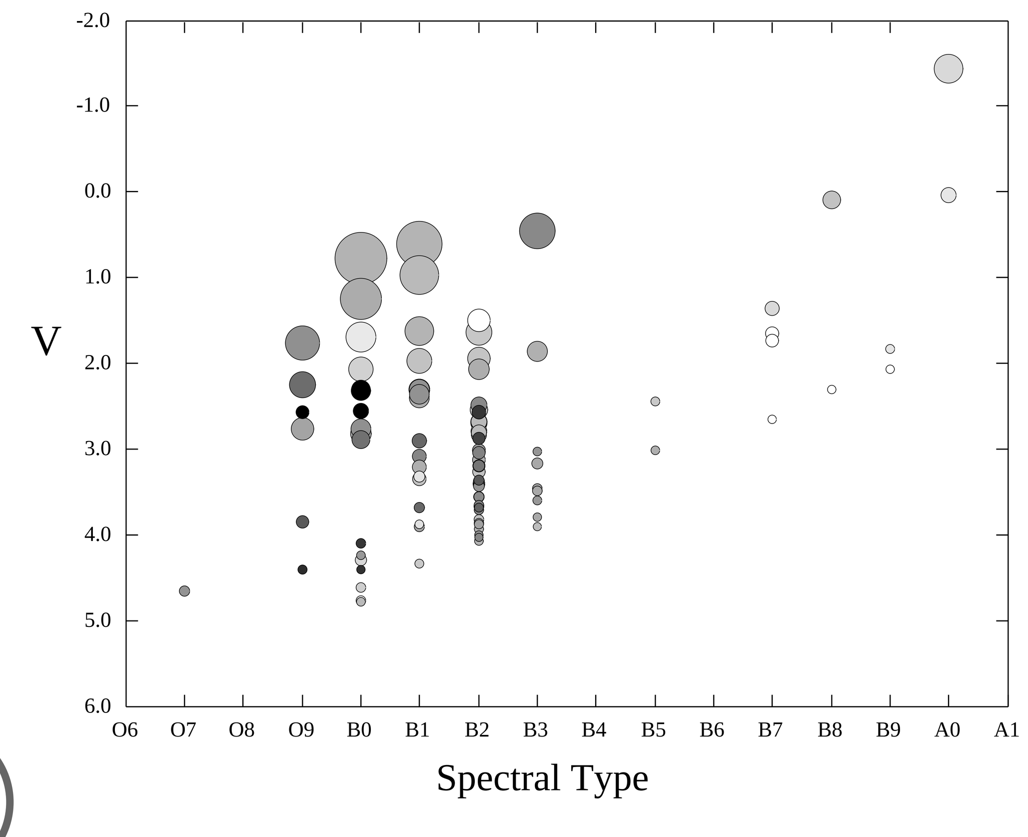
5

This shows *how much backscattered light* we should expect at high galactic latitudes, from a dust layer having A_V = 0.1, if the albedo of the interstellar grains is 0.1 (black curve), 0.2 (red curve), 0.3 (blue curve), and isotropic scattering is assumed. The straight black lines are a cartoon of the *actual* high galactic latitude ultraviolet background radiation spectrum. We conclude that the observations are NOT due to the backscattering of the local interstellar ultraviolet radiation field as evaluated in this paper.



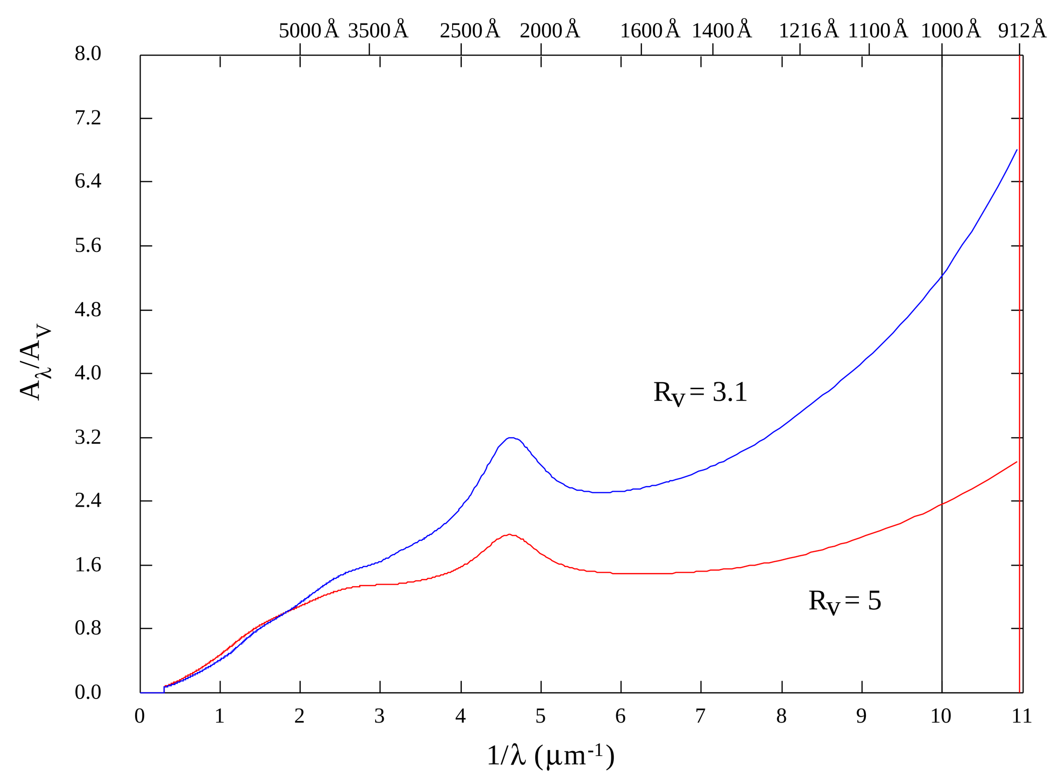
6

Which stars contribute the most to the local interstellar ultraviolet radiation field at 965 Å ? You always wanted to know! it is *these 100 stars*, which contribute 87.5% of the total flux. Darkening indicates extinction. Area of circle is proportional to contribution.



7

Which stars contribute the most to the local interstellar ultraviolet radiation field at 1535 Å ? You always wanted to know *this*, too! It is *these* 100 stars, which contribute 62.1% of the total flux. Darkening indicates extinction. Area of circle is proportional to contribution. Homework: identify Sirius.



8

Interstellar extinction, per Cardelli, Clayton, and Mathis 1989.
I find that the grain albedo is *a* ~ 0.1 for wavelengths shorter than 1500 Å (6.7 mμ^{-1}), and *a* ~ 0.4 for wavelengths longer than 1500 Å .
I conclude that it is the smallest grains that have the low albedo.

Poster: *This poster was printed from a 388K (84K zipped) postscript file that was created on a Macintosh in fortran.*