Weekly Report

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1 The total flux of Vega

It should be possible to determine the total flux of Vega over a wide spectrum using the UBVRI fluxes presented in the calibration paper. The paper lists flux values obtained through the five filters, along with the effective center wavelength of the filter and the FWHM of the filter's response curve:

Filter	Effective Wavelength (Angstroms)	FWHM (Angstroms)	Flux (erg s^{-1} cm^{-2} $Å^{-1}$)	Total flux (erg s^{-1} cm^{-2})
U	3735	485	4.22×10^{-9}	2.05×10^{-6}
B	4443	831	6.22×10^{-9}	5.17×10^{-6}
V	5483	827	3.55×10^{-9}	2.93×10^{-6}
R	6855	1742	1.795×10^{-9}	3.13×10^{-6}
I	8637	1970	8.60×10^{-10}	1.69×10^{-6}

Table 1: Vega energy fluxes through UBVRI filters

Then obtaining the total energy flux for the combined range should only require multiplying the fluxes by their corresponding FWHM's, to give the total flux received by individual filters as shown in the fifith column of the table above, then adding up the five separate values, to give a total flux of 1.50×10^{-5} erg s^{-1} cm^{-2}, or 15.0 nW/m^2.

We can also find a reasonable estimate for the photon flux based on the same data. Knowing that each photon has energy $E = \frac{hc}{\lambda}$, and assuming all photons received by any single filter has about the same wavelength equal to the effective wavelength of the filter, the total photon flux received by a filter should be given by

$$F_{photon} = \frac{\lambda}{hc} F_{energy} \tag{1}$$

where F_{energy} is the total energy flux through a single filter, F_{photon} is the corresponding photon flux and λ is the effective wavelength of the filter. This gives the photon fluxes listed in Table 2.

The values give a total photon flux over the whole range of wavelengths equal to 1.19×10^8 s^{-1} cm^{-1}.

Filter	Effective Wavelength (Angstroms)	Total energy flux (erg s^{-1} cm^{-2})	Total photon flux (s^{-1} cm^{-2})
U	3735	2.05×10^{-6}	3.85×10^{5}
B	4443	5.17×10^{-6}	1.16×10^{6}
V	5483	2.93×10^{-6}	8.11×10^{5}
R	6855	3.13×10^{-6}	1.08×10^{6}
I	8637	1.69×10^{-6}	7.37×10^{5}

Table 2: Calculating Vega photon fluxes

Note that the sum values are only valid if it can be assumed that the filter response curves do not overlap significantly; otherwise there are regions in which photons or energy are being counted twice, in which case more accurate values would be lower, but should be on the same order of magnitude.