A Consideration for Spectral Resolution

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There are applications where the spectral resolution of common solar reference spectra (~0.1 to 1.0 nm) is too coarse

- *e.g.* convolution with the line shape of a spectrometer, perhaps 2 nm FWHM

A potential solution: scaling a high-resolution spectrum to match the reference

- generate a scaling spectrum aligned with the high-res one that, when convolved with the reference band responses, gives back the reference irradiance values:

$$E_{\mathrm{Sun_{ref}}} = \sum_{\lambda} c_{\lambda} S_{\lambda} R_{\mathrm{ref}}(\lambda)$$

$E_{\mathrm{Sun_{ref}}}$ = reference solar irradiance
S_{λ} = high resolution solar spectrum
c_{λ} = scaling factor (high resolution)
$R_{\mathrm{ref}}(\lambda)$ = reference spectrum band response

What to use for $R_{\mathrm{ref}}(\lambda)$?

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A possible approach:

- bin the high-res spectrum to the reference spectrum resolution
  - rectangular bins at the spectral spacing of the reference
- scale each binned quantity to the reference irradiance
  - this also creates radiometric conversion factors
- generate interpolations to match $c_\lambda S_\lambda$ at bin boundaries, while maintaining the scale of each bin
- concatenate interpolated values to build c_λ spectrum
- build full $c_\lambda S_\lambda$ spectrum

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