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MASSIVE-SCALE SEMI-EMPIRICAL CALCULATIONS OF ATOMIC DATA FOR OPACITIES AND SPECTRA

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Of the line data on my website, 99 per cent have predicted wavelengths and can be used only to compute opacities. One percent have good wavelengths between known levels and can be used for detailed spectrum calculations for comparison to observed spectra. The line data with good wavelengths account for only one half of the observed lines. The gf values and damping constants for most lines must be adjusted to match observed spectra. We know that the higher configurations are missing from the line lists. We know that heavier elements are missing from the line lists. We know that isotopic and hyperfine splittings are missing from the line lists. Leaving out all these lines systematically underestimates the opacity, produces energy distributions with systematic errors, and leads to abundance determinations with large systematic errors.

We need much better laboratory analyses including hyperfine and isotopic splitting. We need better calculations that fill in the higher configurations and the heavier elements.

I am doing as much as I can to fill in the missing data and to make it available on my web site. I will review several current examples and compare with Iron Project results.