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Interactive comment on "Detection and measurement of total ozone from stellar spectra: Paper 2. Historic data from 1935–1942" *by* R. E. M. Griffin

Anonymous Referee #2

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This paper uses archival photographic stellar spectra for a novel and imaginative purpose – to measure the total ozone over Mount Wilson between 1935 and 1942. The technique used is the measurement of the equivalent widths (strengths) of the Huggins ozone bands in the near ultraviolet part of the spectrum. The Huggins bands are superimposed on the stellar spectra, and this paper describes the techniques used to extract total ozone column densities from these spectra, and the comparison of the derived total ozone with contemporaneous measurements in Arosa, Switzerland. The author is a well-known expert (probably the world expert) in the extraction of astronomical data from photographic spectra, and a vocal advocate for the preservation of

astronomical photographic plates. The extraction of these data was clearly arduous, but the results are believable and compare well with the Arosa database. The author has made commendable efforts to address systematic errors. This method shows considerable promise for the reconstruction of total ozone time series at a number of locations across the globe for periods during the first half of the twentieth century before extensive anthropogenic interference. However, the ultimate usefulness of this method for reconstruction of ozone time series will only be revealed once it is learned how many spectra which can be used for this purpose actually exist in observatory archives. I recommend the publication of this excellent, useful and well-written paper with only minor modifications, listed below:

1) The author is an astronomer, and has used in the paper certain terms which may not be familiar to non-astronomers. These terms, which should be briefly defined, include "equivalent width", "continuum placement" and "air mass". 2) The author needs to justify why we should expect the equivalent widths of the Huggins bands to show a linear relationship with the gf values. This requires a) that the Huggins bands are unsaturated and thus are on the linear part of the curve of growth and b) that the energy of the lower state for each band is the same or nearly the same for all the observed bands (this may have been explained in paper I, but a sentence or two reminding the reader of these requirements would be useful). 3) As the author notes, a close inspection of tables 1 and 2 reveals four results which appear to be abnormally low (as compared with the Arosa database). All four of these results were obtained using the same quartz prism spectrograph. The other results which, with one exception, were obtained with grating spectrographs, are generally high compared with the Arosa values. The author rightly states that with such a small sample it is impossible to separate technical problems from real, local variability, but there is one other possible contributer to this systematic difference, and this is the fact that the prism plates generally penetrate further into the ultraviolet than the grating plates, and thus access a greater number of(and to a certain extent, stronger) Huggins bands. On the other hand, the S/N at these shorter wavelengths tends to be somewhat less than at longer wavelengths. It would be of interest

ACPD

5, S4098–S4100, 2005

to repeat the analysis for the prism plates, but this time using only the bands which lie at wavelengths greater than, say, 315nm, to explore this possible systematic effect. At the very least, the author may wish to mention this possible systematic effect in the paper. 4) There is one probable typo in table 2. The zenithal ozone for the Aug 24.86 1939 plate is recorded as 29 D.U., whereas I suspect it is more like 290 D.U..

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 10925, 2005.