Southern African Large Telescope

Title:	**Study of atmospheric dispersion at SALT using RSS long-slit data**
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ABSTRACT

In this document I show how to use RSS long-slit data to estimate values of atmospheric dispersion for SALT. For the total range of used airmasses SALT spectral data show good agreement with model data for atmospheric differential refraction at an altitude of 2 km.

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1 Introduction

Atmospheric dispersion (atmospheric differential refraction) has long been known to affect the results of a variety of measurement techniques in astronomy. It is clear that the importance of atmospheric dispersion increases rapidly with increasing zenith angle and decreasing wavelength, and infrared observations are rarely affected. As an efficient in UV band SALT needs to correct for this effect using Atmospheric Dispersion Corrector (ADC).

It is useful to know how large is atmospheric dispersion (AD) effect for SALT. It could be measured using different methods. I would like to show how we can estimate the value of AD using RSS long-slit data. The only limitation for this method is that AD could be calculated only for the center of the field, where long-slit is located.

2 The method and results

The idea of the method is that we can trace the Y-position of reduced 2D long-slit spectra using `apall` task from `apextract` IRAF package. In case of reduced spectra X-position is given in wavelength and such result can be easily compared with models from Filippenko (1982), where values of AD depending on wavelength and airmass are given. For such study it is better to use spectrophotometric standard stars, because (1) they are star-like objetcs, (2) have usually good enough level of signal, and (3) were observed usually close to the parallactic angle.

As an example, the result of tracing of the spectrophotometric standard star is shown in the top panel of Fig. 1. Grating G900 was used in this configuration, with total spectral range 3650–6750 Å. Spectrum was observed with airmass 1.31. Using these data, I calculated Y-positions for this spectrum at wavelengths 3650 Å, 4400 Å, 5500 Å and 6750 Å, where the first three are effective wavelength for U, B and V filters respectively. These calculated positions are shown in the bootom panel of Fig. 1 altogether with model data from Filippenko (1982). All positions for both observations and models were recalculated in the way, that position at 5500 Å is 0. For the observed spectrum calculated differences in pixels were recalculated into arcseconds using scale 0.258 arcsec/pix, because data were taken with binning factor of 2. It is possibly to see from Fig. 1 that observed values of AD for SALT are very close to the model data.

In the same way I measured two more spectra of spectrophotometric standards taken with airmasses 1.19 and 1.34, and compared them with model data from Filippenko (1982). These results are shown in Fig. 2. They also show good agreement with model data. Since total range of airmases for SALT is narrow and about 1.17–1.38, we can conclude that we have agreement with model data inside of the total range of airmasses.

References

Filippenko, A.V. 1982, PASP, 94, 715

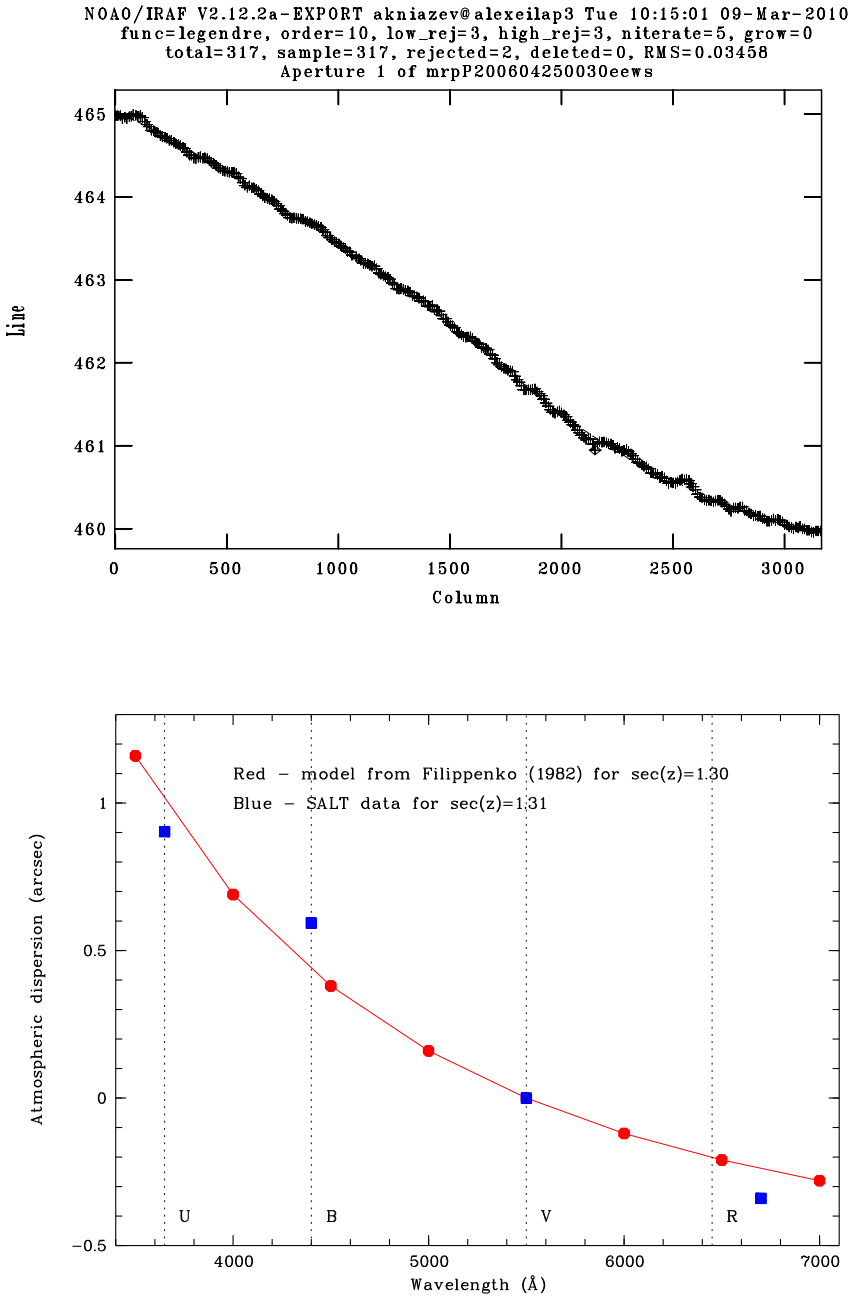

Figure 1: *Top panel:* An example of atmospheric dispersion in the center of the RSS field. Grating is GR900 with Grating angle 13.63 and Articulation angle 27.27. Covered spectral range is 3650–6750 Å. Y-positions of the standard star v. channel are shown. The total range of the atmospheric dispersion is 5 pixels. Airmass is 1.31. *Bottom panel:* Comparison of the top panel data (blue filled squares) with model data (red filled points) from Filippenko (1982).

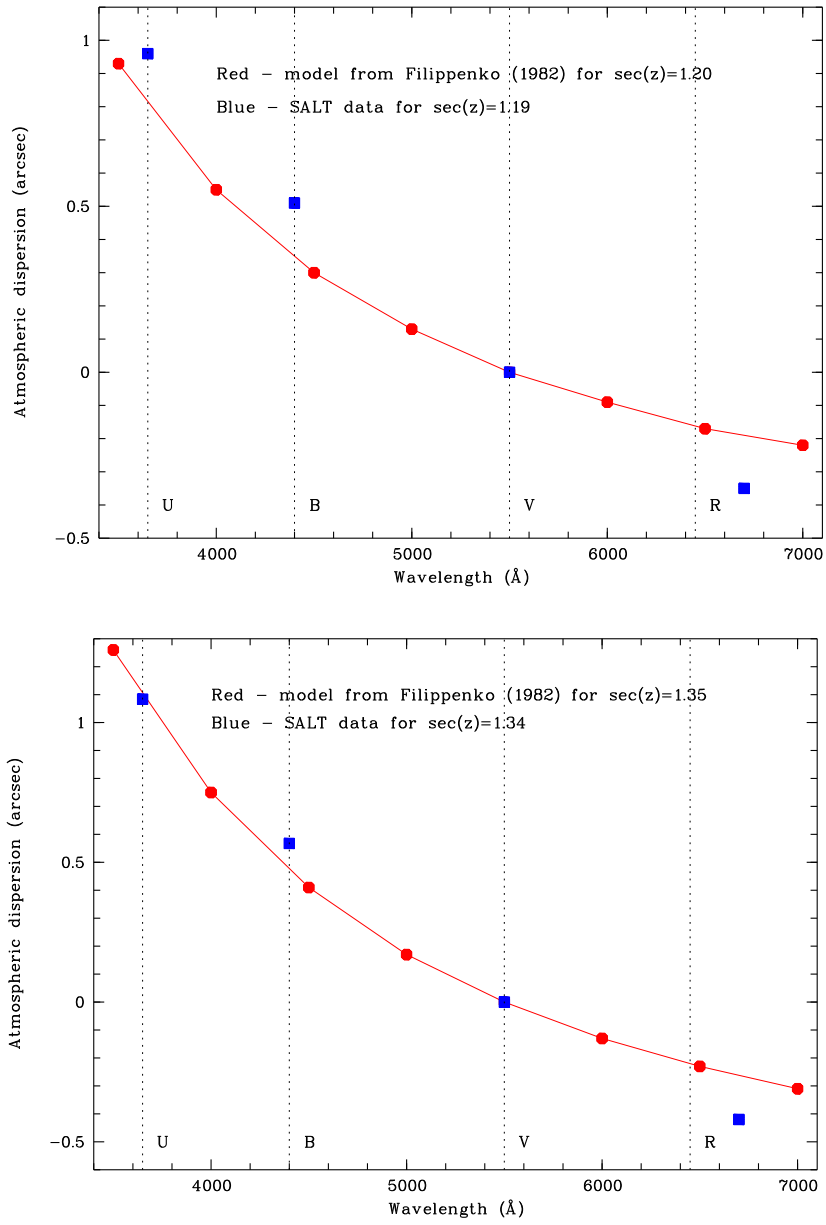

Figure 2: Two additional examples of comparison of the SALT atmospheric dispersion, calculated using RSS spectra, with model data (red filled points) from Filippenko (1982): airmass 1.20 (top panel) and airmass 1.35 (bottom panel).