The following sections have been generated by the PI. The total page limit for these sections is 4 × A4 pages. Font size should not be less than 10 points.

15. SCIENTIFIC RATIONALE

This section needs to discuss the scientific background and aims of the proposal and why you want to make these observations. This section should not exceed 1000 words. Figures and graphics can be included, or appended in Section 18.

Our team has used a Monte Carlo radiative transfer code to show that accretion disk winds can have a profound impact on, and may even dominate, the optical spectra of Cataclysmic Variables (CVs; Matthews et al., in prep). During this project, the lack of high signal-to-noise, broadband optical spectra of Nova-like variables with good spectral resolution became very apparent. We therefore propose a set of spectroscopic observations of three 'classic' simple-disk Nova-likes, with the following key aims:

- *To validate our results by utilising SALT's wide spectral coverage including the Balmer jump.*
- *To test specific predictions made by during our simulation work.*
- *To obtain spectra with spectral resolution such that the effect of the wind on the line profile shapes can be tested.*
- *To create something of an online 'atlas' for the CV community by making the data publicly available.*

Cataclysmic variables are systems in which a white dwarf accretes matter from a donor star via Roche-lobe overflow. In non-magnetic nova-like systems (NMNLs) this accretion is mediated by an accretion disk which forms around the white dwarf, and emits in the optical and ultraviolet. NMNLs act as the perfect laboratory for accretion physics and testing of the 'simple' disk model proposed by Shakura & Sunyaev (1972), with one specific example being the testing of the predicted $T \propto R^{-3/4}$ temperature profile with eclipse mapping (Rutten, van Paradijs & Tinbergen 1992).

For over three decades, it has been known that winds emanating from the accretion disk are important in shaping the ultraviolet spectra of CVs (Heap 1978), the most spectacular evidence being the P-Cygni like profiles of resonance lines such as C IV (see e.g. Cordova & Mason 1982). However, the extent to which winds influence optical spectra is not known, and even their origin and driving mechanism remains unclear (Drew & Proga 2000). Answering these questions has far reaching implications, as disk winds are of astrophysical importance across many orders of magnitudes in mass. They are proposed as an important mechanism for AGN feedback (Silk & Rees 1998) and shaping the spectra of Quasars (Weymann et al. 1991), and understanding them is vital to test unification of accreting objects.

Our recent Monte Carlo radiative transfer simulations (Matthews et al., in prep) expand on the work of Long & Knigge (2002) by incorporating line transfer techniques suggested by Lucy (2002, 2003). Excitingly, these improvements have enabled us to show that the same outflow models used to explain the ultraviolet features seen in CVs also have a significant impact on optical features. In particular, we find that recombination lines in Hydrogen and Helium can be produced by a disk wind, and the same wind geometry can 'fill in' the Balmer absorption edge that has thus far been present in CV models (but not observations; see e.g. Knigge & Drew 1997). An example synthesized spectrum can be seen in Figure 1.

We propose a spectroscopic study of three classic high-state systems at different inclinations. **RW Sextantis, IX Velorium** and **UU Aquarii** are all simple disk CVs with high accretion rates, and hence also have potential for mass loss. At inclinations of $\sim 30°$, $\sim 60°$ and $\sim 80°$ respectively these three objects provide opportunities to probe spectra across the full range of viewing angles.

These observations are essential for validating our results and will provide a useful resource to the community. They are required because sufficient quality spectra of NMNLs at varying inclinations are not available, and SALT's spectral capabilities provide the perfect opportunity to observe these objects. In symbiosis with our modeling, the analysis of these spectra will help us to draw conclusions about the nature of the Balmer jump, the recombination lines of H and He and the continuity between disk atmosphere and disk wind. This will provide answers of astrophysical importance from a relatively modest time investment, and will also result in prompt publication for maximum benefit to the community.

16. IMMEDIATE OBJECTIVES

This section needs to present the plan of how you will use the data you will gather to achieve the science goals set out above. There is a 250 word limit.

Our objective is to use the wide-band spectrum for direct comparison with our radiative transfer simulations. By obtaining spectra at a variety of inclinations we will be able to test for the presence or otherwise of a Balmer jump in emission or absorption, discover trends in line emission strengths and profile shapes across the Balmer series, and assess the Helium emission. Combined with our theoretical work, this will provide a unique insight into how much the disk wind affects the optical spectra of CVs.

17. DATA REQUIREMENTS FOR PROPOSAL COMPLETION

This section should explain what (if any) other observations are needed to complete the science objectives. If time is requested for more than one semester, the justification should be here. There is a 100 word limit.

Broadband optical spectra, as described in the technical justification, for all three objects: RW Sextantis, IX Velorium and UU Aquarii.

18. TECHNICAL JUSTIFICATION

This section should be limited to 500 words and needs to clearly demonstrate that you have used the SALT instrument simulation tools to find a configuration which makes sense and matches your science goals, including the S/N required. It needs to verbalize the overall observing strategy and to demonstrate that you understand the overheads involved in the observations and hence a justification of the total time requested.

In their normal state, RW Sextantis, IX Velorium and UU Aquarii have optical V band magnitudes of 9.9, 9.0 and 13.3 respectively (Ritter & Kolb 2003). We require SNR $\geq$ 30 for all objects, but fortunately this is easily achievable with time budgets still being dominated by overheads. In total, we estimate 198.3 seconds of total time (exposure plus overheads) for UU Aqr, and ?? and ?? for RW Sex and IX Vel respectively.
We will be using RSS in long slit mode. Will will use the pg2300 grating which provides coverage from ??? to ??? with a high enough spectral resolution. We suggest the following grating angles, to be repeated for **each** observation

- Camera Station 60.25°, Grating angle 48.875°. Simulation file uuaqr_blue.rsim.
- Camera Station 70.75°, Grating angle 29.375°. Simulation file uuaqr_mid.rsim.
- Camera Station 85.0°, Grating angle 39.125°. Simulation file uuaqr_mid2.rsim.
- Camera Station 98.5°, Grating angle 49.25°. Simulation file uuaqr_red.rsim.

These grating settings provide coverage from $\lambda 3505$Å $-$ $\lambda 6949$Å. This set of observations has a combined exposure time of ?? and overheads of ?? leading to a total ?? of time, and obtains SNR $\geq$ 30 for all observations, and SNR $\sim$ 100 in the majority of cases.

19. ROLE OF THE PI

This section, which is only required if you request time from the South African TAC, should describe the role the PI will have in the project other than proposing and being a co-author on the proposal and the published paper.

The PI will liase with the Co-Is and SA.

20. REFERENCES

A list of all relevant references.

Cordova & Mason, 1982, ApJ, 260, 716

Drew & Proga 2000, NewA Rev., 44, 21

Groot, et al. J. 2004, A&A 417, 283

Lucy 2002, A&A, 384, 725

Matthews et al., in preparation

Rutten, van Paradijs & Tinbergen 1992, A&A, 260, 213

Silk & Rees 1998, A&A, 331, L1

Dhillon 1996, IAU Colloq. 158: 208, 3

Knigge & Drew 1997, ApJ, 486, 445

Long & Knigge 2002, ApJ, 579, 725

Lucy 2003, A&A, 403, 261

Ritter & Kolb 2003, A&A, 404, 301

Shakura & Sunyaev 1973, A&A, 24, 337

Weymann et al. 1991, ApJ, 373, 23

21. ADDITIONAL RELEVANT FIGURES AND GRAPHICS

Any additional figures or graphics not already inserted in the text boxes can be placed here, provided the 4 page limit is maintained.

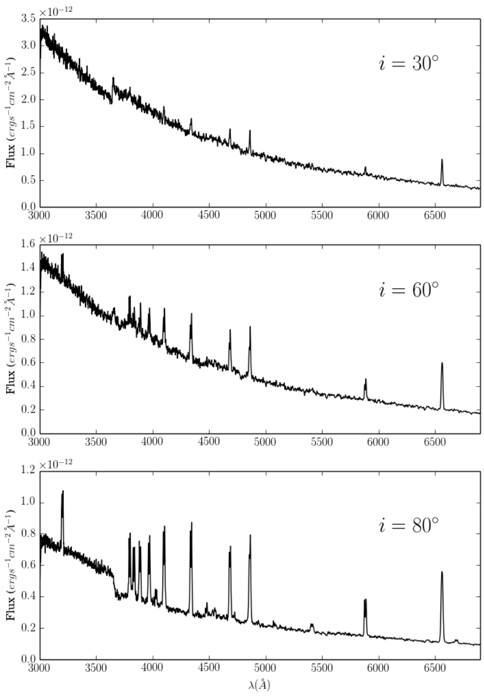

Figure 1: A simulated spectrum at angles of 30, 60 and 80 degrees, which are the viewing angles corresponding showing to the inclinations of the three targets. Recombination lines in the Balmer series and Helium I & II are prominent. The filling in of the Balmer jump can be seen clearly in the highest inclination model.

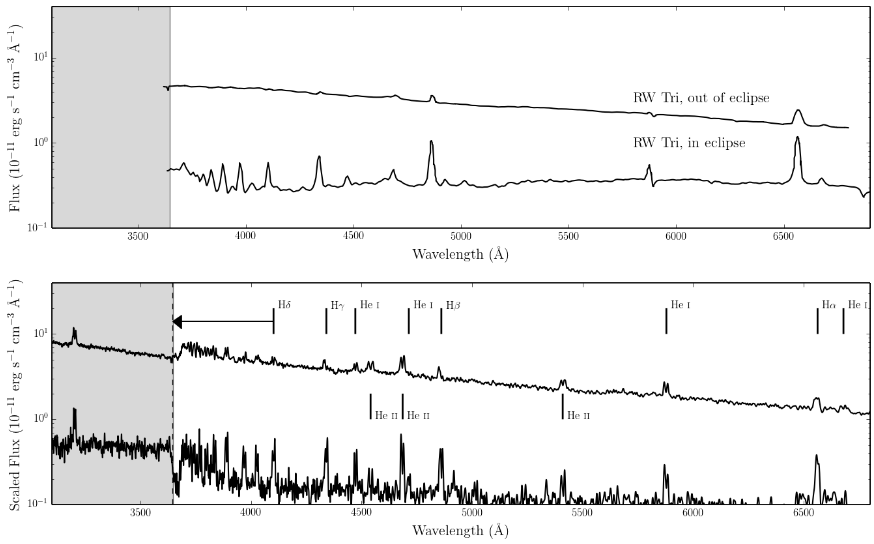

Figure 2: *Top Panel:* In and out of eclipse spectra of the high inclination Nova-like RW Tri, which has been digitized from Groot et al. (2004). *Bottom Panel:* In and out of eclipse synthetic spectra from Model B. Prominent lines are marked, and the region blueward of the Balmer edge is shaded in grey.