Phase-resolved spectroscopy of the eclipsing AM Her system RX J0929–24

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1. Introduction

RX J0929.1–2404 is one of nine known eclipsing AM Her systems. Eclipsing systems are important since many of their parameters can be accurately determined. Many also exhibit an 'absorption dip', when the accretion stream obscures our view of the emission region on the white dwarf surface. In principle, these dips allow us to study accretion stream features that are usually swamped by the emission from the white dwarf.

Optical photometry of Sekiguchi, Nakada & Bassett (1994, MNRAS, 266, L51) shows no evidence for a such dip in RX 0929, but *ROSAT* data taken from the public archive shows a deep dip in X-rays. To make a search for the dip in the optical and determine other system parameters such as distance, we obtained phase-resolved spectroscopic observations of RX 0929.

2. Observations and Results

Spectra were obtained in good conditions using the ESO 3.6m telescope at La Silla, Chile on 1997 Feb 7 & 8. The spectral ranges were 3800–6800 Åand 6000–9800 Åwith spectral resolution of ∼15Å. Figure 1 shows a subset of our spectra, covering orbital phases around the eclipse, (the eclipse center defines ϕ=0.0). The dip is clearly seen in our spectrophotometry.

In contrast to the continuum, the line fluxes start to decrease near $\phi \sim 0.85$. This we attribute to absorption by the accretion stream. Figure 1 shows spectra starting at ϕ=0.85, (where the spectrum looks similar to that at earlier phases), to ϕ=0.05. As we view later in phase, all the emission lines, except for HeII λ 4686, decrease in strength. By ϕ=0.90, all the emission lines have disappeared, or appear in absorption (again except HeII λ 4686). The absorption of Hα and Hβ is red-shifted by $\sim 600\,\mathrm{km\,s^{-1}}$ compared to the emission component. This must represent the relative bulk velocity of between the in-falling (absorbing) accretion stream and the emitting region. The absorption dip is clearly seen in Equivalent Width measurements.

By ϕ=0.94, the dip maximum has passed and the lines are again seen in emission, but only the broad component is present. This is because the bulk of the narrow component is emitted by the illuminated face of the secondary star, which is hidden from view at these phases. HeII λ 4686 is also seen with

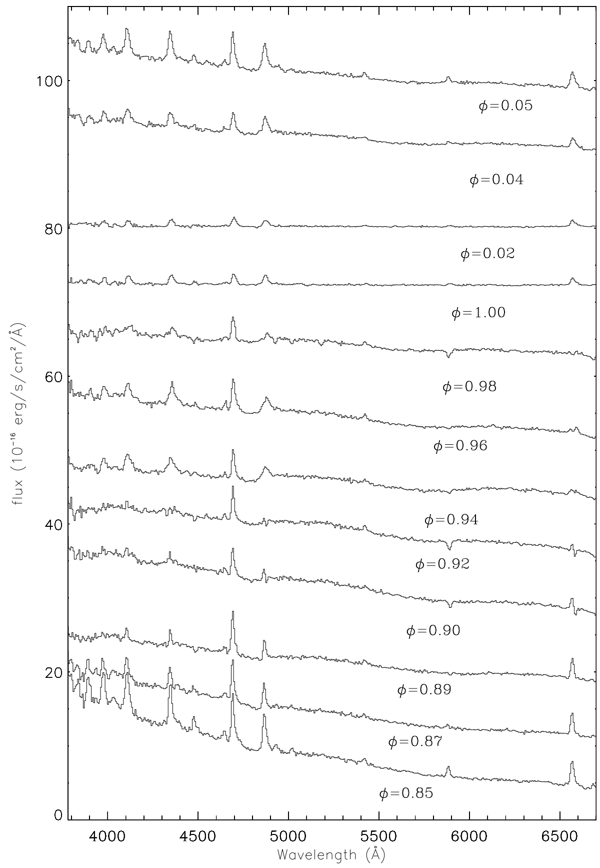

Figure 1. Consecutive spectra have been offset by 8 flux units vertically and show how the spectrum changes through the absorption dip and through the eclipse.

a lower flux, presumably for the same reason. Line emission from H and He is seen throughout the eclipse, though our temporal resolution is poor and the lines may have been fully occulted at the end of the eclipse. By ϕ=0.05 the narrow component of the lines has returned. These observations will allow us to place constraints on where these lines are emitted and on the ionisation structure of the accretion stream.

A search for cyclotron humps was made by dividing each spectra by the mean spectrum. Humps were seen around ϕ=0.5 and interpreted as cyclotron emission from which we estimated the magnetic field strength of the white dwarf to be $\sim$42 MG. From red spectra taken during mid-eclipse we estimated the spectral type of the secondary to be M2 V. Using the observed flux during eclipse we find a distance of 830pc (assuming a possible spectral type between M1–M3 and a 30% error in the flux at mid eclipse, we find the range in the distance to be 600–1070pc). This makes RX0929 one of the most distant AM Her systems.