An optical study of the high mass star forming region RCW 34

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"6 He shakes the earth out of its place,
And its pillars tremble;
7 He commands the sun, and it does not rise;
He seals off the stars;
8 He alone spreads out the heavens,
And treads on the waves of the sea;
9 He made the Bear, Orion and the Pleiades,
and the chambers of the south;"

Job 9 : 6 - 9, NKJV

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Abstract

This study consisted of an optical photometric and spectroscopic analysis on a $7' \times 7'$ field around the Southern high mass star forming region RCW 34. A previous study on RCW 34 in the NIR discovered many deeply embedded young stellar objects which were suspected to be T Tauri stars and which justified further investigation. The data used in this study consisted of three sets, the first two are photometric and spectroscopic data sets which were obtained during the first two weeks of February 2002. A third data set of spectroscopic observations was obtained by the author during the second week of 2011 of selected candidates using results from the NIR study and from the photometric data sets. All of the spectroscopy was conducted with the long slit spectrograph on the 1.9-m telescope and the photometry with DANDICAM on the 1.0-m telescope at the South African Astronomical Observatory (SAAO) in Sutherland. Objectives accomplished in the course of this study were to understand, obtain, reduce and interpret photometric and long slit spectroscopic CCD images. From the photometric results 57 stars showed excess blue emission on a colour-colour diagram which could be generated by circumstellar matter. The spectroscopic study showed 5 stars that showed Hα emission and 2 with strong Li absorption lines which confirm the suspicions of the NIR study about T Tauri stars in the region. All of the stars from the spectroscopic study in 2011 were identified as low-mass K or M type stars. Using colour-magnitude diagrams it was possible to see that the majority of the stars in the cluster are low-mass pre-main sequence stars. The stars matching between the optical and NIR filters were plotted on NIR colour-colour diagrams showing that the 5 stars that had Hα emission lines also had NIR colours characteristic to T Tauri stars. Out of the 5 stars that showed Hα emission, 2 were found to be classical T Tauris and three were found to be weak line T Tauris

Keywords: RCW 34; T Tauri; GUM 19; HII region; Pre-main sequence stars; Star formation; Photometry; Spectroscopy; SAAO; IRAF; DANDICAM

Opsomming

Hierdie studie dek die optiese fotometriese en spektroskopiese analises van 'n veld in die suidelike hoë-massa stervormende gebied RCW 34. 'n Vorige studie in die naby-infrarooi (NIR) van RCW34 het die bestaan van 'n groot aantal jong diep-liggende sterliggame onthul. Onsekerheid oor die vermoedelike T Tauri aard van hierdie sterliggame, het verdere ondersoek regverdig. Drie datastelle is as basisinligting vir hierdie studie gebruik. Die eerste twee datastelle was fotometriese en spektroskopiese datastelle, verkry tydens die eerste twee weke van Februarie 2002. Spektroskopiese waarnemings versamel deur die skrywer gedurende die tweede week van Januarie 2011 van uitgesoekte kandidaatsterre uit die vorige NIR studie en optiese fotometriese, het gedien as die derde datastel. Die spektroskopiese waarnemings is gedoen met die langspleetspektrograaf op die 1.9-m teleskoop, en die fotometrie met DANDICAM op die 1.0-m teleskoop by die Suid Afrikaanse Astronomiese Observatorium (SAAO) in Sutherland. Die doelwitte bereik met hierdie studie was om fotometriese en langspleet spektroskopie-afbeeldings met 'n lading-gekoppelde toestel (Eng. Charge-Coupled Device (CCD)) te verkry, te reduseer, te interpreter en te verstaan. Die fotometriese resultate het oormatige blou uitstraling van 57 sterre getoon op 'n kleur-kleur diagram. Hierdie uitstraling kon moontlik onstaan deur materie wat die sterre omring. Die spektroskopiestudie het Hα uitstraling vanaf 5 sterre getoon en ook getoon dat 2 sterre sterk Li absorpsielyn bevat, wat die vermoedens bevestig van die NIR studie oor T Tauri sterre. Al die sterre van die spektroskopiestudie van 2011 is aangetoon as lae-massa K- of M-tipe sterre. Die gebruik van kleur-magnitude diagramme het dit moontlik gemaak om te bevestig dat die meerderheid van sterre lae-massa voor-hoofreeks sterre is. Sterre met geslaagde passing van optiese en NIR filters, was uitgestip op NIR kleur-kleur diagramme om te toon dat die 5 sterre met Hα uitstraallyne ook NIR-kleureienskappe eie aan T Tauri sterre besit. Uit die 5 sterre met Hα uitstraling is 2 moontlik klassieke T Tauri sterre, en die 3 ander was swaklyn T Tauri sterre.

Sleutelwoorde: RCW34; T Tauri; GUM 19; HII-gebied; Voor-hoofsiklus sterre; Stervormasie; Fotometrie; Spektroskopie; SAAO; IRAF; DANDICAM

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