

## Optical spectroscopy of SN1998S

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### 1. Introduction

The supernova SN1998S was discovered in the SCII.2 galaxy NGC3877 on 1998 March 3 at a discovery magnitude of 15.2 (IAUC 6829). The visual lightcurve indicates the supernova reached a maximum on 1998 March 20, at a magnitude  $m_{\text{vis}} = 11.8$  mag. Early, premaximum spectra of the supernova (Filippenko & Moran 1998a, 1998b; Garnavich, Jha & Kirshner 1998; Qiu 1998) showed a blue featureless continuum with prominent hydrogen emission lines with broad wings and a narrow peak. No P-Cygni absorption was detected. Also, features typical of Wolf-Rayet stars were seen, which disappeared around the optical maximum. The spectra indicated the supernova was of type II<sub>n</sub>.

We present in this poster the preliminary results of the spectroscopic monitoring of the supernova from VBO during March 13 – April 15, covering the pre-maximum, the maximum and the early decline phases.

### 2. Results from VBO observations

Figure 1 shows the temporal development of the spectrum. Spectra during the maximum phase indicated a blue continuum with weak Balmer lines, Fe II lines began to develop. The emission line profile had changed from the asymmetric profile with steep blue wings seen during pre-maximum. The  $H\beta$  line showed a narrow P-Cygni profile and a blue shifted broad, shallow absorption trough. A similar profile was seen in the  $H\alpha$  line also.

The Fe II lines increased in strength with time. The  $H\beta$  line was blended with Fe II lines by April 5.8. By this time, the narrow P-Cyg feature had disappeared in the  $H\beta$  line, while still present in  $H\alpha$  and continued to be present in all our spectra.  $H\alpha$  emission developed a broad profile, with the centroid blue-shifted by  $\approx 900$  km/s, similar to that seen in other supernovae of type II<sub>n</sub> (Schlegel 1990). The narrow P-Cyg feature was superimposed on this broad feature. Ca II/N II lines in the 8500-8600 Å region were present in the spectrum on April 15.7.

The continuum which was extremely blue during the pre-maximum and maximum phases got redder with time. The continuum colours, as obtained from the spectra, changed from  $(b - v = -0.47; v - r = -0.39)$  on March 19.8 to  $(b - v = 0.39; v - r = -0.10)$  on April 15.7.

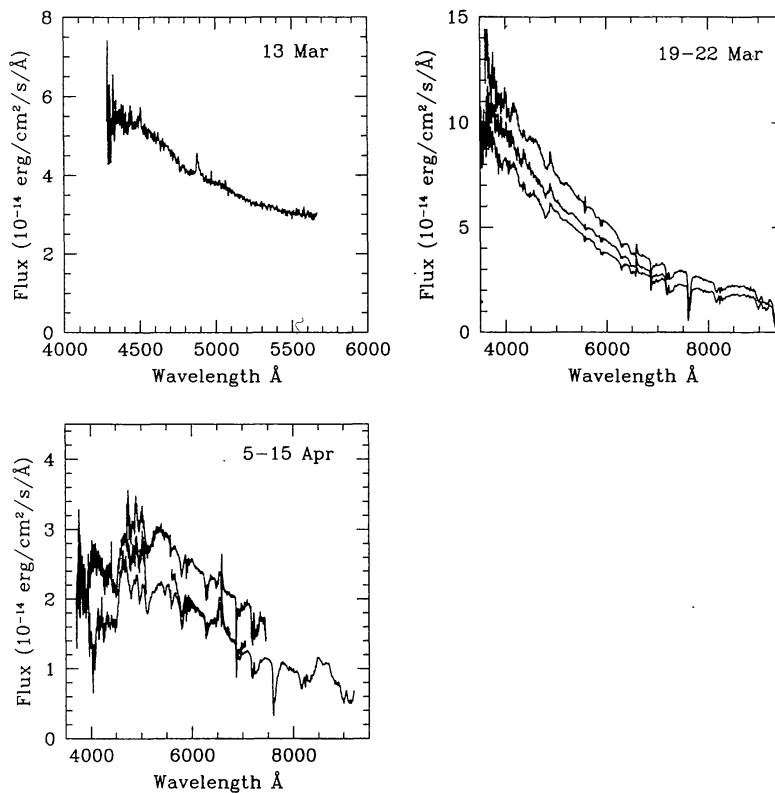


Figure 1. Temporal development of the optical spectrum of SN1998S. Based on observations from VBO.

The expansion velocities decreased with time. The mean velocity (both  $H\beta$  and  $H\alpha$ ) of the broad absorption trough decreased from a value of  $-10040$  km/s on March 13 to  $-5550$  km/s on April 15. The narrow P-Cygni absorption decreased from  $\sim -500$  km/s on March 17 to  $\sim -260$  km/s on April 11.

### 3. Discussion

The temporal development of the spectrum of SN1998S is presented here.

Narrow Wolf-Rayet features were seen very early in the pre-maximum phase. These features as well as the narrow component of the Balmer lines most likely originate from a circumstellar gas flash-ionised by the supernova outburst. As the fast expanding ejecta from the supernova swept past this circumstellar gas, the circumstellar material formed an expanding shell around the supernova remnant, giving rise to the narrow P-Cygni feature seen in the emission lines.

### References

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