Clumping in Hot Star Winds
W.-R. Hamann, A. Feldmeier & L.M. Oskinova, eds.
Potsdam: Univ.-Verl., 2008
URN: http://nbn-resolving.de/urn:nbn:de:kobv:517-opus-13981

XMM-Newton observations of Zeta Orionis (O9.7 Ib): A Collisional Ionization Equilibrium model

A.J.J. Raassen[1,2], K.A. van der Hucht[1], N.A. Miller[3] & J.P. Cassinelli[4]
[1]*Netherlands Institute for Space Research (SRON), Utrecht, The Netherlands*
[2]*Astronomical Institute "Anton Pannekoek", Amsterdam, The Netherlands*
[3]*Dept. of Physics & Astronomy, Universiy of Wisconsin-Eau Claire, Eau Claire, USA*
[4]*Dept. of Physics & Astronomy, Universiy of Wisconsin at Madison, Madison, USA*

We present the analysis of XMM-Newton observations of ζ Orionis. The analysis is based on fitting to the total spectrum as well as diagnostics of individual line.

1 CIE model

We have fitted the RGS, EPIC-MOS and EPIC-pn spectra applying a three temperature collisional ionization equilibrium (CIE) model for optically thin plasma, from SPEX in combination with MEKAL. The ionization equilibrium is based on calculations by Arnaud & Rothenflug (1985). The obtained temperatures, Emission measures (EM) and abundances are given in Table 1. The temperatures range from $\approx$ 0.1 ... 0.6 keV. The EM values are in units of 10^{54}cm^{-3}. The abundances are close to solar photospheric values, except for Ne, Mg, and Si which are somewhat higher. The values are relative to solar photospheric values (Anders & Grevesse 1989) except for Fe (Grevesse & Sauval 1999).

Table 1: Multi-temperature fit

Parameter	Value	Abun	
kT_1	0.073 (.006)	C	1.04 (0.19)
EM_1	8.2 (2.7)	N	1.10 (0.12)
kT_2	0.201 (.004)	O	0.92 (0.08)
EM_2	3.76 (0.31)	Ne	1.34 (0.18)
kT_3	0.551 (.013)	Mg	1.94 (0.24)
EM_3	1.57 (0.18)	Si	1.41 (0.21)
		Fe	1.13 (0.10)

2 He-like line ratio diagnostic

Based on forbidden line versus intercombination line diagnostics in He-like ions we conclude that the ions in the hot plasma are formed at an average distance from the stellar surface of 3.9 (1.7) R_* for Mg XI, 4.8 (1.8) R_* for Ne IX, 12.5 (1.5) R_* for O VII, and 34 (10) R_* for N VI.

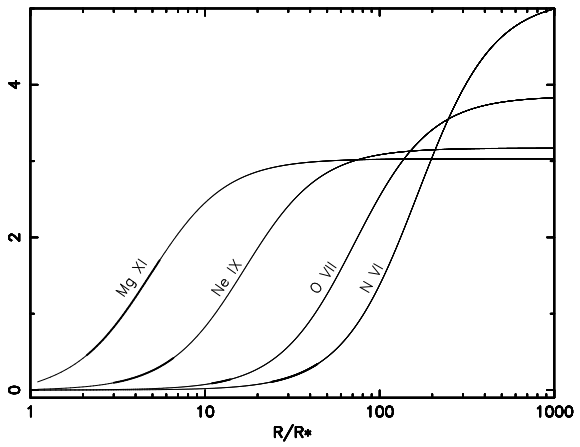

Figure 1: The curves show the theoretical f/i ratios (thin lines) and the measured values (thickened portions).

References

Anders, E., & Grevesse N. 1989, Geochimica et Cosmochimica Acta, 53, 197

Arnaud, M., & Rothenflug, J. 1992, A&AS, 60, 425

Grevesse, N., & Sauval, A.J. 1999, A&A, 347, 348