# The relationship between gamma Cassiopeiae's X-ray emission and its circumstellar environment

M. A. Smith(1),
R. Lopes de Oliveira(2,3),
C. Motch(4),
G. W. Henry(5},
N. D. Richardson(6),
K. S. Bjorkman(7),
Ph. Stee(8), D. Mourard(8),
J. D. Monnier(9), X. Che(9),
R. Buecke(10),
E. Pollmann(11)
D. R. Gies(6), G. H., Schaefer(6), T. ten Brummelaar(6),
H. A. McAlister(6), N. H. Turner(6), J. Sturmann(6),
L. Sturmann(6), and S. T. Ridgway(12)

(1)Catholic University of America,
(2) Departmento de Fisica, Universidade Federal de Sergipe, (3) Departmento de Fisica, Universidade de Sao Paulo,
(4) Observatoire Astronomique, Universit'e de Strasbourg,
(5)Center of Excellence in Information Systems, Tennessee State University,
(6)Center for High Angular Resolution Astronomy and Department of Physics and Astronomy, Georgia State University,
(7)Ritter Astrophysical Research Center, Department of Physics and Astronomy,
(8)Laboratoire Lagrange, l'Observatorie, Universite de Nice,
(9) Department of Astronomy, University of Michigan
(10) Anna-von-Gierke-Ring 147, Hamburg,
(11)Emil-Nolde-Str. 12, Leverkusen,
(12) National Optical Astronomical Observatory, Tucson.

gamma Cas is the prototypical classical Be star and is best known for its variable hard X-ray emission. To elucidate the reasons for this emission, we mounted a multiwavelength campaign in 2010 centered around 4 XMM-Newtonobservations. The observational techniques included Long Baseline Optical Interferometry (LBOI), monitoring by an Automated Photometric Telescope and Halpha observations. Because gamma Cas is also known to be in a binary, we measured Halpha radial velocities and redetermined its period as 203.55+/-0.2 days and an eccentricity near zero. The LBOI observations suggest that the star's decretion disk was axisymmetric in 2010, has an inclination angle near 45^o, and a larger radius than previously reported. The Be star began an "outburst" at the beginning of our campaign, made visible by a disk brightening and reddening during our campaign. Our analyses of the new high resolution spectra disclosed many attributes found from spectra obtained in 2001 (Chandra) and 2004 (XMM). As well as a dominant hot 14 keV thermal component, these familiar ones included: (i) a fluorescent feature of Fe K stronger than observed at previous times, (ii) strong lines of N VII and Ne XI lines indicative of overabundances, and (iii) a subsolar Fe abundance from K-shell lines but a solar abundance from L-shell ions. We also found that 2 absorption columns are required to fit the continuum. While the first column maintained its historical average of 1x10^21 cm^-2, the second was very large and doubled to 7.4x10^23 cm^-2 during our X-ray observations. Although we found no clear relation between this column density and orbital phase, it correlates well with the disk brightening and reddening both in the 2010 and earlier observations. Thus, the inference from this study is that much (perhaps all?) of the X-ray emission from this source originates behind matter ejected by gamma Cas into our line of sight.

Reference: Astronomy and Astrophysics
Status: Manuscript has been accepted

Weblink: http://xxx.lanl.gov/abs/1201.6415

Comments:

Email: msmith@stsci.edu