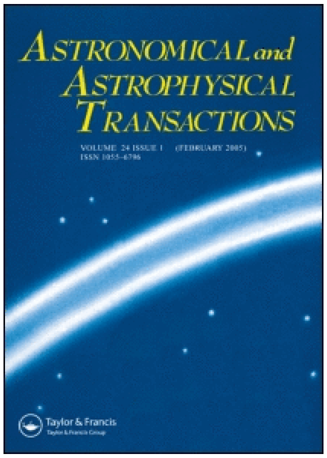
This article was downloaded by:[Bochkarev, N.]
On: 11 December 2007
Access Details: [subscription number 746126554]
Publisher: Taylor & Francis
Informa Ltd Registered in England and Wales Registered Number: 1072954
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK




Astronomical & Astrophysical Transactions
The Journal of the Eurasian Astronomical Society
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713453505

# Double-peaked broad-line H$_\beta$ profiles of 3C390.3 FROM 1995-99. II. the accretion disk model

A. N. Burenkov [a]; A. M. Dumont [b]; A. I. Shapovalova [a]; J. R. Valdes [c]; L. Carrasco [c]; S. Collin [b]; V. Chavushyan [c]; N. G. Bochkarev [d]; V. T. Doroshenko [d]; F. Legrand [c]; V. M. Lyuty [d]; V. P. Mikhailov [a]; O. I. Spiridonova [a]; V. V. Vlasyuk [a]
[a] Special Astrophysical Observatory, Russian Academy of Sciences, Nizhnij Arkhyz, Karachai-Cherkess Republic, Russia
[b] DAEC, Observatoire de Paris, Section de Meudon, Place Jansen, France
[c] Instituto Nacional de Astrofisica, Optica y Electronica, Puebla, Mexico
[d] Sternberg Astronomical Institute, University of Moscow, Moscow, Russia

Online Publication Date: 01 August 2001
To cite this Article: Burenkov, A. N., Dumont, A. M., Shapovalova, A. I., Valdes, J. R., Carrasco, L., Collin, S., Chavushyan, V., Bochkarev, N. G., Doroshenko, V. T., Legrand, F., Lyuty, V. M., Mikhailov, V. P., Spiridonova, O. I. and Vlasyuk, V. V. (2001) 'Double-peaked broad-line H$_\beta$ profiles of 3C390.3 FROM 1995-99. II. the accretion disk model', Astronomical & Astrophysical Transactions, 20:2, 353 - 355
To link to this article: DOI: 10.1080/10556790108229729
URL: http://dx.doi.org/10.1080/10556790108229729

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article maybe used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

*Astronomical and Astrophysical Transactions*, 2001, Vol. 20, pp. 353–355
Reprints available directly from the publisher
Photocopying permitted by license only

©2001 OPA (Overseas Publishers Association) N.V.
Published by license under
the Gordon and Breach Science Publishers imprint,
a member of the Taylor & Francis Group.

# DOUBLE-PEAKED BROAD-LINE $H_\beta$ PROFILES OF 3C390.3 FROM 1995-99. II. THE ACCRETION DISK MODEL

A. N. BURENKOV,[1] A. M. DUMONT,[2] A. I. SHAPOVALOVA,[1]
J. R. VALDES,[3] L. CARRASCO,[3] S. COLLIN,[2] V. CHAVUSHYAN,[3]
N. G. BOCHKAREV,[4] V. T. DOROSHENKO,[4] F. LEGRAND,[3] V. M. LYUTY,[4]
V. P. MIKHAILOV,[1] O. I. SPIRIDONOVA,[1] and V. V. VLASYUK[1]

[1] *Special Astrophysical Observatory, Russian Academy of Sciences, Nizhnij Arkhyz, Karachai-Cherkess Republic, 369167, Russia*
[2] *DAEC, Observatoire de Paris, Section de Meudon, Place Jansen, F-92195, France*
[3] *Instituto Nacional de Astrofisica, Optica y Electronica, Tonantzintla, Puebla, Mexico*
[4] *Sternberg Astronomical Institute, University of Moscow, Universitetskij Prospect 13, Moscow 119899, Russia*

*(Received January 15, 2001)*

A preliminary fitting by the accretion disk model of the broad $H_\beta$ line profiles of 3C 390.3 is presented.

KEY WORDS Galaxies: active – galaxies: individual (3C 390.3) – line: profiles

## 1 INTRODUCTION

We continue optical monitoring of the broad-line radio galaxy 3C 390.3. Some results of broad-band photometry and spectrophotometry during the period 1995–1999 are presented in Shapovalova *et al.* (2001). A more detailed description of our data (observations, processing) and the results of studying 3C 390.3 will be reported in Shapovalova *et al.* (2001). The main purpose of this paper is to test how an accretion disk model conforms with the time-varying shape of the broad $H_\beta$ profile.

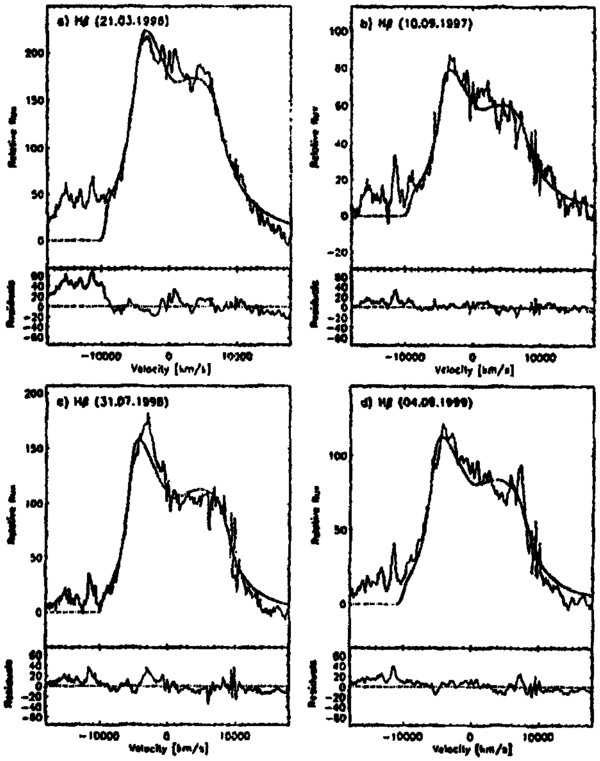



**Figure 1** The observed (solid line) and model (dotted line) profiles of the broad at $H_\beta$ emission line. (a), (c) – 3C 390.3 at $H_\beta$ flux maximum and (b), (d) – at minimum.

## 2 THE ACCRETION DISK MODEL

If the broad hydrogen lines originated in an accretion disk, analysis of their profile variations could provide further information on this disk. In this paper we do not make any hypothesis about the disk structure or how it is illuminated as was done in previous papers (Dumont and Collin, 1990; Rokaki *et al.*, 1992; Rokaki and Boisson, 1999); we want to derive the fundamental parameters of the disk emission. We compute the line profiles emitted by the disk allowing for the relativistic Doppler and gravitational redshifts, using equations given by Gerbal and Pelat (1981) and Chen *et al.* (1989). These equations are valid for inclination angles smaller than 80 degrees, which is the case here. The resulting profiles are double-peaked and asymmetric: they demonstrate two peaks, where blueshifted one is always higher than the redshifted one. They are convolved with the instrumental profiles and fitted to the observed line profiles. We assume that the Balmer lines are emitted by a disk rotating around a static central object with a Keplerian velocity, and that the emissivity varies as a power law of distance *R*. When we use a single power law, the line wings cannot be well represented. The fitting to the profiles can be greatly improved using a double emissivity function. The fitting has been carried out for 4 selected profiles distributed in time and representative of the maxima and minima of flux (Figure 1). The fitting gives values for the inclination angle $i$ very similar to those expected: the averaged inclination angle $i$ is equal to 25° with a maximum discrepancy of 3.5°. So, the hypothesis of a disk emitting the broad Balmer lines is relevant. If the inclination angle $i$ is about 25°, the region of maximum emission is at about 200 gravitational radii.

## *Acknowledgements*

We would like to thank Didier Pelat (Meudon observatory) for his help in computation of the model profiles and V.E. Zhdanova for help in processing the spectra.

This paper had financial support from INTAS (grant N96-0328), RFBR (grant N97-02-17625, grant N00-02-16272a.), the scientific-technical programme 'Astronomy' (Russia), RFBR+CHINE (grant 99-02-39120) and CONACyT grants GXXXX-E and 32106-E (México).

## *References*

Chen, K., Halpern, J. P., and Filipenko A. V. (1989) *Astrophys. J.* **339**, 742.
Dumont, A. M. and Collin, S. (1990) *Astron. Astrophys. Suppl. Ser.* **83**, 71.
Gerbal, D. and Pelat, D. (1981) *Astron. Astrophys.* **95**, 18.
Rokaki, E., Collin, S., and Boisson, C. (1992) *Astron. Astrophys.* **253**, 57.
Rokaki, E. and Boisson, C. (1999) *Mon. Not. R. Astron. Soc.* **307**, 41.
Shapovalova, A. I. *et al.*(2001) *JENAM-2000 Proceedings* (in press).
Shapovalova, A. I. *et al.*(2001) *Astron. Astrophys* (in preparation).