

This article was downloaded by:[Bochkarev, N.]  
On: 19 December 2007  
Access Details: [subscription number 788631019]  
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>

### Modelling the atmospheres of accretion disks

V. F. Suleymanov<sup>a</sup>

<sup>a</sup> Kazan State University,

Online Publication Date: 01 June 1993

To cite this Article: Suleymanov, V. F. (1993) 'Modelling the atmospheres of accretion disks', *Astronomical & Astrophysical Transactions*, 4:1, 33 - 34

To link to this article: DOI: 10.1080/10556799308205354

URL: <http://dx.doi.org/10.1080/10556799308205354>

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.

# MODELLING THE ATMOSPHERES OF ACCRETION DISKS

V. F. SULEYMANOV

*Kazan State University*

(Received October 31, 1991; in final form February 3, 1992)

The short results modelling of the accretion disks around white dwarfs and supermassive black holes are presented.

KEY WORDS quasars, white dwarfs, accretion.

The region where continuum emission is formed at the Rosseland optical depth  $\tau_R < 100$  is called below the atmosphere of an accretion disk (AAD). We consider  $\alpha$ -disks (Shakura and Sunyaev, 1973). We divide the disk into several rings and the atmosphere is considered separately for each ring. The total spectrum of the disk is a sum of rings' spectra, with the Doppler and Einstein shifts taken into account. The atmosphere of an individual ring is modelled using the code STARDISK based on Kurucz's code ATLAS5 (Kurucz, 1970).

We modelled AAD around white dwarfs (cataclysmic variable stars) and supermassive black holes (quasars and active galactic nuclei). Our main conclusion are as follows.

1. The local (for a given radius) AAD around white dwarfs differ only slightly from stellar atmospheres with the same  $T_{\text{eff}}$  and  $\lg g$  at the surface, if the role of the corona is neglected (Suleymanov, 1992a).

2. An AAD of high luminosity ( $L > 0.5L_{\text{Edd}}$ ) around a super-massive black hole with  $\alpha \sim 1$  may differ strongly from a stellar atmosphere:

a) There are additional solutions with high temperature ( $T_e \sim 10^{6-7}$  K) at low  $T_{\text{eff}} (\sim 10^{4-5}$  K) (Suleymanov, 1991).

b) The disk may be effectively optically thin because it has low density, that is  $\tau_{\text{eff}} \sqrt{\tau_e \tau_{f-f,b-f,b-b}} < 1$ , with  $\tau_e \gg 1$ , and the disk spectrum may have many lines and continuums in emission, in particular the Balmer and Paschen ones (Suleymanov, 1992b).

c) Strong wind from the surface of the disk should exist because the radiation force due to the resonance lines exceeds the gravitation force by two orders of magnitude for  $\tau_R < 10^{-2}$  (Suleymanov, 1992b).

## References

- Shakura, N. I. and Sunyaev, R. A. (1973). Black Holes in Binary Systems. Observational Appearance. *Astron. Astrophys.* **24**, 337–355.  
Kurucz, R. L. (1970). ATLAS: a computational program for calculating model stellar atmospheres. *Smithson. Astrophys. Observ. Spec. Report.*, **309**, 1–292.

- Suleymanov, V. F. (1992a). Modelling accretion disks and radiation spectra in the cataclysmic variable stars. I. V603 Aql. *Pis'ma A. Zh.* (in Russian, in press).
- Suleymanov, V. F. (1991). On the possible nature of X-ray radiation from quasars. *Pis'ma A. Zh.* **17**, 575–582 (in Russian).
- Suleymanov, V. F. (1992). Methods of calculation of radiation spectra for accretion disks. Review and analysis of results. *Trudy Kaz. Gor. Observ.* **54**, (in Russian, in press).