RADIATION FROM ADVECTION-DOMINATED FLOWS

Application to Sgr A*

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1. Introduction

Advection-dominated accretion flow (hereafter ADAF) is the only self-consistent solution to describe the optically thin accretion flows around compact objects. The main feature of ADAF is that the dynamics of the flow is dominated by accretion process rather than radiation process. As a result of advection domination, the luminosity of ADAFs is very low. Coupled with the existence of the event horizon, ADAF has been successfully applied to the dim accretion black holes such as central core of our Galaxy :Sgr A*. In this issue, we calculate the spectrum radiated from the optically thin ADAFs and show that the observed spectrum of Sgr A* is explained with the accretion massive black hole.

2. Accretion Flow Model

We solve the basic equations for the optically thin accretion gas around a black hole globally. We assume that the gas is two-temperature plasma with randomly oriented magnetic field. The radiation processes taken into account are synchrotron emission, bremsstrahlung, and Comptonization. We also include the effect of redshift due to bulk motion and gravity. The basic equations used in our calculations are described in detail in Manmoto, Mineshige and Kusunose 1997. We show in the figure the observed spectrum of Sgr A* and our model (shown by solid line). The observational data in the figure are ones formerly compiled and tabulated in Narayan et al. 1997.

3. Results and Discussions

We fit the observational data with the standard values of physical parameters such as $\alpha = 0.1$, $\beta = 0.5$ (case of equipartition), $\dot{m} = 2.5 \times 10^6$. The
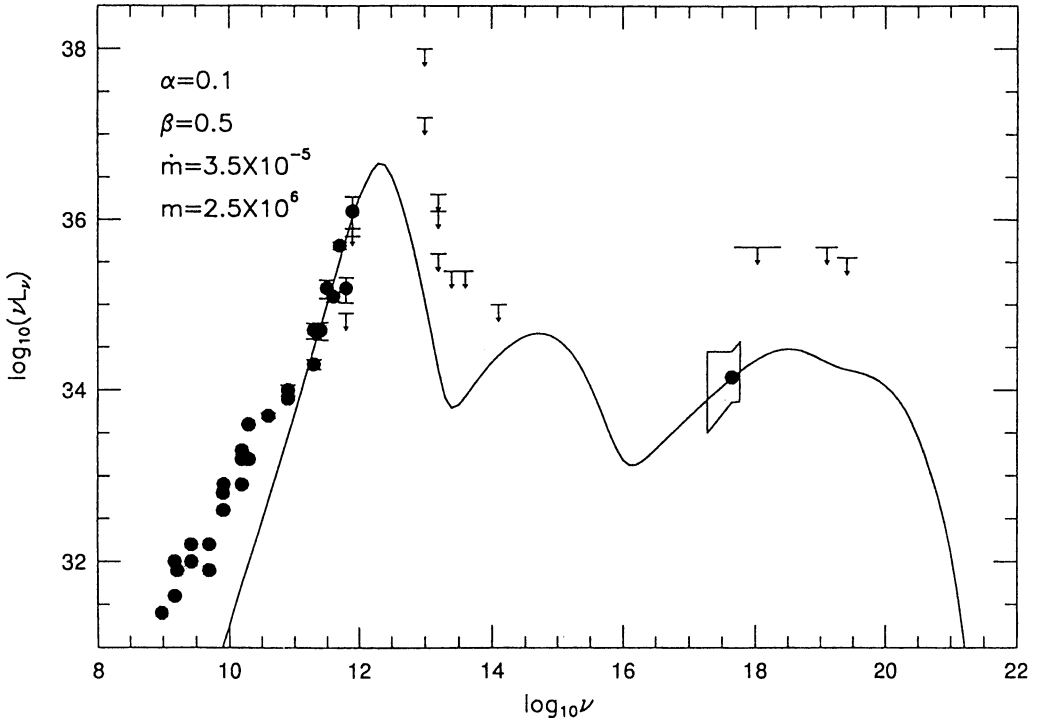
Figure 1. Spectrum of Sgr A*

parameters we assigned are very close to those assigned by Narayan et. al. 1997. In Manmoto et al 1997, we concluded that the several X-ray data which were asserted to be from Sgr A* are in fact not from Sgr A* itself, if we set $\alpha \sim 0.1$ which is considered to be the standard value for ADAFs. The newly added infrared upper limit (Menten et al. 1997) makes it improbable that the X-ray data more luminous than the upper limits shown in the figure previously obtained (see Narayan et al. 1995) are from Sgr A* itself only.

4. References

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