J50b On Black Hole Mass Estimation from X-ray Spectra of Ultraluminous X-ray Sources

○ Kiki Vierdayanti(京都大学)、渡會 兼也（大阪教育大学)、嶺重 慎 (京都大学)

One of the most useful methods to estimate the black hole mass in X-ray binaries (XBs), when the dynamical method is unavailable, is by X-ray spectral fitting. The most well-known fitting model for Galactic black hole candidates (BHCs) is the disk blackbody (DBB) model, in which the effective temperature profile is assumed to be $T_{\rm eff} \propto r^{-3/4}$, where r is the disk radius. It has two fitting parameters: the innermost disk temperature, $T_{\rm in}$, and the innermost disk radius, $r_{\rm in}$. The black hole mass can be estimated by assuming that the inner radius coincides with that of the last stable circular orbit ($r_{\rm ms} = 3r_{\rm g}$, where $r_{\rm g}[\equiv 2GM/c^2]$ is the Schwarzschild radius). We propose a methodology to derive a black hole mass from the spectral fitting by using the extended DBB model where $T_{\rm eff} \propto r^{-p}$ is assumed. In addition to $T_{\rm in}$ and $r_{\rm in}$, p is also set as the fitting parameter. For this we basically use that of the DBB model, in which $r_{\rm ms} = 3r_{\rm g} \propto M$ is assumed. However, it is not obvious if this assumption is appropriate for $p \sim 0.5$, that is in the slim disk regime. We fit the theoretical slim disk spectra with the extended DBB model and estimate the black hole mass from the value of $r_{\rm in}$ from the fitting. We calculate a correction factor, $M/M_{\rm x}$, where M is the actual black hole mass and $M_{\rm x}$ is the derived mass based on the assumption used in the DBB model as mentioned above. We found that in the slim disk case $r_{\rm in} < 3r_{\rm g}$. Our results seem to support the recent black hole mass estimation of the ultraluminous X-ray sources (ULXs) from the fitting with the extended DBB model by asuming $r_{\rm in} = 2r_{\rm g}$.