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国台学术报告 NAOC COLLOQUIUM

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Elliptical accretion disk as a model for tidal disruption events

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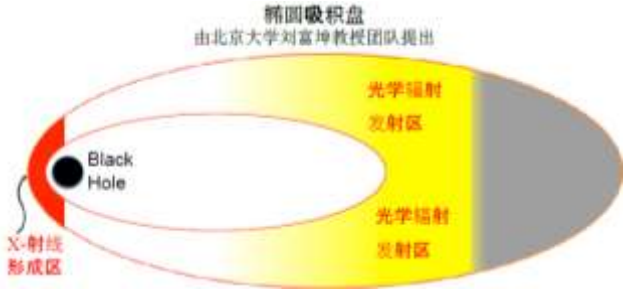
Dr. Fukun Liu is a professor of astrophysics and the former director of the Department of Astronomy of Peking University and joint professor of KIAA-PKU. He is a member of the supervisors of the Chinese Astronomical Society. He obtained his PhD in astrophysics at SISSA (Italy) in 1999 and worked with Professor Marek Abramowicz at Chalmers University of Technology and Gothenburg University as a post-doctoral fellow of the Natural Science Research Foundation of Sweden (NFR fellow) from 1999 to 2001. He joined Peking University in 2001. His research interests include AGNs, accretion disk theory, supermassive black hole and binaries (SMBHBs), gravitational wave astrophysics, and tidal disruption events. Together with colleagues, he predicted the observational signatures and discovered the first pairs of SMBHBs in quiescent galaxies. His research group recently developed the elliptical accretion disk model for TDEs. He was awarded the Top 10 Achievements in Astronomy of China, respectively, in 2011 and 2014 and received the special allowances of the State Council of China in 2016.

Abstract



A star would be tidally disrupted, when it closely passes by a supermassive black hole (SMBH). After the tidal disruption, about half of the stellar debris becomes bound and falls back to the SMBH. In the canonical model, the stellar debris circularizes rapidly to form a circular accretion disk of size about twice the orbital pericentre of the star. The circular accretion disk is hot with temperature about a few times 10^5 K and radiates mainly in the soft X-rays. Stellar tidal disruption events (TDEs) discovered in the X-rays are consistent with these expectations, but those in the optical/UV band are not. The observations of the luminous optical luminosities, sub-Eddington bolometric luminosities, low and constant blackbody temperature, large and decreasing emitting regions, and strong and complex asymmetric broad optical emissions of the optical/UV TDEs challenge the canonical model. We recently proposed and developed an elliptical accretion disk model for TDEs. We investigated the properties of the elliptical accretion disk and showed that the elliptical accretion disks have distinctive hydrodynamic structures and spectral energy distributions, which are fully consistent with the observations of optical/UV TDEs. In this talk, I will introduce the elliptical accretion disk model for TDEs and compare the predications with the observations of TDEs.

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