

Exploring the Inner Structure of Active Galactic Nuclei by Reverberation

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The innermost structure of active galactic nuclei (AGNs) consists of an accretion disk surrounding a supermassive black hole and, on somewhat larger scales, rapidly moving diffuse gas. The ultraviolet through near IR spectrum of AGNs is dominated by thermal continuum emission from the accretion disk and broad emission lines and absorption features from the diffuse gas. The continuum flux from the accretion disk varies with time, and the emission lines also change in brightness, or “reverberate,” in response to these variations, with a delay due to the light-travel time across the line-emitting region. Measurement of the emission-line time delay yields the size of the line-emitting region and by combining this with the emission-line Doppler width, the central black hole mass can be inferred. I will discuss results from recent “reverberation mapping” experiments, including a 179-orbit Hubble Space Telescope program, that have been designed to explore the dynamics of the emission-line gas and are yielding a wealth of new and quite surprising information about AGN structure.