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Invited Lecture

PARTIAL OBSCURATION AS A CAUSE OF ASYMMETRIES OF BROAD BALMER LINE PROFILES IN ACTIVE GALACTIC NUCLEI

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The broad-line region (BLR) is the region producing the broad emission lines in active galactic nuclei (AGNs). Profiles of the broad lines, and the time delays in the responses of these lines to variations in the ionizing continuum (reverberation mapping), imply that the BLR consists primarily of dense, turbulent gas in a flattened distribution co-rotating above the accretion disc of an AGN. With this geometry, the observed profiles of the broad lines depend on the viewing angle. If the BLR is seen close to face-on, the line profiles are centrally-peaked, "logarithmic" profiles. As the BLR is viewed progressively further off-axis, the profiles should become broader and double-peaked, as is expected from a rotating disc of gas. However, the expected "disc-like" profile is almost never seen in AGNs. Instead, broad double-peaked profiles are usually quite asymmetric. We have studied a sample of the most extreme Balmer line profiles. We show that the properties of these extreme profiles arise naturally because of partial obscuration of the BLR by outflowing dust clouds. Such obscuration can be a factor causing some of the anomalous responses of emission lines to continuum variability.