Notes for Sebastian F. Hönig "DUST REVERBERATION MAPPING IN THE ERA OF BIG OPTICAL SURVEYS AND ITS COSMOLOGICAL APPLICATION"

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1. Introduction

The near-infrared (IR) light curves of active galactic nuclei (AGN) show variability that is consistent with the optical light curves, however lagging by tens to hundreds of days.

Dust around AGN absorbs the UV/optical radiation from the putative accretion disk and reemits in the IR. At about 1500K, the dust sublimates, corresponding to the hottest dust emission peaking at $\sim 2\mu m$. Despite the exponential decrease of the Wien tail, some contribution of the hot-dust emission will reach into optical wavebands. Dust is in LTE so we can calculate its temp./emission from the incoming radiation. The optical emission is dominated by the AGN central engine's "big blue bump" (BBB). The BBB spectral energy can be approximated as $\lambda F_\lambda \propto \lambda^{-4/3}$

Kelly 2009 and 2013 show that the optical variability is well reproduced by a stochastic model based on a continuous autoregressive process (Ornstein-Uhlenbeck process).

The idea is to use optical observations to get the dust torus time lag. mock light curves and observations are made to test the method. Cross correlation functions are used to recover the dust tori time lag.

Dust time lags are about 4 times longer than BLR ones.