Notes for Mandal et al. "REMAP: Determination of the inner edge of the dust torus in AGN by measuring time delays "

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1. Introduction

Unified AGN model has dusty torus surrounding accretion disk and super massive black hole. The broad band spectral energy distribution (SED) for AGN has a prominent big blue bump, which indicates emission from the accretion disk and an excess emission in the infrared (IR) region, which is thought to be thermal emission from the dusty torus. There are two way to infer the structure/size of the torus either by Reverberation Mapping or by IR interferometry. Getting the lag between the UV/Optical and near-IR can give us an estimate of the distance between the central engine and the inner radius of the dusty torus, which is the dust sublimation radius. The inner radius is of order 0.01 - 0.1 pc or 10 - 100 light days. Inner radii found with RM seem to be smaller by a factor of 3 from what we would expect from the dust sublimation radius for a temperature of 1600 K (can be explained by many factors). Cross correlation is used to find the time lag between UV/Optical and NIR light curves. RM has three assumptions

1. The continuum originates in a single central source of isotropic radiation.

2. Light-travel time is the most important time scale here.

3. There is a simple, though not necessarily linear relationship between the observed continuum and the ionizing continuum

The torus lag is 4-5 times larger than the BLR lag.
A restriction is put on the BLR lag of the sources of 3-10 days, this can give meaningful dust time lags that are more than around 30 days and have been monitored for 6 months. A magnitude constraint is also imposed where the V-band must be brighter than 16.5 mag (and declination greater than -10 deg) to get a good S/N and observability.

The accretion disk component for the NIR-flux is removed using a model before the correlation analysis between the V and NIR band is done.