Mapping the central regions of AGN

- **Measured continuum inter-band delays suggest accretion disc sizes that are too large for their luminosity. Either the standard model for accretion is incorrect, or there is significant contamination of the pure disc signal by additional reprocessing sites. This project aims to quantify the broad line region contribution to the delay signature.**

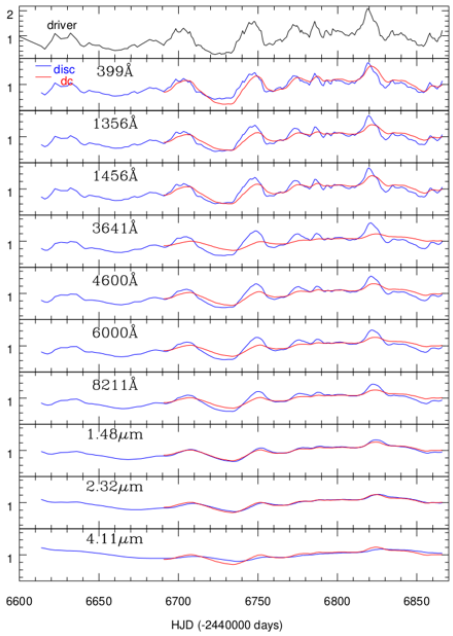
Level	PhD
First Supervisor	Michael Goad
Second Supervisor	Simon Vaughan
Application Closing Date	19 January 2022
PhD Start date:	26 September 2022

Project Details:

Correlated continuum and broad emission line variability studies have proven a powerful probe of the central regions of Active Galactic Nuclei (AGN).

Traditionally RM has focused on probing the spatial distribution and kinematics of the broad emission line region (BLR), and determining the mass of the central supermassive black hole. More recently, correlated continuum variations have been used to : (i) measure the distance to the hot dust (dust RM), and (ii) map the disc radial temperature profile, T(R).

Dust delays provide an upper limit to the BLR outer boundary necessary for constraining photoionization models, while inter-band continuum delays reveal T(R), which in turn can be used to determine the mass accretion rate through the disc for AGN with known black hole mass.



Reprocessed continuum light-curves from an irradiated disc and broad emission–line region

We have on-going optical--IR programs with Liverpool Telescope in support of HST (200 orbits) and Swift/XRT/UVOT monitoring programs, providing ground-based spectrophotometry, for disc, dust and broad emission-line variability studies. The PhD project will focus on constructing photoionization models of low and high accretion rate sources in the context of self-consistent energy conserving models of the ionizing SED necessary for determining the diffuse continuum contribution to the inter-band continuum delays (e.g., Fig 1), and for interpreting broad emission-line variations. The work will involve a substantial modelling component and may also include data reduction and analysis

References:

1 Cackett et al. 2021, in press. https://arxiv.org/pdf/2109.02155.pdf

2 Cackett, E. et al. 2020, ApJ 896, 1. https://arxiv.org/pdf/2005.03685.pdf

3 Korista, K.T. and Goad, M.R. 2019 MNRAS, 489, 5284. https://arxiv.org/pdf/1908.07757.pdf

4 Lawther, D., Goad, M.R. et al. 2018 MNRAS 481, 533.https://arxiv.org/pdf/1808.04798.pdf

Further information on how to apply and funding can be found HERE