**STFC funded PhD Project**

**Reference:** STFC-Goad

**Supervisors:**

Dr Michael Goad mg159@le.ac.uk

Dr Simon Vaughan sav2@le.ac.uk

**Project Title:** Mapping the central regions of AGN

**Project Description**

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.
 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**

* Cackett et al. 2021, in press. <https://arxiv.org/pdf/2109.02155.pdf>
* Cackett, E. et al. 2020, ApJ 896, 1. <https://arxiv.org/pdf/2005.03685.pdf>
* Korista, K.T. and Goad, M.R. 2019 MNRAS, 489, 5284. <https://arxiv.org/pdf/1908.07757.pdf>
* Lawther, D., Goad, M.R. et al. 2018 MNRAS 481, 533.<https://arxiv.org/pdf/1808.04798.pdf>