TRUE2: unveiling the nature of true Seyfert 2 candidates through optical polarimetry

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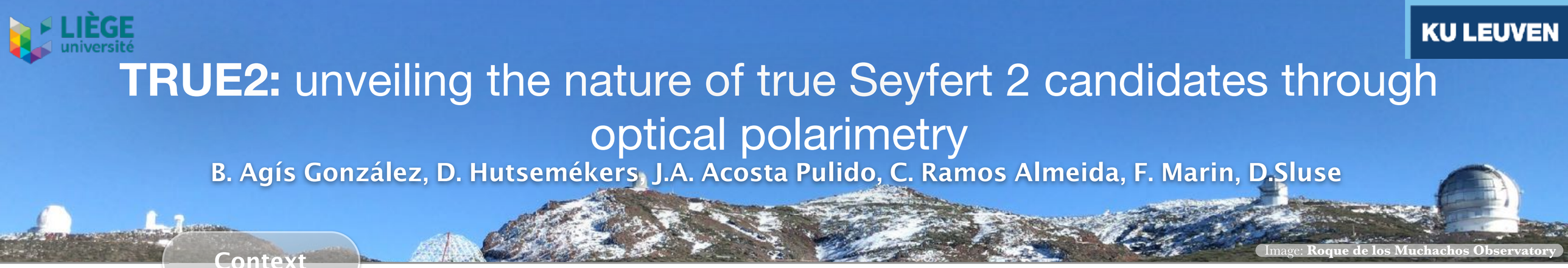


Context

The so-called true Seyfert 2 candidates [1] are Seyferts galaxies whose optical spectra do not show broad lines. Yet, in the X-ray domain, they exhibit some characteristic behavior of Seyferts 1 such as lack of X-ray obscuration and/or short timescale variability. A true Seyfert 2 candidate will be confirmed as a true Seyfert 2 galaxy if the lack of the broad line region (BLR) emission is not only observational but physical. Since the BLR is hidden behind the circumnuclear, optically-thick, dusty torus, only polar-scattered light can probe the presence or absence of the BLR. Hence, scattering-induced polarization is the only way to probe the existence of hidden-BLRs (HBLR).

Methodology

(A). IMAGING POLARIMETRY: The unique method to detect HBLRs is spectropolarimetry, but this technique is very time-consuming. Dealing with a large sample of true Seyfert 2 candidates would not be realistic. However, since these objects lack efficient X-ray obscurers, the most plausible explanation to cause the non-detection of a physically present HBLR is the absence of efficient polar scattering regions. The presence of a efficient polar scattering region implies a continuum of significant polarization and this can be measured using imaging polarimetry, which is about 8 times less time-consuming than spectropolarimetry.

(A). IMAGING POLARIMETRY:

↑↑ Significant polarization degree → **efficient** scattering region ✓

↓↓ Null polarization degree → **NO efficient** scattering region ✗

- Targets expected to show detectable HBLRs.
- ***Candidates to confirm the existence of HBLRs and so discard/confirm definitely their true 2 candidacy with spectropolarimetry***

- No expectations to detect HBLRs with spectropolarimetry

(B). SIMULATIONS - STOKES:

Establish a limit on the polarization degree in order to define efficient scattering regions. It will allow to select candidates expected to show detectable HBLRs performing spectropolarimetry

Submit observing proposals

Input: efficiency (opacity, morphology, inclination…) of the scattering region

COMPARING:

Our observational data **vs.** STOKES SIMULATIONS

measured broad-band polarization ↔ **Output:** synthetic broad-band polarization

STOKES

A Monte Carlo radiative transfer code dedicated to multiwave-length polarization. It is the most widely code used to predict, fit and interpret the polarization of AGN (http://www.stokes-program.info/). It can constrain **a lower limit on the degree of linear polarization to indicate the presence of a scattering medium able to act as a mirror,** i.e. providing us with an indirect view of the HBLRs. How?

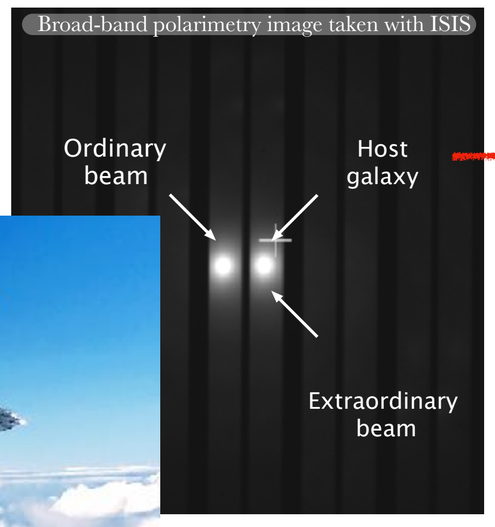
STOKES INFO:

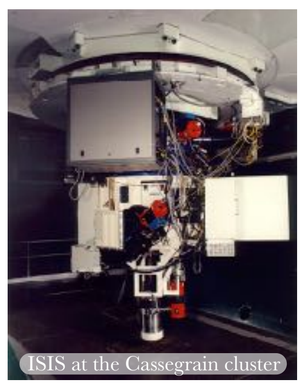
Aims

1) Establish a rigorous limit on the continuum polarization to detect efficient scattering regions
2) Determine which candidates does not present an efficient scattering region.
3) Select a sub-sample of targets likely to present HBLRs in spectropolarimetry

Preliminary Results

The Intermediate dispersion Spectrograph and Imaging System (**ISIS**) is mounted at the Cassegrain focus of the 4.2m William Herschel Telescope, which is situated at Roque de los Muchachos Observatory





- We got new imaging polarimetry data from ISIS@WHT of 10 true 2 candidates which had not been checked in polarized light.

HOST GALAXY CORRECTION: The host galaxy can dilute the intrinsic AGN polarization. Since the host galaxy is resolved we can estimate the induced dilution from our images.

So far, all candidates show broad-band polarization degrees compatible with zero →

→ NO EFFICIENT SCATTERING REGIONS

- We are comparing the measured continuum polarization with STOKES simulations to constrain the morphology, localization, density, composition and limit of efficiency of the scattering regions. This will also allow us to get insights on the BLR and optically-thick circumnuclear dusty region all at once.

REFERENCES: [1] Heckman, T. et al. 1995, ApJ, 452, 449; [2] Goosmann, R. & Gaskell, C. M. 2007, A&A, 465, 129