

Turbulence/outflows perpendicular to low-power jets in Seyfert galaxies†

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Abstract. We present recent results from our MAGNUM survey of nearby active galactic nuclei (AGN), which exploits observations from the optical/near-IR integral field spectrograph MUSE at VLT. We detect strongly enhanced line widths in emission line maps of four galaxies perpendicularly to their low-power jets and AGN ionisation cones, indicative of turbulent/outflowing material. The observation of a similar phenomenon in other works suggests that it originates from an interaction mechanism between the jet and the galaxy disc through which it propagates.

Keywords. galaxies: jets, galaxies: Seyfert, galaxies: individual (IC 5063, NGC 5643), galaxies: ISM, galaxies: kinematics and dynamics, techniques: spectroscopic

1. Introduction

Ionised outflows are routinely observed in active galactic nuclei (AGN), either powered by the strong AGN radiation pressure or by powerful jets (see e.g. [Fabian 2012](#)).

Here we focus on new results from our 10-to-100 pc spatially-resolved MAGNUM survey (Measuring Active Galactic Nuclei Under MUSE Microscope) of nearby AGN (e.g. [Venturi et al. 2017, 2018](#); [Mingozi et al. 2019](#)) observed with the optical and near-IR integral field spectrograph MUSE at VLT ([Bacon et al. 2010](#)), revealing a peculiar phenomenon in objects hosting low-power jets.

2. Turbulence/outflows perpendicular to low-power jets

In Fig. 1 we present MUSE maps of two Seyfert galaxies from our survey, IC 5063 and NGC 5643. Here, while the high bulk velocity gas (panels b and e) indicates an outflow in the direction of the AGN ionisation cones (traced by [O III], panels a and d), as normally expected in AGN (e.g. [Fischer et al. 2013](#)), a strongly enhanced line velocity width ($\gtrsim 800$ km/s; panels c and f), indicating turbulent/outflowing motions with low bulk velocity, is observed instead perpendicularly to the ionisation cones and radio jets (black contours in panels c and f). We detect this phenomenon in two other galaxies of

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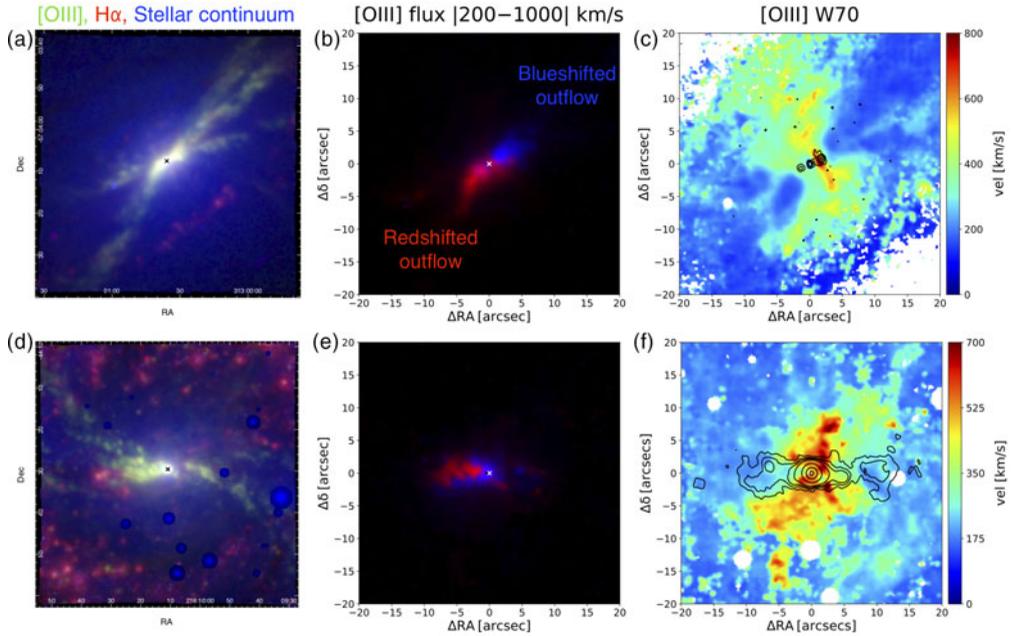


Figure 1. VLT/MUSE maps of IC 5063 (top) and NGC 5643 (bottom). a) and d) Flux maps of ionised gas, $[O\ III]\lambda 5007$ (green) and $H\alpha$ (red), and stellar continuum (blue). b) and e) Bulk of the high-velocity outflow, traced by the flux of $[O\ III]$ line profile integrated in the velocity range $\pm|200-1000|$ km/s (blue if approaching, red if receding) with respect to the stellar velocity in each spaxel (to exclude contributions from gas rotating in the disc). c) and f) $[O\ III]$ W70 line velocity width map (i.e difference between the 85th- and 15th-percentile velocities of the line profile), with radio jet contours superimposed, ATCA 17.8 GHz from Morganti *et al.* (2007) for IC 5063, 8.4 GHz VLA from Leipski *et al.* (2006) for NGC 5643.

our sample, NGC 1068 and NGC 1386. We note that all the four mentioned galaxies host a low-power radio jet with low inclinations to galaxy disc.

3. Discussion and Conclusions

We have shown MUSE emission-line maps of two nearby Seyfert galaxies from our MAGNUM survey, which - together with two other sources of the sample - exhibit enhanced line velocity widths perpendicularly to their low-power radio jets and ionisation cones, indicative of turbulent/outflowing motions. A similar phenomenon has been reported in other recent works also in galaxies hosting jets lying low onto the galaxy disc (e.g. Shin *et al.* 2019). This suggests that the jets, through the interaction with the gas in the disc, are responsible for generating the observed perpendicular turbulence/outflow. Moreover, our results confirm that not only powerful jets in “radio loud” objects (e.g. Nesvadba *et al.* 2008) are capable of affecting the gas in the host, but also low-power jets residing in “radio quiet” galaxies, as indicated by recent works (e.g. Jarvis *et al.* 2019).

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