

LETTER TO THE EDITOR

# Velocity measurement in the extensive [OIII] emission region $1.2^\circ$ south-east of M31<sup>★</sup>

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## ABSTRACT

*Context.* The discovery of a broad,  $\sim 1.5^\circ$  long filamentary [OIII] 5007 emission  $\sim 1.2^\circ$  south-east of the M31 nucleus has recently been reported. More than 100 hours of exposures of a wide field ( $3.48^\circ \times 2.32^\circ$ ) have allowed this pioneering detection based on 30 Å narrow-band filters and several small refractors equipped with large cameras.

*Aims.* We report a first velocity measurement in this extensive [OIII] emission line region.

*Methods.* We used the low-resolution spectrograph MISTRAL ( $R \sim 750$ ), a facility of the Haute-Provence Observatory 193 cm telescope. The velocity measurement is based on the  $H\alpha$ , [NII], [SII] and [OIII] lines.

*Results.* The best solution to fit the spectrum indicates that the  $H\alpha$  and [OIII] emissions are at the same heliocentric line-of-sight velocity of  $-96 \pm 4 \text{ km s}^{-1}$ . This was measured within an area of  $\sim 250 \text{ arcsec}^2$  selected on a bright knot along the long filament of  $\sim 1.5^\circ$ , together with a [OIII]5007 surface brightness of  $4.2 \pm 2.1 \cdot 10^{-17} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ arcsec}^{-2}$ . This agrees moderately well with the previous measurement. We also estimated the  $H\alpha$ /[NII] line ratio as  $\sim 1.1$ .

*Conclusions.* The radial velocities at which the  $H\alpha$  and [OIII] lines were detected seem to show that these hydrogen and oxygen atoms belong to the same layer, but we cannot exclude that another weaker [OIII] line, belonging to another structure, that is, at another velocity, is below our detection threshold. Different scenarios have been considered to explain this filamentary structure. The extra-galactic origin was excluded in favour of Galactic origins. We tentatively assume that this filament is a piece of a supernova remnant located at a distance of  $\sim 0.7 \text{ kpc}$  from the Sun, of which we only see a small fraction of the shells with a radius of  $\sim 35 \text{ pc}$ . The progenitor may be along the line of sight of the galaxy M31, but this observation might also just be part of a large-scale filamentary structure that should be investigated further.

**Key words.** Galaxy: general – ISM: supernova remnants – ISM: atoms – galaxies: ISM – galaxies: intergalactic medium – galaxies: M31

<sup>★</sup> Observations done at Haute-Provence Observatory