

Gas physical conditions and kinematic of the giant outflow Ou4

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Ou4 is a recently discovered bipolar outflow with a projected size of more than one degree in the plane of the sky. It is apparently centred on the young stellar cluster -whose most massive representative is the triple system HR8119- inside the HII region Sh 2-129. The driving source, the nature, and the distance of Ou4 are not known. Deep narrow-band imagery of the whole nebula at arcsec resolution was obtained to study its morphology. Long-slit spectroscopy of the tips of the bipolar lobes was secured to determine the gas ionization mechanism, physical conditions, and line-of-sight velocities. An estimate of the proper motions at the tip of the south lobe using archival images is attempted. The existing multi-wavelength data for Sh 2-129 and HR 8119 are also comprehensively reviewed. The morphology of Ou4, its emission-line spatial distribution, line flux ratios, and the kinematic modelling adopting a bow-shock parabolic geometry, illustrate the expansion of a shock-excited fast collimated outflow. The radial velocities and reddening are consistent with those of Sh 2-129 and HR 8119. The improved determination of the distance to HR8119 (composed of two B0 V and one B0.5 V stars) and Sh 2-129 is 712 pc. We identify in WISE images a 5 arcmin-radius (1 pc at the distance above) bubble of emission at 22 micron emitted by hot (107 K) dust, located inside the central part of Ou4 and corresponding to several [O III] emission features of Ou4. The apparent position of Ou4 and the properties studied in this work are consistent with the hypothesis that Ou4 is located inside the Sh 2-129 HII region, suggesting that it was launched some 90 000 yrs ago by HR8119. The outflow total kinetic energy is estimated to be $\sim 4 \times 10^{47}$ ergs. However, the alternate possibility that Ou4 is a bipolar planetary nebula, or the result of an eruptive event on a massive AGB or post-AGB star not yet identified, cannot be ruled out.

Reference: Astronomy and Astrophysics, in press

Status: Manuscript has been accepted

Weblink: <http://arxiv.org/abs/1407.4617>, <http://hal.archives-ouvertes.fr/hal-01022286>

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