

# Gas physical conditions and kinematics of the giant outflow Ou4

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**Context.** The recently discovered bipolar outflow Ou4 has 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 HR 8119 “ inside the H ll region Sh 2-129. The driving source, the nature and distance of Ou4 are not known.

**Aims.** The basic properties of Ou4 and its environment are investigated to shed light on the origin of this remarkable outflow.

**Methods.** Deep narrow-band imagery of the whole nebula at arcsecond resolution was obtained to study the details of its morphology. Long-slit spectroscopy of the bipolar lobe tips was secured to determine the gas ionisation mechanism, physical conditions, and line-of-sight velocities. An estimate of the proper motions at the tip of the south lobe using archival plate images was attempted. The existing multi-wavelength data for Sh 2-129 and HR 8119 were also comprehensively reviewed.

**Results.** The observed morphology of Ou4, its emission-line spatial distribution, line flux ratios, and the kinematic modelling developed adopting a bow-shock parabolic geometry, illustrate the expansion of a shock-excited fast collimated outflow. The observed radial velocities of Ou4 and its reddening are consistent with those of Sh 2-129 and HR 8119. The improved determination of the distance to HR 8119 (composed of two B0 V and one B0.5 V stars) and Sh 2-129 is 712 pc. We identify in WISE images at 22  m an emission bubble of 5 arcmin radius (1 pc at the distance above) emitted by hot (107 K) dust grains, located inside the central part of Ou4 and corresponding to several [O III] emission features of Ou4.

**Conclusions.** 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 H ll region, suggesting that it was launched some 90 000 yr ago by HR 8119. The outflow total kinetic energy is estimated to be  $\sim 4 \times 10^{47}$  ergs. However, we cannot rule out the alternative 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.

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Comments:

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