

Colliding winds in and around the stellar group IRS 13E at the galactic centre

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Abstract

IRS 13E is an enigmatic compact group of massive stars located in projection only 3.6 arcsec away from Sgr A*. This group has been suggested to be bounded by an intermediate-mass black hole (IMBH). We present a multiwavelength study of the group and its interplay with the environment. Based on Chandra observations, we find the X-ray spectrum of IRS 13E can be well characterized by an optically thin thermal plasma. The emission peaks between two strongly mass-losing Wolf–Rayet stars of the group. These properties can be reasonably well reproduced by simulated colliding winds of these two stars. However, this scenario underpredicts the X-ray intensity in outer regions. The residual emission likely results from the ram-pressure confinement of the IRS 13E group wind by the ambient medium and is apparently associated with a shell-like warm gas structure seen in Pa α and in ALMA observations. These latter observations also show strongly peaked thermal emission with unusually large velocity spread between the two stars. These results indicate that the group is colliding with the bar of the dense cool gas mini-spiral around Sgr A*. The extended X-ray morphology of IRS 13E and its association with the bar further suggest that the group is physically much farther away than the projected distance from Sgr A*. The presence of an IMBH, while favourable to keep the stars bound together, is not necessary to explain the observed stellar and gas properties of IRS 13E.