Executive Summary

Microquasars, the local siblings of extragalactic quasars, are binary systems comprising a compact object and a companion star. By accreting matter from their companions, microquasars launch powerful winds and jets, influencing the interstellar environment around them. Steady gamma-ray emission is expected to rise from their central objects, or from interactions between their outflows and the surrounding medium. The latter prediction was recently confirmed with the detection at the highest (TeV) energies of SS 433, one of the most interesting microquasars known.

We analyzed more than ten years of GeV gamma-ray data on SS 433. After gating off the nearby, bright pulsar PSR J1907+0602, SS 433 is finally detected in GeV gamma-rays. Detailed scrutiny of the data reveal emission associated with a terminal lobe of one of the jets and with another position in the SS 433 vicinity, co-spatial with a gas enhancement, distant ~35 pc from the central object. The latter is associated to the source via timing to the precessional period of SS 433.

This result challenges obvious interpretations and is unexpected from any previously published theoretical models. It provides us with a chance to unveil the particle transport from SS 433 and to probe the structure of the local magnetic field in its vicinity. Anisotropic diffusion could link the cloud with relativistic protons from the outflow of SS 433, providing a possible picture for a periodic signal in gamma-rays.