MICRO QUASAR WORKSHOP

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Magnetic field topology unveils a discrete jet in the exotic microquasar SS 433

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The ejection of relativistic outflows is the most spectacular consequence of accretion onto compact objects, powered by the interplay of gravity, particles and magnetic fields. The microquasar SS 433, one of the most exotic binary systems in our Galaxy, shows powerful precessing jets. In these outflows, radio synchrotron emission unveils a complex magnetic field topology, seemingly parallel to the bulk velocity of propagation. Although the origin of this field remains unclear, it was suggested that it might be connected with the jet underlying morphology. In this contribution, we study this intriguing connection. By running cutting-edge numerical simulations that include for the first time the evolution of the source magnetic fields, we show that the observed field orientation is explained by the collision of discrete structures that propagate with different velocity on the sub-parsec scale. These prompt interactions also lead to the formation of elongated plasma bullets which are more stable, and thus more propitious to propagate to larger distances. This result represents a robust piece of evidence of the tight connection between the jet morphology and the topology of the magnetic field in the microquasar SS 433, leading to valuable insights into the broader picture of magnetic field evolution and non-thermal processes in relativistic jets.

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