

Multi-wavelength observations of the young binary system Haro 6-10: The case of misaligned discs

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Context. We present a multi-wavelength, high-resolution observational survey of the young binary system Haro 6-10 (GV Tau, IRAS 04263+2426), which is harbouring one of the few known infrared companions. **Aims.** The primary goal of this project is to determine the physical and geometrical properties of the circumstellar and circumbinary material in the Haro 6-10 system. **Methods.** High-resolution optical (HST/WFPC2) and near-infrared (VLT/NACO) images in different bands were analysed to investigate the large-scale structures of the material around the binary. Mid-infrared interferometry (VLTI/MIDI) and spectroscopy (TIMMI2 at the 3.6m ESO telescope) were carried out to determine the structure and optical depth of the circumstellar material around the individual components. **Results.** The multi-wavelength observations suggest that both components of the binary system Haro 6-10 are embedded in a common envelope. The measured extinction indicates a dust composition of the envelope similar to that of the interstellar medium. Each component of the system has a circumstellar disc-like structure typical of young stars. The discs are highly misaligned: the northern component is seen almost edge-on and the southern component is an almost face-on disc. **Conclusions.** The two main formation scenarios of binary systems with misaligned discs are the gravitational capture of a passing object in a dense environment, and the fragmentation of the collapsing molecular cloud. Given the low-density environment of the Taurus-Aurigae star-forming region, the first scenario is unlikely for Haro 6-10. The binary system most probably formed via fragmentation of two different parts of the collapsing molecular cloud combined with other dynamical processes related to the cloud and/or the protostars. This can be the explanation also for other binary systems with an infrared companion.

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