SPACE TRAVEL

Give us a brake

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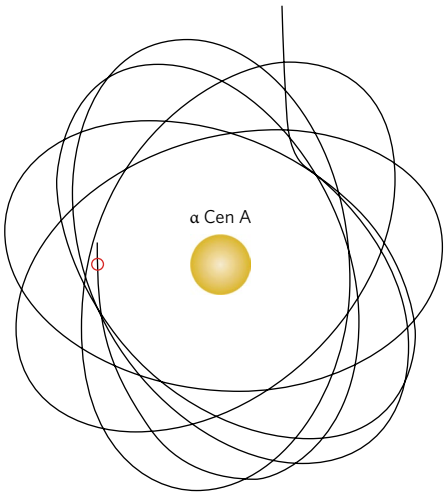

Credit: D. H. Forgan, R. Heller & M. Hippke

Suppose we send a (tiny) light-powered spacecraft to another star system. Moving at 10–20% of light speed would not allow much time to collect data, therefore we need to slow down the probe. Deceleration using the destination star's photons and gravitational field is one way, as well as using the stellar magnetic field. But, en route the light sails can accumulate charge, leading to a deflective Lorentz force normal to the direction of travel. Duncan Forgan, René Heller and Michael Hippke analyse the radiation pressure and the gravitational and Lorentz forces as 'photogravimagnetic assists' of light sails, showing that charge is an important factor in trajectory — with both beneficial and deleterious effects.

Indeed, the authors show that depending on whether the magnetic force is repulsive or attractive, the photogravimagnetic effect could lead to greater acceleration and closer approaches (such as the orbit injection pictured), or erratic trajectories ending in impact or ejection. However, given that charge sources change from negative (our Sun) to positive (interstellar medium) to negative (destination star), the amount and nature of the light sails' charge is difficult to predict and may need regular monitoring. Their study bears particular relevance to the planning and resources of the Breakthrough Starshot project that aims to send "ultra-fast light-driven nanocrafts" to α Centauri, and the nearest exoplanet, Proxima Centauri b.

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