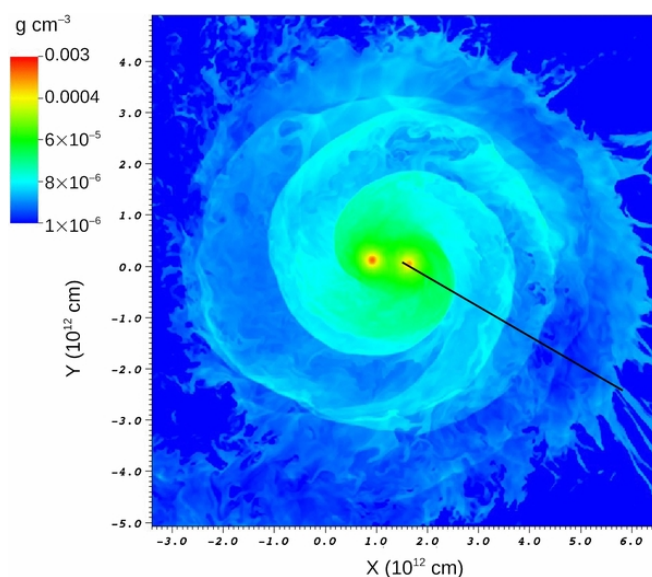


Seminario

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Common Envelope Shaping of Planetary Nebulae

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The morphology of planetary nebulae emerging from the common envelope phase of binary star evolution is investigated. Using initial conditions based on the numerical results of hydrodynamical simulations of the common envelope phase it is found that the shapes and sizes of the resulting nebula are very sensitive to the effective temperature of the remnant core, the mass-loss rate at the onset of the common envelope phase, and the mass ratio of the binary system. These parameters are related to the efficiency of the mass ejection after the spiral-in phase, the stellar evolutionary phase (i.e., RG, AGB or TP-AGB), and the degree of departure from spherical symmetry in the stellar wind mass loss process itself respectively. It is found that the shapes are mostly bipolar in the early phase of evolution, but can quickly transition to elliptical and barrel-type shapes. Solutions for nested lobes are found where the outer lobes are usually bipolar and the inner lobes are elliptical, bipolar or barrel-type, a result due to the flow of the photo-evaporated gas from the equatorial region. It is found that the lobes can be produced without the need for two distinct mass ejection events. In all the computations, the bulk of the mass is concentrated in the orbital or equatorial plane, in the form of a large toroid, which can be either neutral (early phases) or photoionized (late phases), depending of the evolutionary state of the system.