AGB Atmospheres in Binary Environments : A First Step with CO5BOLD

Tomassini Gabriel, *Chiavassa Andrea*

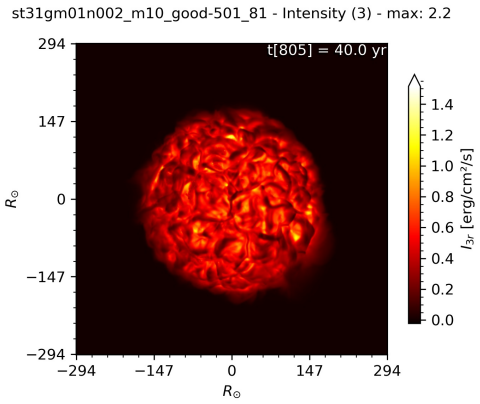
Université Côte d'Azur, Laboratoire Lagrange, Observatoire de la Côte d'Azur

gabriel.tomassini@oca.eu

Asymptotic Giant Branch (AGB) stars are key actors in the chemical enrichment of galaxies through intense mass loss. Understanding the structure and dynamics of their extended atmospheres is essential to constrain this process. Observational evidence from post-AGB systems â including circumbinary disks and asymmetric nebulae â points to a strong influence of binary companions, though mechanisms that remain unclear. Most stars form in binary or multiple systems, and many host planetary companions whose remnants are detected around white dwarfs, raising the question of how such companions affect the AGB phase itself.

To explore this, we use the CO5BOLD [1] code to perform 3D radiative hydrodynamic simulations of AGB stellar convection. This code includes realistic treatments of radiation and convection and has successfully reproduced observed features of single AGB stars. In this study, we introduce a modified gravitational potential that incorporates a second gravitational term and a centrifugal term to simulate the influence of a close companion.

This setup allows us to investigate the impact of binarity on atmospheric structure and dynamics. We expect changes in the morphology â possibly the emergence of tidal features â as well as modifications to pulsation and convective patterns. These simulations provide a step toward understanding how companions, from stars to planets, shape the late stages of stellar evolution.



References

[1] Freytag, B., Steffen, M., Ludwig, H.-G., et al. 2012, Journal of Computational Physics, 231, 3, 919. doi :10.1016/j.jcp.2011.09.026