

## **Abstract SF2A**

### **Hydrodynamical stellar tachoclines in low-mass stars: the effect of the evolution of the differential rotation in their convective envelope.**

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Stellar tachoclines are thin transition regions located between the radiative core and the convective envelope of solar-type stars. As these two regions generally rotate differently and differentially for the convective region, tachoclines are naturally the seat of strong shear and potential turbulence. Therefore, they link the dynamics of both regions and, as such, understanding the dynamics of the transport and mixing inside the tachocline would shed light on how the dynamical processes of the convection zone might affect the secular transport inside the radiative zone.

In particular, we expect the evolution of the differential rotation in the convection zone to affect the dynamics of the tachocline. Indeed, as the star is braked on the MS, the differential rotation in the convection zone evolves from a cylindrical rapidly-rotating regime (columns of varying velocities, aligned with the rotation axis) to a conical solar-like regime (with an equatorial acceleration as in the case of the Sun) and finally a conical anti-solar-like regime (with a polar acceleration) for older or more massive stars.

As of today, stellar evolutionary codes only consider the solar conical regime to study the dynamics of stellar tachocline throughout the evolution of the star. After demonstrating that Mathis & Zahn 2004's formalism is able to treat coherently hydrodynamical stellar tachoclines when taken in the thin layer approximation, we derive the differential rotation, meridional circulation and mixing coefficients inside the tachocline. In particular, we found that a cylindrical regime leads to shallower loops of rotation and meridional circulation inside the tachocline, which limits the spatial extend of the shear. As such, the mixing is reduced compared to the other rotation regimes, suggesting that the shear mixing inside the tachocline increases as the star evolves on the MS. The next step of this work would be to include the effects of magnetism.