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Horizontal shear instabilities in stellar radiative zones[1] JUNHO PARK, VINCENT PRAT, STPHANE MATHIS, CEA Paris-Saclay (DRF/IRFU/DAP) — Shear flows in stratified-rotating fluids have been a popular research topic in astrophysics due to their applications for stellar evolution modeling. In stellar radiative zones, the thermal diffusivity is high with small Prandtl number of order 10ˆ(-6). Also, the horizontal rotation component in latitudinal direction has not been generally considered with the traditional f-plane approximation, but recent research has revealed that it modifies significantly dynamics of inertia-gravity waves in the radiative zones. In this presentation, we revisit the horizontal shear instability problem by considering two components: the thermal diffusivity and the complete Coriolis acceleration rotation (i.e. the non-traditional f-plane approximation). And we study their impacts on hydrodynamic instabilities: inflection-point and inertial instabilities. With numerical and asymptotic stability analyses, we will present new results with mathematical formulations how the thermal diffusivity and horizontal modify these instabilities. For instance, a fast thermal diffusion destabilizes the inertial instability due to the suppression of the stratification effect while the horizontal rotation promotes instabilities and broadens the unstable regime.

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