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Frequency prediction by linear stability analysis around mean flow YACINE BENGANA, LAURETTE TUCKERMAN, Laboratoire de Physique et Mecanique des Milieux Heterogenes (PMMH), CNRS, ESPCI Paris, PSL Research, Sorbonne Universite — The frequency of certain limit cycles resulting from a Hopf bifurcation, such as the von Karman vortex street, can be predicted by linear stability analysis around their mean flows. Barkley (2006) has shown this to yield an eigenvalue whose real part is zero and whose imaginary part matches the nonlinear frequency. This property was named RZIF by Turton et al. (2015); moreover they found that the traveling waves (TW) of thermosolutal convection have the RZIF property. They explained this as a consequence of the fact that the temporal Fourier spectrum is dominated by the mean flow and first harmonic. We could therefore consider that only the first mode is important in the saturation of the mean flow as presented in the Self-Consistent Model (SCM) of Mantic-Lugo et al. (2014). We have implemented a full Newton's method to solve the SCM for thermosolutal convection. We show that while the RZIF property is satisfied far from the threshold, the SCM model reproduces the exact frequency only very close to the threshold. Thus, the nonlinear interaction of only the first mode with itself is insufficiently accurate to estimate the mean flow. Our next step will be to take into account higher harmonics and to apply this analysis to the standing waves, for which RZIF does not hold.

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