Geophysical Research Abstracts
Vol. 20, EGU2018-18088, 2018
EGU General Assembly 2018

Stability of finite amplitude periodic and progressive rotational waves

William Seez, Malek Abid, and Christian Kharif
IRPHE - CNRS, Marseille, France (seez@irphe.univ-mrs.fr)

The stability of two dimensional wave solutions to the Euler equations is a well studied domain. Indeed, in the irrotational setting, infinetissimal two and three-dimensional perturbations are known to give rise to instabilities that are viable candidates for the modeling of extreme ocean phenomena for example.
However, the influence of vorticity on these instabilities is as yet unknown.
Numerical methods are developed both for the evaluation of nonlinear two dimensional steady periodic and progressive waves propagating on arbitrary shear currents and the three dimensional linear stability analysis of these base waves.
The quartet and quintet resonances predicted in the irrotational case are shown to exist in the presence of vorticity. The associated instabilities are enhanced by co-flowing shears.
A novel three-dimensional instability domain linked to vorticity is also detected and shown to generate, under certain conditions, stationary three dimensional bifurcations of the basic two dimensional wave.