

Abstract Submitted  
for the DFD20 Meeting of  
The American Physical Society

**Onset, mixing and saturation of the turbulent Faraday instability**

ANTOINE BRIARD, BENOT-JOSEPH GRA, CEA de Bruyeres-le-Chatel, LOUIS GOSTIAUX, LMFA, Centrale Lyon, MATHILDE CAVELIER, CEA de Bruyeres-le-Chatel — When a system of two miscible fluids in stable configuration is destabilised by a periodic vertical acceleration, a turbulent mixing zone may grow in size as a result of parametric resonances between internal gravity waves. With the growth of this layer, enhanced by turbulent diffusion, the intensity of the mean density gradient decreases, and the natural frequency of the system can no longer be excited, which eventually leads to saturation of the instability. The final size of the mixing zone was predicted to be  $L_{sat} = 2Ag_0(2F + 4)/\omega^2$ , where  $A$  is the Atwood number,  $g_0$  the gravitational acceleration, and  $F$  and  $\omega$  the intensity and pulsation of the periodic forcing. This prediction was well assessed numerically and experimentally for a wide range of parameters. In addition, a whole variety of wavelengths were observed at onset that match a simple inviscid prediction when the instability is initiated from a sharp interface. Additionally, a model was derived to take into account an initial width for the miscible interface, along with viscous effects. A remarkable feature is the observation of a spontaneous change of wavelength that can occur during the instability: this phenomenon can be explained by the linear inhomogeneous theory.

Antoine Briard  
CEA de Bruyeres-le-Chatel

Date submitted: 03 Aug 2020

Electronic form version 1.4