

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

How gravity influences hydrothermal waves in alcohol sessile droplets¹ FLORIAN CARLE, DAVID BRUTIN, Aix Marseille University - IUSTI

— This study, performed under several gravity levels, focuses on the formation and behaviour of hydrothermal waves (HTWs) that spontaneously develop on droplets surfaces when surface tension gradient are strong enough as a response to temperature gradients. HTWs have been found to form concentric torus around the apex rotating in the same direction from hot to cold area creating a shear phenomenon between the two torus where instability develops and get dragged in the flow. This leads to a detachment of the thermal plume, well visible on the top infrared visualisation. HTWs develop in a large number in methanol, half as much in ethanol and at this day, no instability have been experimentally observed in propanol. These behaviours are evidenced with the effective Marangoni number; its high value for the methanol indicates an intense turbulent flow. Gravity levels influence the atmospheric convective transport contribution to the droplets evaporation inducing diffusive evaporation under microgravity conditions and diffusive and convective evaporation under Moon, Mars and Earth gravity level; convection being directly linked to buoyancy. Evaporation dynamics is therefore modified and the temperature gradient between the contact line and the apex can be more or less important.

¹The authors acknowledge the financial support of the “Centre National d’Études Spatiales” and also for the parabolic flights conducted at Bordeaux Merignac, France.

Florian Carle
Aix Marseille University

Date submitted: 26 Jul 2013

Electronic form version 1.4