Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Influence of relative humidity and ambient temperature on hydrothermal waves (HTWs) of organic solvent volatile droplets[1] DANIEL OREJON, YUTAKU KITA, I2CNER, YUYA OKAUCHI, YUKI FUKATANI, MASAMICHI KOHNO, Kyushu University, YASUYUKI TAKATA, I2CNER, KHELLIL SEFIANE, University of Edinburgh, JUNGHO KIM, University of Maryland — Droplets of organic solvents undergoing evaporation have been found to display distinctive hydrothermal patterns or HTWs at the liquid-vapor interface. Since the evaporation of mentioned organic solvents in ambient conditions is ubiquitous, in this work we investigate the effect of ambient temperature and relative humidity on the self-generated HTWs by means of infrared thermography. The intensity of the HTWs was found to decrease when lowering the ambient temperature due to a reduction in droplet evaporative cooling. On other hand, the enhancement or suppression of the HTWs was also possible by controlling the relative humidity of the system. Absorption and/or condensation of water vapor onto the evaporating droplet was found to be the main cause for the differences observed on the HTWs retrieved at the liquid-vapor interface. To account for the water adsorbed or condensed we perform in-situ gas chromatography analysis at different droplet lifetimes. Experimental results showed an increase in the amount of water condensed when increasing the relative humidity of the system as expected. In addition, for the same ambient temperature ethanol evaporation was enhanced by high relative humidity.

[1]The authors acknowledge the support of WPI-I2CNER.

Daniel Orejon
I2CNER

Date submitted: 11 Jul 2016 Electronic form version 1.4