Abstract Submitted for the DFD12 Meeting of The American Physical Society

Capillary forces on elastic solids measured in molecular dynamics JOOST H. WEIJS, Physics of Fluids, University of Twente, Enschede, ANTONIN MARCHAND, BRUNO ANDREOTTI, Laboratoire de Physique et Mécanique des Milieux Hétérogènes, ESPCI, Paris, JACCO H. SNOEIJER, Physics of Fluids, University of Twente, Enschede — The distribution of capillary forces that a liquid drop exerts on a solid substrate is still debated. While the force normal to the interface can be derived from a global argument, this is not the case for the tangential force component. Experiments in which the force is derived from the elastic deformation of the solid are difficult to perform and interpret, and have lead to different conclusions. To resolve this issue, we directly measure the force in Molecular Dynamics simulations of Lennard-Jones droplets in contact with a solid at varying contact angles. We find that the tangential force component is always pointed towards of interior of the drop, and can qualitatively be explained by density functional theory with the sharp kink approximation. This contradicts the classical view the that the capillary force on the solid acts parallel to the liquid interface.

> Joost H. Weijs Physics of Fluids, University of Twente, Enschede

Date submitted: 02 Aug 2012

Electronic form version 1.4