

# Soft interfaces: playing with van der Waals, Coulombic and entropic interactions at the nanoscale

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The symmetry breaking at liquid interfaces gives rise to phenomena or interactions like capillary waves or entropic repulsion between fluctuating membranes, which are strictly surface specific. Liquid interfaces can also be used to reveal phenomena, which are present but hardly visible in the bulk. In any case, the complex interplay between geometry and nanometer range interactions gives rise to subtle effects, which can be revealed by scattering measurements as will be illustrated using a few examples studied at the ESRF. I will first show how non-local van der Waals interactions vastly decrease the effective surface tension of liquids at the nanometer scale. In a second example, I will discuss how short-range, solvent-mediated couplings determine the interfacial distribution of ions more effectively than pure Coulombic interactions, with tremendous impact in life, environmental or atmospheric sciences. Finally, I will show how the soft entropic repulsion potential between lipid membranes could be determined by combining specular and off-specular reflectivity.