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Phase Separation of Water/Glycerol Binary Mixtures Next to Lipid Monolayers – An X-ray and Neutron Reflectivity Study[1] LUKA POCIVAVSEK, BRIAN LEAHY, MATI MERON, BINHUA LIN, The University of Chicago, JAREK MAJEWSKI, LANL, KA YEE LEE, The University of Chicago — We recently developed a general model for studying instabilities like wrinkling and folding in interfacial membranes on fluid substrates. The dominant length scales describing the instability are set by the elastic response of the membrane (primarily bending) and the "stiffness" of the substrate. These length scales, like the wrinkle wavelength and fold amplitude, are independent of the particular interfacial molecular interactions for micron thick membranes where typical system energies like the membrane bending stiffness are thousands of times larger than intermolecular potentials. However, as the membranes become thinner and thinner and eventually approach molecular membranes only a couple of nanometers thin, the chemical interactions between the membrane and the fluid substrate strongly influence the wrinkling and folding length scales. We present data for two such systems (a lipid monolayer and a gold nanoparticle layer) on different hydrogen bonding fluids and discuss possible mechanisms and modifications of our wrinkle-to-fold scaling laws to account for this new degree of freedom.

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