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Capillary waves with surface viscosity¹ LI SHEN, FABIAN DENNER, Imperial College London, NEAL MORGAN, Shell Global Solutions (UK) Ltd., BEREND VAN WACHEM, DANIELE DINI, Imperial College London — Experiments over the last 50 years have suggested a correlation between the surface (shear) viscosity and the stability of a foam or emulsion. With recent techniques allowing more accurate measurements of the elusive surface viscosity, we examine this link theoretically using small-amplitude capillary waves in the presence of the Marangoni effect and surface viscosity modelled via the Boussinesq-Scriven model. The surface viscosity effect is found to contribute a damping effect on the amplitude of the capillary wave with subtle differences to the effect of the convective-diffusive Marangoni transport. The general wave dispersion is augmented to take into account the Marangoni and surface viscosity effects, and a first-order correction to the critical damping wavelength is derived.

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