Dynamics of Circular Contact Lines: Spin Coating under Marangoni forces.[1] SHOMEEK MUKHOPADHYAY, ROBERT BEHRINGER, Physics Department, Duke University — Spin Coating remains one of the most important industrial applications of fluid dynamics, where understanding and controlling the instabilities is very important. The basic configuration consists of a fluid drop that is initially centrally located on a flat horizontal rotating surface. In this work we report on experiments on thin liquid films and fingering instabilities of a liquid drop, over a large range of angular speeds (from 10 mHz to 10Hz) of completely wetting PDMS oils on oxidized silicon wafers. Using a novel experimental setup, we will look at the effect of applying a radial temperature gradient (as opposed to a vertical gradient) on the dynamics of both the drop and the thin liquid film. In this case, the Marangoni forces oppose the centrifugal body forces. Depending on the relative strength of the driving force (angular speeds of 1 to 10 Hz and temparature gradients of 10 K/cm) and the drop size (volume of the drop varies from 1 microlitre to 100 microlitre) nontrivial wave structures and patterns arise. These results will be analyzed in the framework of the lubrication approximation.

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