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Stability Of Oscillatory Rotating-Disk Boundary Layers SCOTT MORGAN, CHRISTOPHER DAVIES, Cardiff University — The rotating disk boundary layer has long been considered as an archetypal model for studying the stability of three-dimensional boundary-layer flows. It is one of the few truly three-dimensional configurations for which there is an exact similarity solution of the Navier-Stokes equations. Due to a crossflow inflexion point instability, the investigation of strategies for controlling the behaviour of disturbances that develop in the rotating disk flow may prove to be helpful for the identification and assessment of aerodynamical technologies that have the potential to maintain laminar flow over swept wings. We will consider the changes in the stability behaviour which arise when the base-flow is altered by imposing a periodic modulation in the rotation rate of the disk surface. Following similar work by Thomas et. al. [Proc. R. Soc. A (2011) 467, 2643-2662], preliminary results indicate that this modification can lead to significant stabilising effects. Current work encompasses linearised DNS, complemented by a local in time analysis made possible by imposing an artificial frozen flow approximation. This is deployed together with a more exact global treatment based upon Floquet theory, which avoids the need for any simplification of the temporal dependency of the base-flow.

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