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Ice shelf rifts and broad scale viscous ice shelf flow.

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The seaward margins of Antarctica's fringe of ice shelves display a variety of rifts which apparently cleave the shelves from top to base. Such rifts are common once the ice shelves advance beyond lateral restraints of headlands or islands. There are sometimes indications that the locations where rifts occur may depend on the presence of spatial heterogeneities in the ice shelf and the deformation history of the ice.

Spectacular examples of ice shelf disintegration in recent years have renewed interest in ice shelf fracture and ice berg calving - observation of rift initiation and propagation and the extension of the viscous fluid ice flow paradigm to include such material failures are growing fields.

Understanding the influence of through-cutting rifts on the broad scale deformational flow of the ice shelf is a useful preliminary to these activities and, setting aside questions of rift origin and growth, it seems worthwhile to explore the circumstances of large scale flow that might favour rifting, the response of broad scale flow to the presence of a rift, and the subsequent motion of the rift.

We present results, computed with a depth-integrated model of ice shelf flow, for idealised ice shelf geometries, and for real rifts in the Amery Ice Shelf, East Antarctica. For the Amery Ice Shelf, we compare our modelling with observations, with particular focus on the possible influence of the material properties of the apparently substantial body of ice ("mélange") observed to occupy the rifts.