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Numerical modelling and data assimilation of the Larsen B ice shelf

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Using a combination of flow modelling and data assimilation, the stress field and fracturing of pre-collapse Larsen B ice shelf is investigated. A two-dimensional vertically integrated shelf-flow model is used with a data assimilation technique based on Lagrangian-multipliers to determine ice rheology and stress regime that are consistent with observed velocity fields from satellite interferometry (ERS-1/2). In particular, we optimize simultaneously the spatial distributions of ice rheology (Glen's A) and the velocities at the inland shelf boundary given the ice shelf's observed geometry. For Larsen B, the inversion procedure identifies the main features of rheological weakening within the shelf including shear margins or fracture zones. Based on the inverted rheology and by applying simple fracture mechanics, we investigate the effect of the 1990's thinning of Larsen B on its stability.