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Modelling tidal modulations in flow of the entire Filchner-Ronne Ice Shelf and adjoining ice streams

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Ocean tides are known to affect the flow of ice shelves and ice streams, even far upstream of their grounding lines. In many places around the Weddel Sea, which is characterised by strong semidiurnal tides, this flow modulation is strongest at a fortnightly period that is absent in the tidal forcing. Explaining the distances that these signals can penetrate and the change in frequency from their tidal origins can provide unique insights into ice rheology and subglacial processes. We present results from a new 3D full-Stokes viscoelastic model of the entire Filchner-Ronne Ice Shelf and its major adjoining ice streams. We employ an inverse Robin approach to invert for basal slipperiness beneath grounded ice. By modelling the entire ice shelf we can include, for the first time, the complete rotating tidal system in a unified way that will implicitly include phase behaviour such as tidal tilting. This model enables us to test whether our current understanding of tidal modulation of ice flow is sufficient to reproduce the complex spatial variations that we observe with an extensive array of both old and new GPS data.