Variability in the mass flux of the Ross Sea ice streams, Antarctica, over the last millennium

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Various field and model data are synthesized to obtain a ~1000 year ice flow history for the Ross Sea ice stream system in West Antarctica to address the magnitude and timing of changes in mass flux for this region. The observed history shows a dominance of short-term (decade- to century-scale) variability in ice stream shear margins and the grounding line position due to internal variability of the coupled system. Our observations highlight the interplay between adjacent ice streams, which suggests that the behavior of any individual ice stream cannot be examined in isolation. In addition, individual events cannot be well understood without a more long-term and spatially extensive survey of ice sheet changes. In the context of this millennium-scale history, the relatively recent stagnation of Kamb Ice Stream is seen as just one stage in the thermodynamic cycles of ice streams in this region. The changes in mass balance that result from the KIS stagnation may thus be viewed as century-scale "noise" relative to the longer-term trend. Understanding and characterizing this is a necessary step before model-based predictions of ice sheet mass balance for the next century can be made.