EGU2020-15996
https://doi.org/10.5194/egusphere-egu2020-15996
EGU General Assembly 2020


# Increased ice flow in the Getz region of West Antarctica, from 1994 to 2018

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The Getz region is a marine-terminating sector of West Antarctica, characterised by a ~650 km long ice shelf that buttresses the inland ice sheet. The majority of the Getz drainage basin is grounded well below sea level, and while the ice shelf has thinned, its calving front has remained relatively stable since the early ’90s. Satellite observations have shown strong thinning of both the ice sheet and ice shelf over the past 25-years, and mass balance studies have shown that the sector is negatively imbalanced (−16.4 ± 4.0 Gt/year). In this study, we use satellite data to measure ice speed in the Getz region, over a 25-year period from 1994 to 2019. We use Synthetic Aperture Radar (SAR) data from historical missions including ERS-1, 2 and ALOS PALSAR, in combination with newer data from the Sentinel-1a & b satellite constellation, to generate annual velocity maps. The Sentinel-1 data extend the historical velocity record and provides a new high temporal resolution record, 6-day averaged solutions, of velocity change since 2017. We used satellite observations in combination with the BISICLES ice sheet model to fill gaps in the observational record, and to measure ice discharge and from the region. We find there are 14 distinct flow units that drain the Getz coastline, with average speeds ranging from 153 ± 7 to 1053 ± 194 m/yr around the grounding line. Our results show that all of these flow units have sped up during the study period, since 1994. At the grounding line, we measure an average speed increase of ~5 $m/yr^2$, with some flow units accelerating by over 11 $m/yr^2$. We find that the spatial pattern of change in ice speed is consistent with the regions of strongest surface lowering, which on some flow units occurs at rates of up to -2.4 m/yr. Our observations show that ice speedup is greatest where the ice is thickest (>700 m), and grounded most deeply. This long 25-year record of change also shows that on some ice streams, the rate of change in ice speed has not been constant throughout the study period. In some regions where ocean temperature measurements are also available, we find that increases in ice speed coincide with the periodic presence of circumpolar deep water, which may therefore be responsible for driving this change. In summary, this study provides a new record of change in ice speed for a rapidly evolving region of Antarctica. In the future, it will be

important to use both ocean models and observations to improve our understanding of how ocean forcing is driving dynamic imbalance in the region. This will improve our understanding of the physical mechanisms driving change in Antarctica, helping us to better constrain the ice sheets future contribution to global sea level rise.