

EGU23-11256, updated on 06 Jun 2023
<https://doi.org/10.5194/egusphere-egu23-11256>
EGU General Assembly 2023
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Mass balance of the northern Antarctic Peninsula Ice Sheet

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Some of the highest specific mass change rates in Antarctica are reported for the Antarctic Peninsula. However, the existing estimates for the northern Antarctic Peninsula (<70°S) are either spatially limited or are affected by considerable uncertainties. Within this study, the first assessment of the geodetic mass balance throughout the ice sheet of the northern Antarctic Peninsula is carried out employing bi-static SAR data from the TanDEM-X satellite mission. Repeat coverages from austral-winters 2013 and 2017 are employed. An overall coverage of 96.4% of the study area by surface elevation change measurements is revealed. The spatial distribution of the surface elevation and mass changes points out, that the former ice shelf tributary glaciers of the Prince-Gustav-Channel, Larsen-A&B, and Wordie ice shelves are the hotpots of ice loss in the study area, and highlights the long-lasting dynamic glacier adjustments after the ice shelf break-up events. The highest mass change rate is revealed for the Airy-Seller-Fleming glacier system and the highest average surface elevation change rate is observed at Drygalski Glacier. The comparison of the ice mass budget with anomalies in the climatic mass balance indicates, that for wide parts of the southern section of the study area the mass changes can be partly attributed to changes in the climatic mass balance. The previously reported connection between mid-ocean warming along the southern section of the west coast and increased frontal glacier recession does not repeat in the pattern of the observed glacier mass losses, excluding Wordie Bay.