

Long-term Mass Balance of the Pacific Ocean Sector of Antarctica Based on Multisensor Fusion

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It is well documented that many Antarctic ice streams and outlet glaciers have changed dramatically during the last two decades. In order to understand the significance of these short-term changes it is desirable to extend the time line as far back as possible, by including historical aerial photographs in the analysis. This has rarely been done, however, mainly because of the lack of ground control points that are required to orient old photography. Our poster presents results on computing long-term changes of outlet glaciers draining to Amundsen Sea from a series of historical aerial photographs, ASTER images and satellite laser altimetry profiles acquired by NASA's Ice, Cloud and land Elevation Satellite (ICESat) mission.

To determine changes all data must be registered in the same reference frame. We achieve this by using elevation profiles, derived from ICESat data, as control features. An example of control features are break lines and they can be extracted from neighboring ICESat profiles as well as from aerial photos. This enables us to precisely register the aerial photographs with respect to the ICESat reference system—an absolute prerequisite for tracking features and determining surface elevation changes.

Another important aspect is to compare elevation profiles acquired by ICESat during different mission phases. Since repeat ICESat satellite ground tracks are not exactly overlapping, elevations must be interpolated at identical points. Our approach is based on the assumption that the surface of the ice sheet can be approximated by analytical functions. This allows us to derive changes by computing the coefficients of the surface models from point data sets representing different time epochs.