

# **Fusion of LIDAR data for Change Detection in Polar Ice Sheets**

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This paper is concerned with fusing laser point clouds obtained at different time periods, including point clouds obtained from different systems, such as airborne laser scanning systems and satellite laser altimetry systems. Although laser point clouds are usually recorded in the WGS84 reference frame, points from different epochs or laser systems are at different positions of the reflecting surface. Therefore comparisons of the surfaces have to be performed on features rather than point. The paper introduces the notion of feature extraction from the original laser point cloud and the perceptual organization of the extracted features, including planar surface patches with their boundaries and roughness. The second part is concerned with matching planar surface patches extracted from two different data sets. This permits a quality control and offers the possibility of refining the registration of the data sets. Wherever disagreements persist, a hypothesis is generated for a change in the surface that may have happened during the time between the two data sets. This approach is particularly suited for change detection studies of the polar ice sheets. The paper includes examples of airborne and satellite laser systems in the Antarctica.