Glacier dynamics and elevation change of Columbia Glacier, Alaska, using TanDEM-X data

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Columbia glacier is a tidewater glacier located on the south coast of Alaska, USA. It has shown dramatic retreat and calving of icebergs from its terminus since the early 1980s. We exploit four set of TanDEM-X data of Columbia glacier acquired during ascending pass (02.03.2012, 13.03.2012) and during descending pass (08.03.2012, 19.03.2012) of the satellite constellation. All sets of data are independently processed to generate four digital elevation models (DEMs). The product is further integrated with the existing, comprehensive database of Columbia Glacier in order to identify elevation changes over time. In addition, intensity images of the dataset are used to estimate the displacement offsets in range and azimuth direction, separately in ascending and descending combinations. The findings reveal that the 2D surface velocities at the calving front of western tributary reach up to ~ 13-17 m day-1 whereas at the eastern tributary, it comes out be ~ 5.5-7.5 m day-1. The offsets determined in slant range geometry are further mathematically processed, based on the least square estimation, to quantify the 3D velocity of the glacier.