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Volume changes 2000 – 2011/2012 of glaciers in the Patagonia Icefields from TanDEM-X and SRTM data

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The behavior of the Patagonia Icefields, the largest temperate ice masses in the Southern Hemisphere, has been subject of several studies due to its importance for understanding the global climate system. Recent global low resolution mass estimates for glaciers and ice caps show significant mass deficit for many ice covered regions over the world including the Patagonia Icefields. High resolution elevation data obtained from the TanDEM-X mission since 2011 allow a more detailed analysis over these areas. One decade earlier the Shuttle Radar Topography Mission (SRTM) of 2000 acquired a similar interferometric dataset which provided the most complete and accurate SAR DEM at the time covering the entire land areas from 56°S to 60°N. We processed experimental CoSSC (Co-registered Single-look Slant range Complex) bistatic TanDEM-X products to Raw-DEMs by using of the Integrated TanDEM-X Processor (ITP) with full control over the whole processing chain and byproducts. Furthermore, due to the difficult topography of this region, layover, shadowing and consequently phase unwrapping problems might affect significant areas in the CoSSC scene where the surface elevation is not reliable. By using repeat pass TanDEM-X acquisitions with different baselines to perform dual baseline phase unwrapping these surfaces are considerably reduced. The obtained DEMs were merged into one mosaic of the Southern Patagonia Icefield (SPI) area and a smaller one covering Gran Campo Nevado (GCN), two of the four major ice masses in the southernmost South America. We are using SRTM and the TanDEM-X multitemporal elevation dataset to compute mass changes of SPI and GCN in the period 2000 – 2011/2012 through the geodetic method. Change rates of ice elevation, dh/dt , are integrated over surfaces corresponding to altitude bins to obtain volume change rates which are consequently converted to mass change rates. In order to achieve a better calibration between different DEMs and to analyze intermediate temporal trends of topography we included in our study several ICESat Geoscience Laser Altimeter System (GLAS) surface height tracks available from 2003 until 2009. Distinct trends in surface elevation change over the last decade are exhibited by this comparison. The surface lowering of major Patagonia glaciers ranges from several tens of meters to values above 100 m at some termini. Exceptions are Perito Moreno glacier with constant elevation in the accumulation and ablation areas and the tidewater glacier Pio XI showing slight thickening.