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Ice Mass Changes in the Russian High Arctic from Repeat High Resolution Topography.

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We use a combination of ASTER and cartographically derived Digital Elevation Models (DEMs) supplemented with WorldView DEMs, the ArcticDEM and ICESat lidar returns to produce a time-series of ice changes occurring in the Russian High Arctic between the mid-20th century and the present. Glaciers on the western, Barents Sea coast of Novaya Zemlya are in a state of general retreat and thinning, while those on the eastern, Kara Sea coast are retreating at a slower rate. Franz Josef Land has a complicated pattern of thinning and thickening, although almost all the thinning is associated with rapid outlet glaciers feeding ice shelves. Severnaya Zemlya is also thinning in a complicated manner. A very rapid surging glacier is transferring mass into the ocean from the western periphery of the Vavilov Ice Cap on October Revolution Island, while glaciers feeding the former Matusevich Ice Shelf continue to thin at rates that are faster than those observed during the operational period of ICESat, between 2003 and 2009. Passive microwave studies indicate the total number of melt days is increasing in the Russian Arctic, although much of the melt may refreeze within the firn. It is likely that ice dynamic changes will drive mass loss for the immediate future. The sub-marine basins beneath several of the ice caps in the region suggest the possibility that mass loss rates may accelerate in the future.