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State of the Alaskan cryosphere - glaciers

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As we approach the end of the first decade of the 21st century, much of Alaska's cryosphere is undergoing dramatic change. Sea ice is forming later, melting earlier, and covering a smaller area of the Arctic Basin. Permafrost is warming, resulting in a disruption of infrastructure at lower elevations and an increase in slope instability and mass wasting, including glacier ice-falls, rock-falls, and rock avalanches at higher elevations. The vast majority of Alaska's large glaciers are currently thinning and/or retreating.

Alaska's climate is changing. First order weather station temperature data show that air temperatures throughout Alaska have increased for decades. Since the mid-20th century, the average increase is about 2.0 degrees C. At most locations, precipitation has also increased. In order to determine how Alaskan glaciers are responding to regional climate change, a comprehensive analysis is being conducted. Initially, it was part of the U.S. Geological Survey's 'Satellite Image Atlas of Glaciers of the World' assessment. Now, the scope of the assessment has been expanded to document the current behavior of hundreds of glaciers located in the eleven Alaskan mountain ranges and three island areas that have glaciers. Data being analyzed come from many sources and include maps, historical observations, ground-and-aerial photography, airborne and satellite radar data, Shuttle and satellite photography, satellite spectral imagery, ICESat data, airborne geophysical data, and vegetation proxy data. Each glacier is covered by a different mix of data types.

In most areas, every glacier that descends below an elevation of approximately 1,500 meters is currently thinning and/or retreating. Many glaciers have an uninterrupted history of continuous post-Little-Ice-Age retreat that spans more than 250 years. Other

glaciers are characterized by multiple late-19th to early-21st century fluctuations. Today, more than 99 persent of the glaciers examined are thinning and/or retreating. However, in the Coast Mountains, St. Elias Mountains, Chugach Mountains, and the Aleutian Range a small number of glaciers are currently advancing and thickening. Many advancing glaciers are, or were formerly tidewater glaciers. Some have been lengthening and thickening for more than two centuries. This presentation documents the current state of the glacier component of the Alaskan cryosphere.