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Here we present the first outcomes of ETHZ's Sun2Ice project, which aims to use a state-of-the-art, highly-optimized, solar-powered Unmanned Aerial Vehicle (UAV), AtlantikSolar, for long-range, and multi-day monitoring of calving glaciers in the Arctic. The „midnight sun" in polar summer time offers unique conditions for solar-powered flights, including potentially energetically perpetual flight, consequently enabling frequent, high-resolution and large-scale glacier surveys. In Sun2Ice, this cutting-edge technology is dedicated to the monitoring of iceberg calving, a still poorly understood process which plays a major role in the observed retreat of many ocean-terminating glaciers. The main achievement of Sun2Ice's 2017 fieldwork was the undertaking of the first-ever autonomous, solar-powered flights of a UAV in a polar region, including a flight of more than 12 hours duration, and the survey of the calving front of Bowdoin Glacier, Northwest Greenland. This monitoring revealed the opening of a major crack, which led to a major calving event one week later. This presentation will focus on the technical challenges, the glaciological outcomes, and the potential of using such a technology for monitoring the Cryosphere with a spatial and temporal resolution not achievable by satellite remote sensing.