# POPULAR SCIENTIFIC SUMMARY

**DOCTORAL CANDIDATE:** Kimberly Ann Casey

**DEGREE:** Philosophiae Doctor

**FACULTY:** Faculty of Mathematics and Natural Sciences

**DEPARTMENT:** Department of Geosciences

**SUPERVISOR(S):** Andreas Kääb, Oddvar Røyset

**DISPUTATION TITLE**

**DISSERTATION TITLE:** Supraglacial dust and debris characterization via in situ and optical remote sensing methods

**POPULAR SCIENTIFIC SUMMARY:**


**Location:** University of Oslo, Department of Geosciences

**Topic:** Study of glacier dust and debris via satellite and field collected data.

**Methods:** Multi- and hyperspectral remote sensing, inorganic geochemical measurements.

**Conclusions:** Satellite techniques were developed to describe glacier surface dust and debris geochemical composition.


Earth's glaciers, ice caps and ice sheets have melted considerably in recent decades. This unprecedented ice melt rate is a key indication of global climate change. A large factor influencing the widespread ice melt is dust, volcanic ash, soot and other particulate deposition on cryospheric surfaces. Satellite Earth observations can be used to monitor glaciers. Yet, to date, particulates on glacier surfaces had not been extensively studied via satellite, and thus melt estimations and debris covered ice identification remained poorly defined by spaceborne glacier measurements.

This dissertation developed satellite data methods to detect and characterize glacier surface dust and debris composition. Visible to thermal infrared multi- and hyperspectral satellite data as well as field work collecting spectral and physical sample data were used to describe surface compositions of glaciers and ice caps in six regions: (1) Iceland, (2) Svalbard, (3) southern Norway, (4) Switzerland, (5) New Zealand and (6) the Khumbu Himalayas, Nepal. Satellite estimates of glacier surface geochemical composition and variability were analyzed at these six diverse global glacier study regions. The glacier dust and debris satellite methods developed allow for an abundance of data to be used on large spatial and temporal scales in improving cryospheric particulate understanding. Improvement to satellite glacier measurements will lead to more accurate glacier and climate models, and a reduction in uncertainties related to global climate change, ice mass loss and sea level rise estimates.