The surface of Saturn's moon Titan is less than 1 billion years old, with mechanisms ranging from ice volcanism to widespread erosion invoked to explain its resurfacing. An analysis of Cassini radar imagery, however, indicates little surface modification by fluvial erosion in some regions.

Because topographic data on Titan are currently limited, Benjamin Black at the Massachusetts Institute of Technology and colleagues devised a method to estimate erosional modification of a surface by quantifying the shapes of drainage networks. They calibrated the method with a numerical landscape evolution model, and then validated their approach by comparisons with terrestrial fluvial networks. They calibrated the method by quantifying the shapes of drainage networks on Titan, they estimate that regionally averaged fluvial erosion in these regions reflects only 0.5–9% of the initial topographic relief.

Assuming surface ages from crater counts, this implies that long-term rates of fluvial erosion are much slower than on Earth. Unless some regions on Titan have been resurfaced more recently than the global average, other mechanisms are required to explain Titan's resurfacing.

Microbial communities reside on the surface of the ice sheet that covers most of Greenland, but the contribution of these communities to regional biogeochemical cycling is unclear. Measurements of nitrogen chemistry in natural surface holes indicate that microbes at the edge of the ice sheet fix nitrogen — they capture atmospheric nitrogen and convert it into a form that can be readily used by other organisms.

In the summer of 2010, Jon Telling of the University of Bristol and colleagues examined nitrogen dynamics in a series of small holes in the surface of the Greenland ice sheet along a 79-km-long transect, running from the terminus of the Leverett Glacier into the ice sheet interior. They identified acetylene reduction, a measure of nitrogen fixation, in debris-rich ice sampled from the glacier terminus, as well as in sediment and water collected from the edge of the ice sheet. The capacity for nitrogen fixation disappeared, however, around 7.5 km from the ice sheet's edge.

Nitrogen fixation by microbes could provide a source of bioavailable nitrogen to the periphery of the Greenland Ice Sheet, potentially aiding the colonization of ice sheet sediments by other microorganisms and plants.

Written by Anna Armstrong, Tamara Goldin, Alicia Newton and Amy Whitchurch