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Oceanography

SIDEBAR | The Best Laid Schemes: A Nares Strait Adventure

By Humfrey Melling

But, Mousie, thou art no thy lane
In proving foresight may be vain:
The best laid schemes o' mice an' men
Gang aft a-gley,
An' lea'e us nought but grief an' pain,
For promised joy.
—Robert Burns, 1786

In 2002, oceanographers began a study of Arctic freshwater export via Nares Strait (Münchow et al., 2006). This 550 km channel separating Greenland from Canada is possibly the longest narrow waterway on Earth. Surrounding ice-capped terrain rises above 2000 m. We used the US icebreaker *Healy* to install recording instruments on submerged moorings in summer in 2003, but planned their recovery in 2005 via an ice camp in spring, because the dangerous fast moving pack ice of summer makes ship-based recoveries difficult.

In 2005, our base was to be a camp on Greenland, and our local transportation a helicopter. Although weather was an important factor in planning, there was apparently little information to appraise. Nares Strait, on the main route for the polar quest a century ago, has since attracted little scientific interest. Its remoteness, rugged landscape, and sea ice are forbidding to travelers. Our plans were guided by a compilation of weather reports from field camps, 1974–1990 (Atkinson et al., 2000), and by weather simulations from a mesoscale forecast model (Samelson and Barbour, 2008). We concluded that wind might cause occasional discomfort and inconvenience, but not peril.

Scientists arrived at the field camp on Lafayette Bay (see Figure 1) on April 12, 2005, after supplies had been flown in from Alert and shelters erected—five sleeping tents, one large storage tent. Three more large tents and a helicopter would complete our infrastructure. Conditions were calm and cold.

Figure 1 (left). Nares Strait from the Aqua/MODIS satellite showing Lafayette Bay. Convergent air flow, delineated by low cloud in the Lincoln Sea, sustained strong wind in the strait at this time, August 12, 2005. *Image courtesy of NASA/GSFC, Rapid Response*

Figure 2 (above). Sleeping tent at Lafayette Bay destroyed by wind April 13–14, 2005.

We were woken early on April 13 by intense wind bursts in general conditions of calm. The bursts progressively became longer and stronger. By afternoon, gusts topping 25 m s^{-1} flattened the storage tent and one sleeping tent (Figure 2), scattering equipment hundreds of meters downwind. Mustered into one tent, we secured it by adding our body weight via ropes tied to the frame; two other unsecured tents collapsed. The wind strengthened until late evening—gusts over 30 m s^{-1}—and did not drop below 20 m s^{-1} until the following morning. An experienced pilot brought

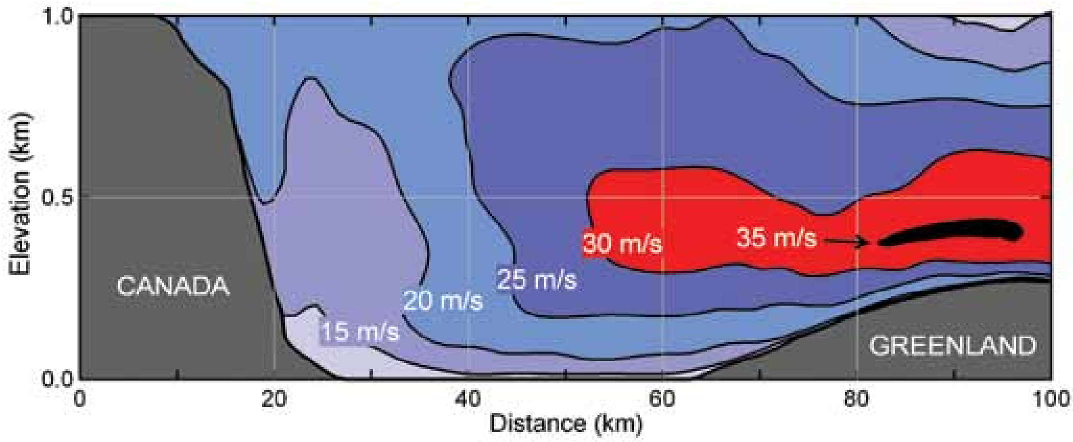

Figure 3: Section of modeled wind speed in Kennedy Channel, April 13, 2005. *Data courtesy of Roger Samelson*

in a Twin Otter to evacuate personnel late in the evening—science back to square one!

Two heavily weighted tents survived this event, but crumpled during another on April 29. Numerical modeling has shown such gales to be ageostrophic, driven by air-pressure difference along the strait (Samelson and Barbour, 2008). On April 13, the along-strait pressure drop was 16 mb; the value (Alert minus Thule) can be twice as large at times! The fastest airflow occurs in a thin jet only 300 m above ground (Figure 3).

Subsequent research has unearthed systematic measurements of weather in Nares Strait, during expeditions in 1871–1873 (Hall) and 1881–1883 (Greely). The first, from ice-trapped *Polaris* at an exposed location in Hall Basin, are most relevant. During the 1871–1872 winter, wind exceeded 20 m s^{-1} twice weekly; the maximum hourly average was 35 m s^{-1} (Bessels, 1876). Davis (1876) writes: "A furious gale on November 21, 1871, tore the *Polaris* free from the ice, but fortunately the ship became lodged on a large floe nearby…" Wind speed at this time was not recorded, for obvious reasons.

Our windstorm created a time of toil after its night of fright. Damaged camp and scientific equipment, dispersed far downwind, had to be gathered, staged, and flown to Alert. Two hundred twelve fuel drums with parachutes, dropped the evening before the storm, had to be dug from wind-packed snow, separated, loaded and flown out, six at a time by Twin Otter. Eleven tons of steel for mooring anchors, too heavy to fly out, had to be cached on land for retrieval by sea a year later. This work kept two aircraft and a ground team busy at Lafayette Bay every day with suitable weather from April 22, when logistics were in place, until May 15.

It is humbling that we could have known the risk, had we had the prudence to look far into the past for insight.

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