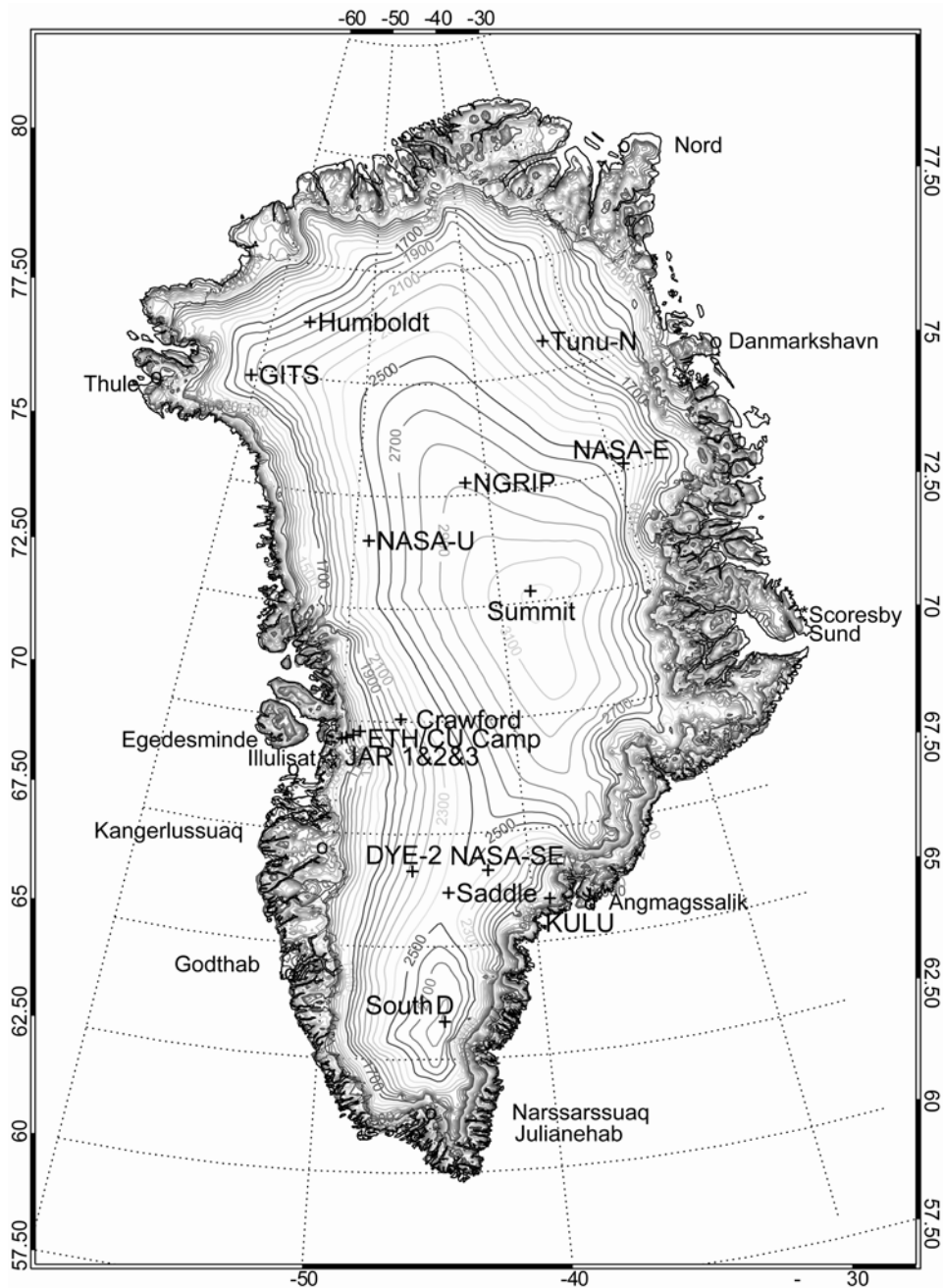
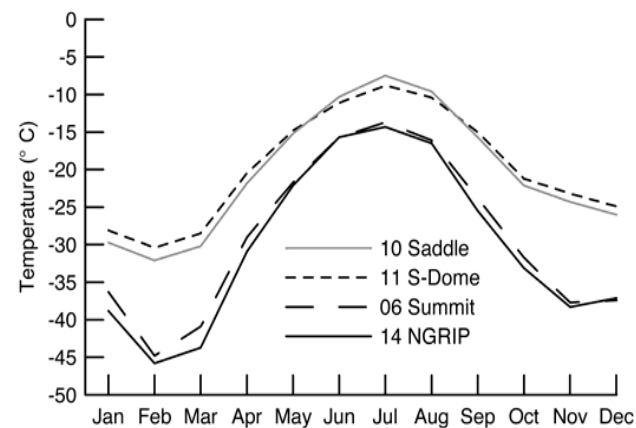
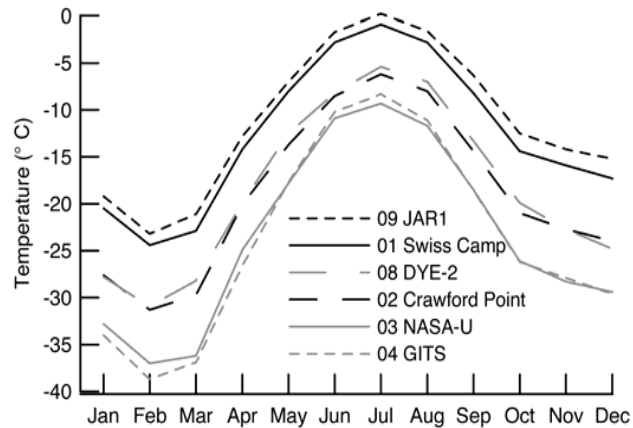
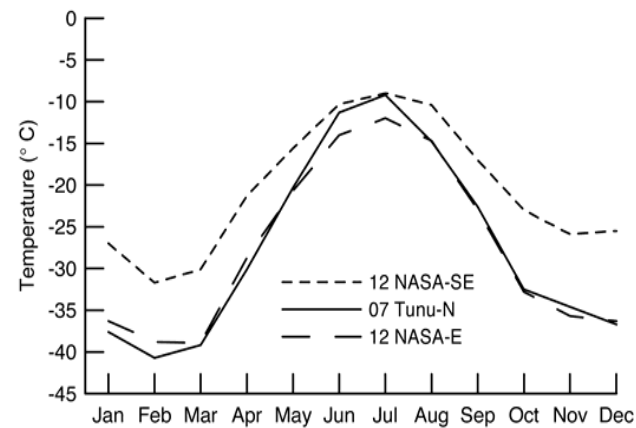
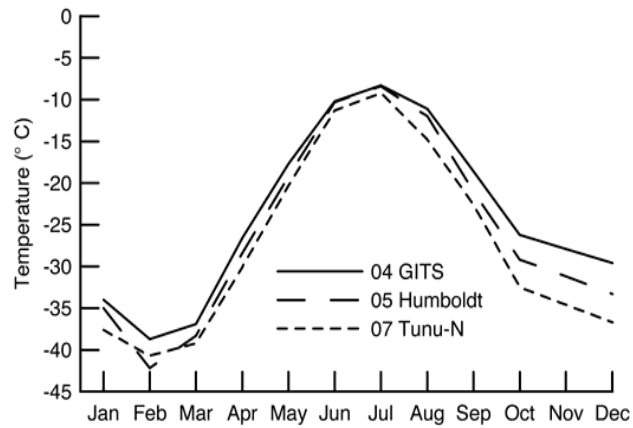


Climate regimes of the Arctic

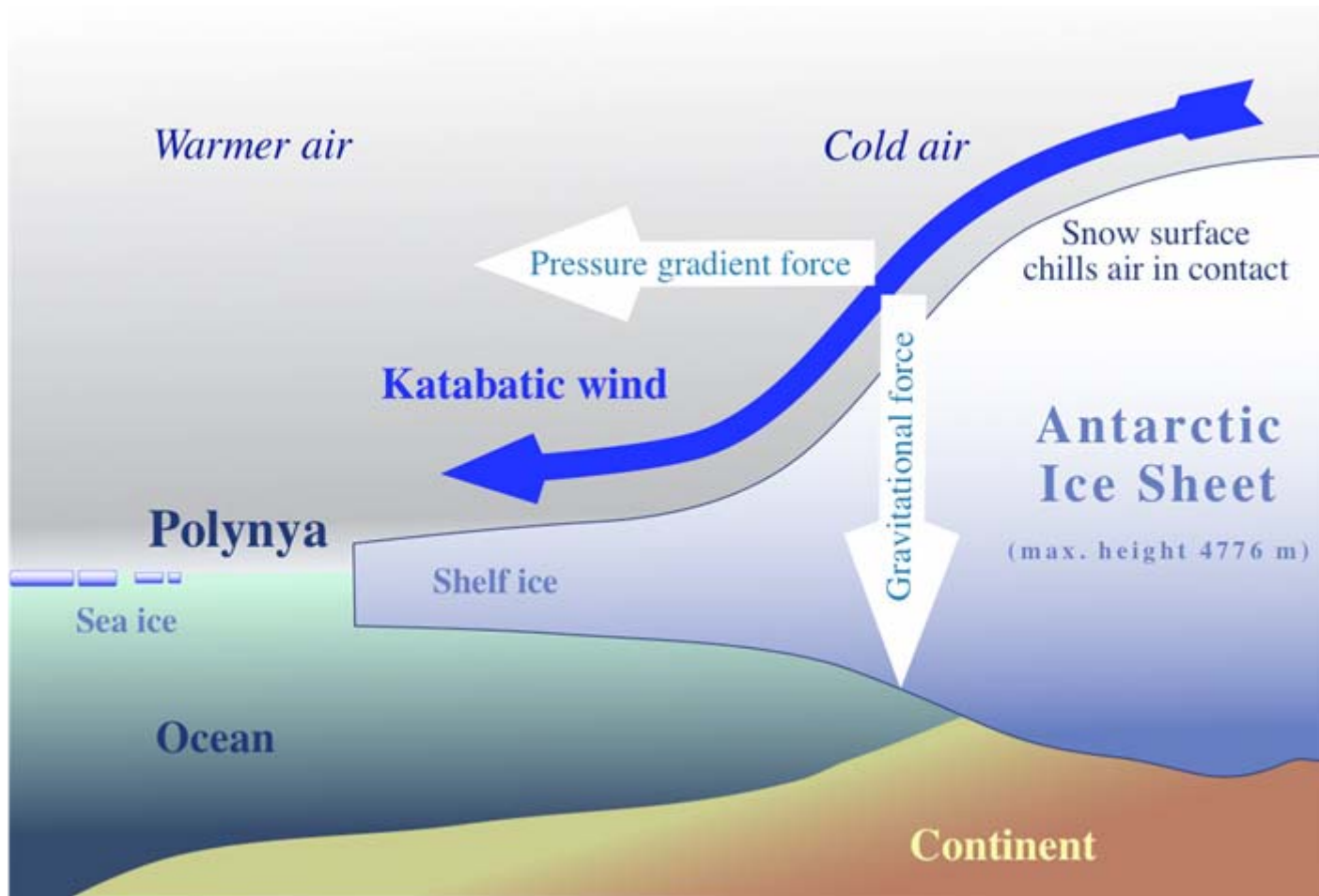
The climate of Greenland



Map of Greenland, showing elevation and the location of GC-Net automatic weather stations (+), expedition stations (x), and coastal settlements (o) [from Steffen and Box, 2001, by permission of AGU]. There are two elevation maxima, at Summit (3208 m) and near South D, about 2800 m.



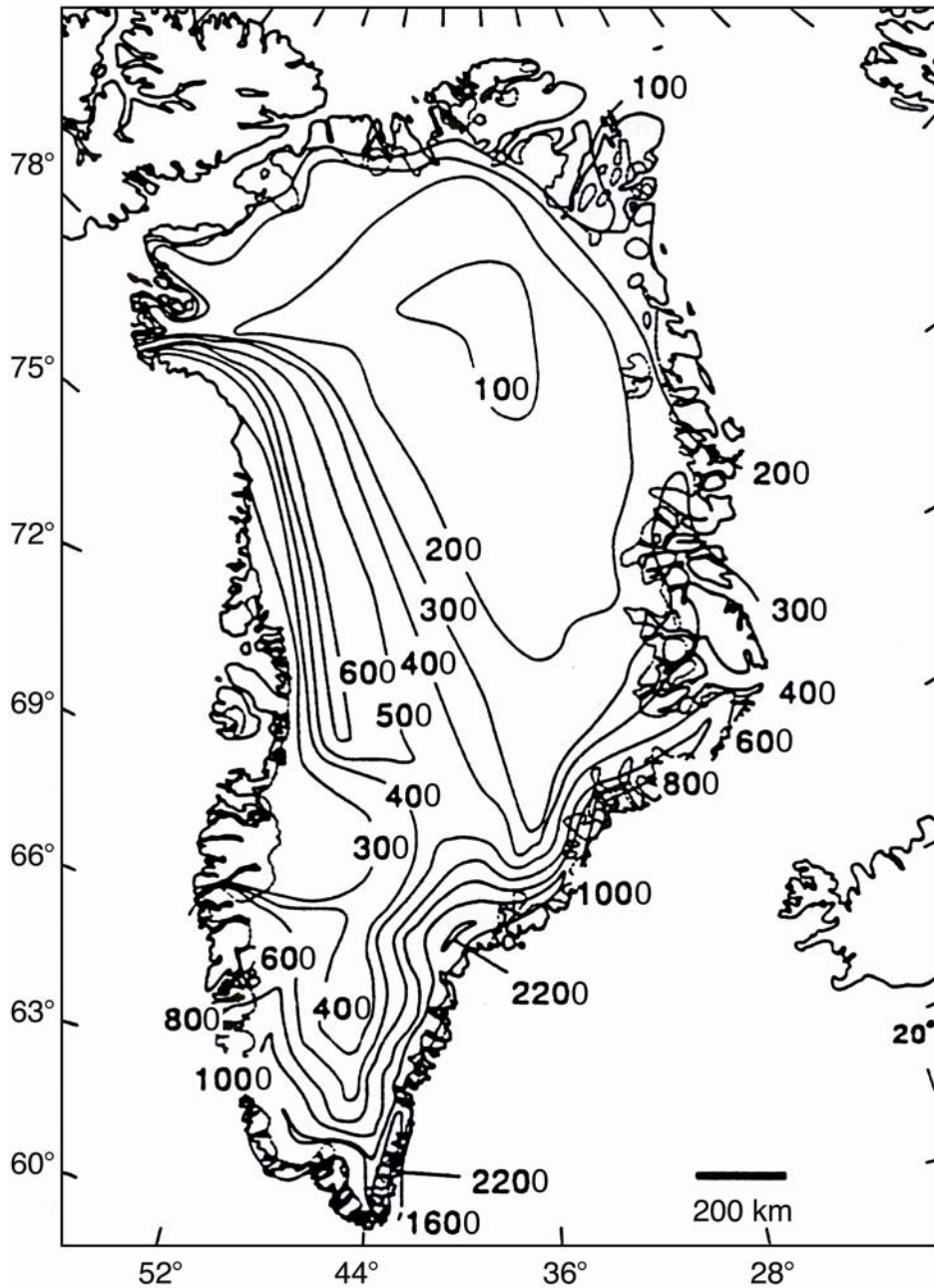
Monthly mean air temperatures for different sites in Greenland (see Figure 8.1 for locations) [from Steffen and Box, 2001, by permission of AGU]. The only station with a July mean temperature above the freezing point is JAR-1 (+0.2 deg. C).



Greenland, like Antarctica is home to frequent katabatic winds. The basic process is illustrated above. Air is chilled near the surface (through radiative cooling) and becomes quite dense. It wants to move outward from the slope due to a horizontal pressure gradient, but finds itself denser than its surroundings. The net effect is a wind moving down the slope [from Wikipedia].

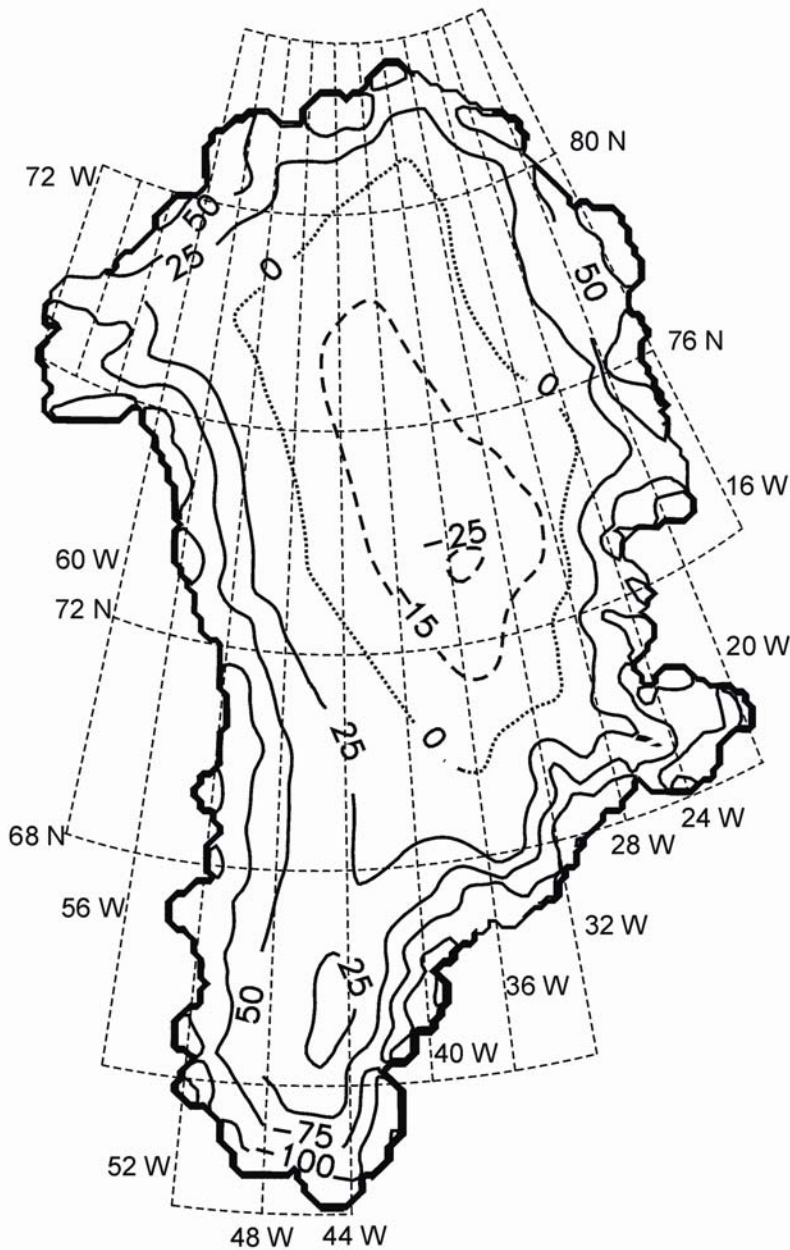
See the YouTube piece (for Antarctica but it gives the idea)

<http://www.youtube.com/watch?v=4YHNNqalyxM>

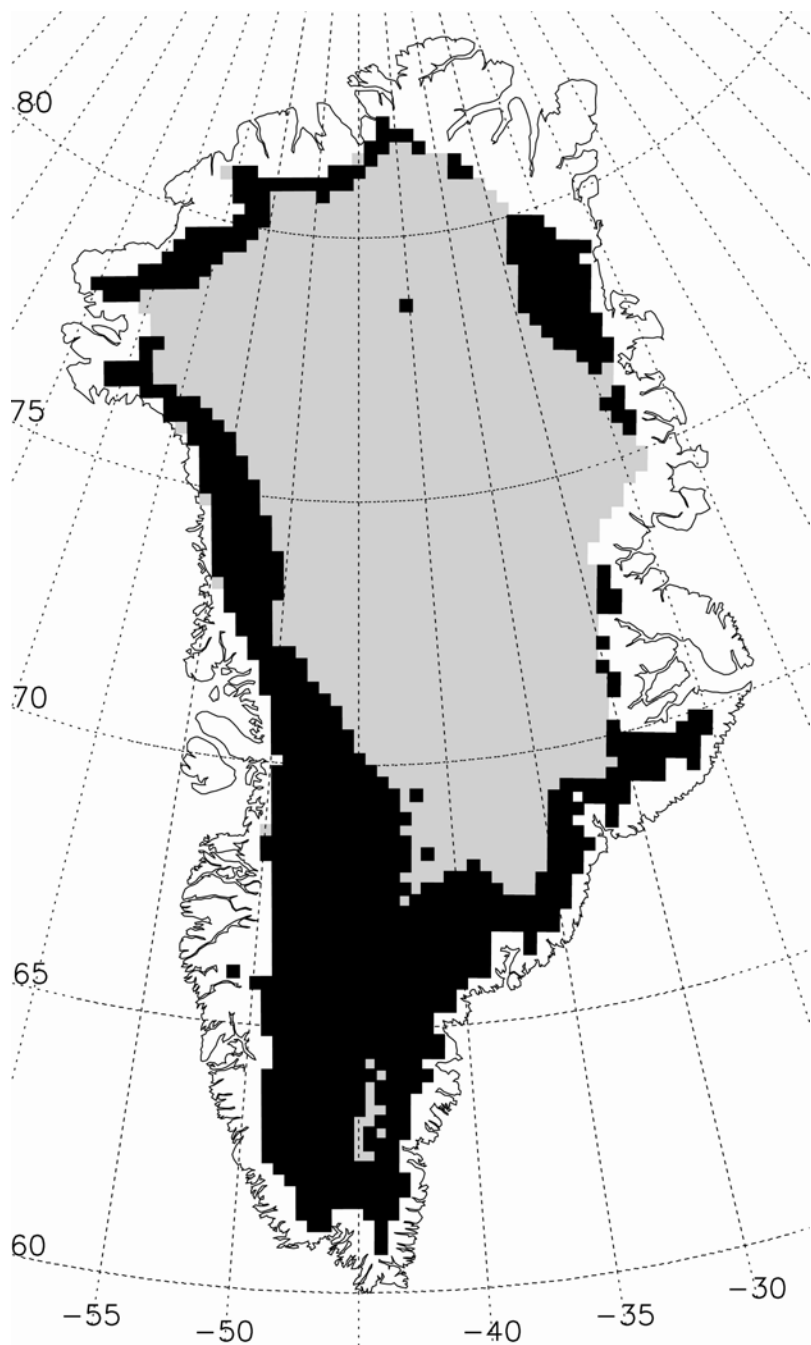


Annual accumulation over the Greenland Ice Sheet in mm water equivalent. The contour intervals are 200 mm, but 100 mm if smaller than 400 mm and 600 mm if larger than 1000 mm [from Chen *et al.*, 1997, by permission of AMS]. Due to orographic precipitation, accumulation along the southeast coast of Greenland locally exceeds 2000 mm. Accumulation over the north-central part of the ice sheet is only 100-200 mm.

2-Level Method

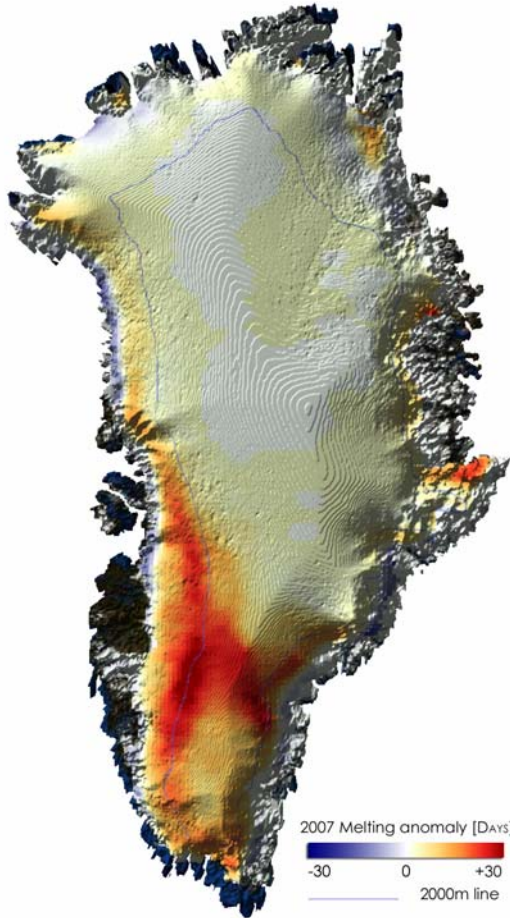


Map of estimated mean annual sublimation for the Greenland ice sheet. Sublimation is a direct change from the solid to vapor state of water. Positive values mean transfer of mass from the surface to the atmosphere [from Box and Steffen, 2001, by permission of AGU]. At the top of the ice sheet the rule is deposition (vapor to solid).

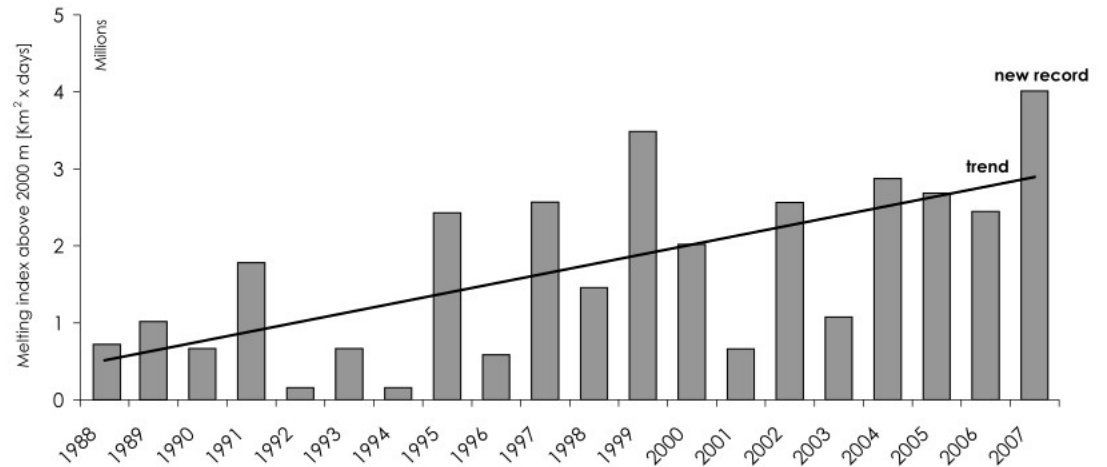


Surface melt extent (black areas) for the summer of 1999 based on satellite passive microwave retrievals [adapted from Abdalati *et al.*, 2001, by permission of AGU].

2007 Melting Day Anomalies



Melting Index Time Series



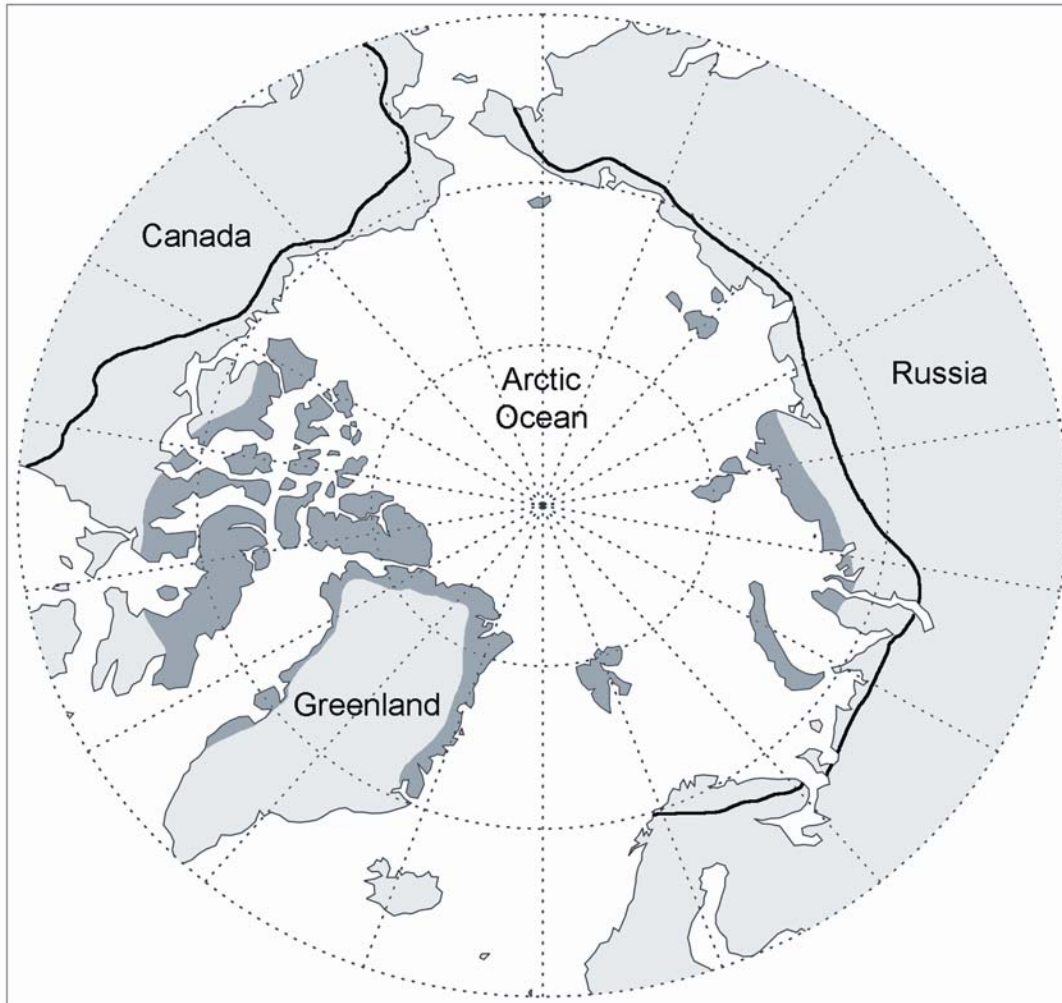
Over the satellite record there is a positive, albeit rather noisy positive trend in melt extent and related melt indices.

Polar Desert

Low precipitation

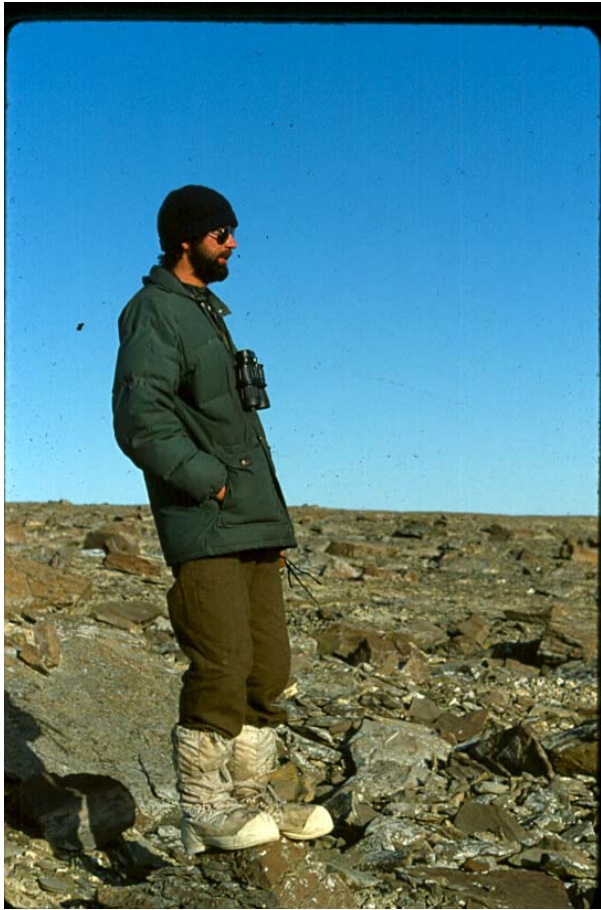
Low annual mean temperature

Generally high continentality

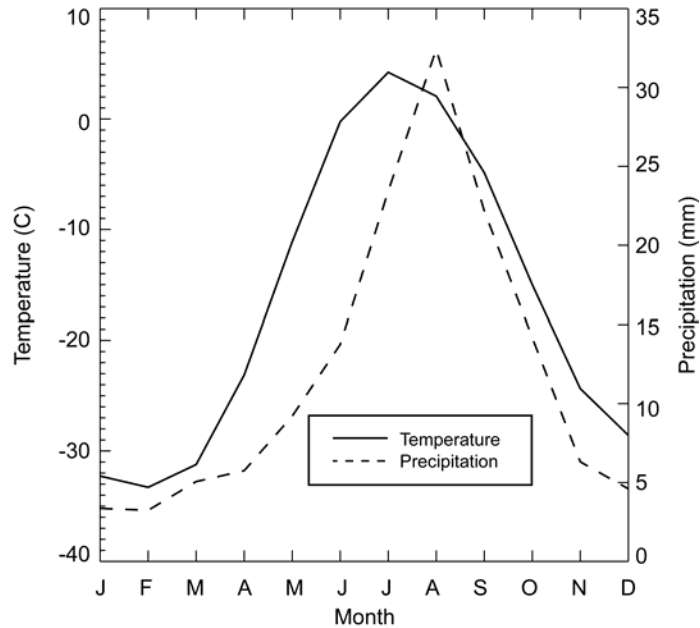


Distribution of Arctic polar desert (dark shading) and approximate southern limit of tundra (bold line) [adapted from Charlier, 1969, also see Webber, 1974, courtesy of N. Saliman, NSIDC, Boulder, CO].

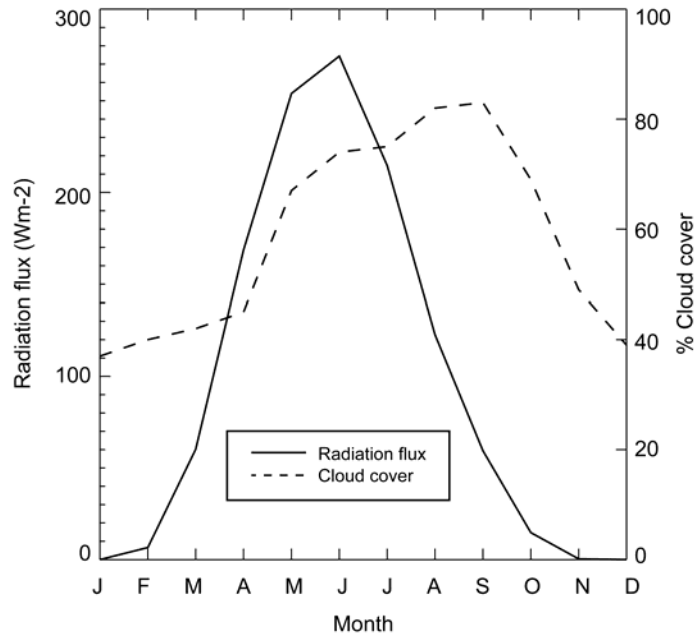
Polar Desert, Ellesmere Island



Resolute: temperature and precipitation



Resolute: cloud coverage and radiation flux



Mean annual cycles of surface air temperature, precipitation, cloud cover and downwelling shortwave radiation for the polar desert site Resolute Bay, NWT, based on a number of different data sources [courtesy of M. Lavrakas, NSIDC, Boulder, CO]. Precipitation for even the wettest month (July) is less than 35 mm, and winter precipitation is very scant. February temperature is below -30 deg. C.

Maritime Arctic

Extensive cloudiness

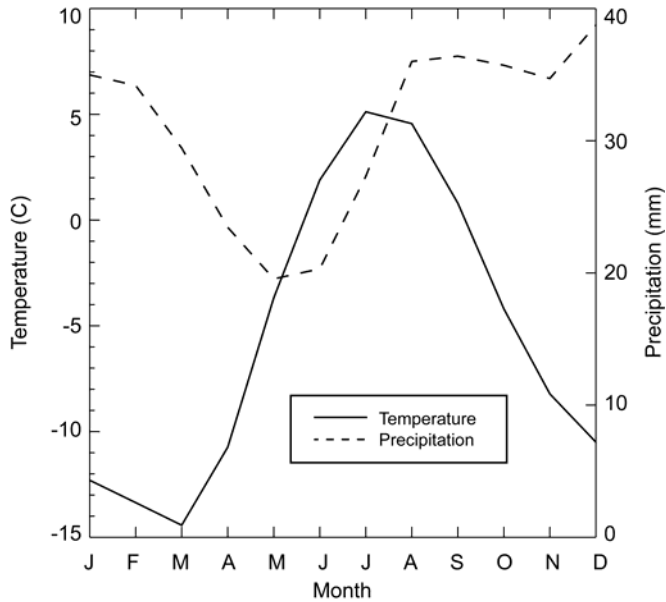
High relative humidity

Small annual range in temperature

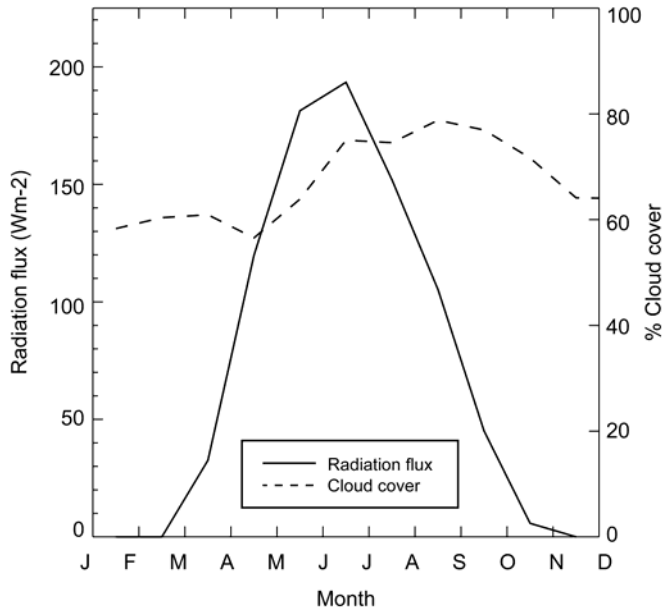
Svalbard – A maritime Arctic site



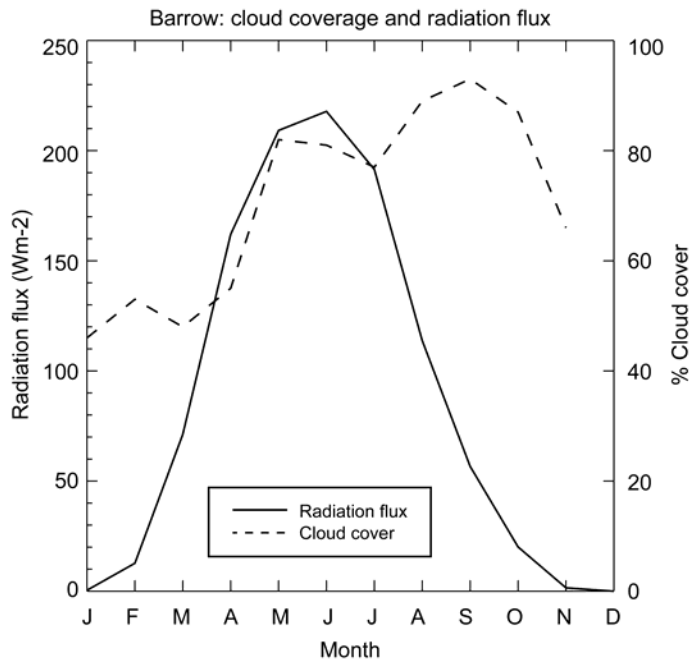
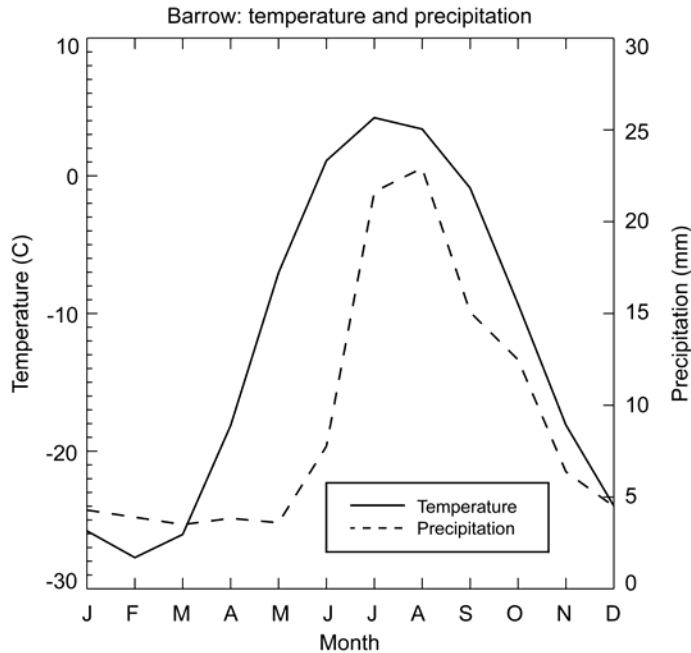
IsfjordRadio: temperature and precipitation



IsfjordRadio: cloud coverage and radiation flux



Mean annual cycles of surface air temperature, precipitation, cloud cover and downwelling shortwave radiation for the maritime site Isfjord Radio (Svalbard), based on a number of different data sources [courtesy of M. Lavrakas, NSIDC, Boulder, CO]. Cloud cover is extensive year round. Precipitation is much more abundant compared to polar desert. The annual temperature range is quite small (only about 10 deg. C, compared to over 30 deg. C at Resolute)



Mean annual cycles of surface air temperature, precipitation, cloud cover and downwelling shortwave radiation for Barrow, AK, based on a number of different data sources [courtesy of M. Lavrakas, NSIDC, Boulder, CO]. While often categorized as a maritime site, Barrow has a large temperature range similar to polar desert sites.

Central Arctic Ocean

Fairly large annual temperature range

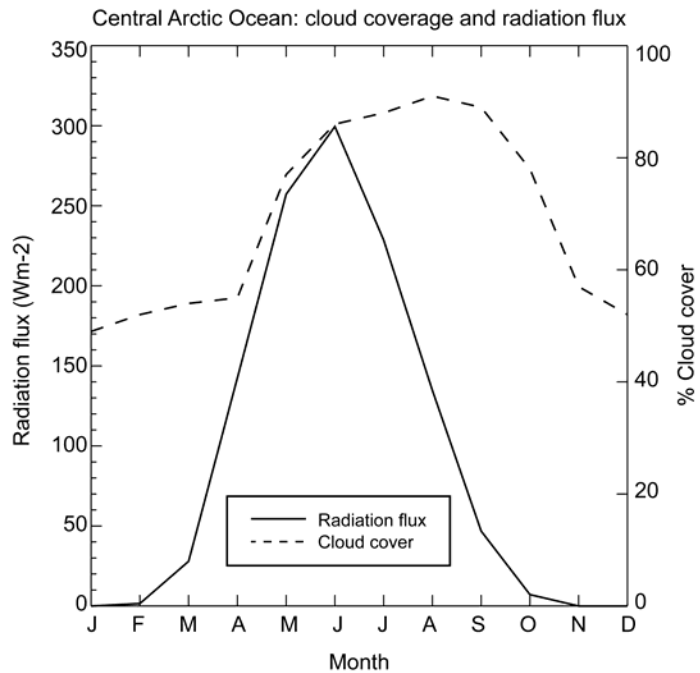
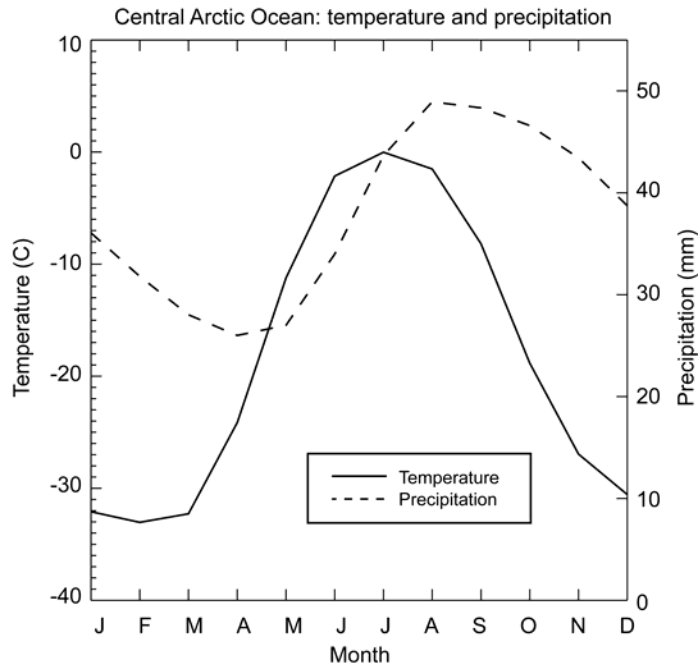
Summer temperatures close to freezing point

Extensive low level stratus in summer

Late summer/early autumn precip. maximum

The ice-covered central Arctic Ocean





Mean annual cycles of surface air temperature, precipitation, cloud cover and downwelling shortwave radiation for the central Arctic Ocean, based on data from the Russian North Pole program [courtesy of M. Lavrakas, NSIDC, Boulder, CO]. Due to the melting ice surface, the surface air temperature in July hovers near the freezing point. Cloud cover peaks in summer – much of this is low-level Arctic stratus.