

SYNOPTIC CLIMATOLOGY OF THE CANADIAN HIGH ARCTIC

Seth Andrews
Department of Geosciences
University of Massachusetts, Amherst MA 01003

An objective classification of daily weather maps for the Canadian High Arctic was updated from the 1979 work by Raymond S. Bradley and John England with the goal of identifying those synoptic situations which greatly affect ablation season temperatures and annual precipitation totals. By utilizing the NCEP re-analysis data set from the NOAA-CIRES Climate Diagnostics Center, 22 basic types were recognized using a mathematical analysis of gridded standardized daily sea level pressure from the region over the 50-year period. These 22 types account for ~98% of the days in the period with most types having distinct seasonal maxima. Along with this, daily precipitation data from Alert and Eureka, Nunavut, Canada, has been analyzed indicating that only a small number of synoptic types account for most of the annual precipitation at each station, which can be directly related to their type frequency. Other, less frequent, synoptic types account for “more efficient” precipitation-bearing situations, in terms of precipitation per day of type occurrence and explain many of the large precipitation occurrences. This classification system is useful for readily identifying specific precipitation and melt events of interest and finding their synoptic types as indicators of those particular days' pressure patterns. This will be an extremely useful tool that will aid in our understanding of the specific climatological scenarios that have lead to extremes in the temperature, precipitation, and mass balance records in the Canadian High Arctic.

SYNOPTIC CLIMATOLOGY OF THE CANADIAN HIGH ARCTIC

Seth Andrews (Raymond S. Bradley), Department of Geosciences, University of Massachusetts, Amherst MA 01003

The cryosphere of the Canadian High Arctic is said to be very sensitive to small deviations in seasonal and annual climate. This sensitivity makes it important to understand daily weather patterns and their cumulative impacts on longer time scales. Variations in these patterns, over time, directly influence and determine the state and nature of High Arctic glaciers through changes in mass balance, via controls such as mean ablation season temperatures and annual precipitation totals. A comprehensive synoptic classification system is therefore necessary to understand all of the coupled components involved in the High Arctic climate system. By updating Bradley and England's (1979) objective classification of daily weather maps for the Canadian High Arctic, a catalog of synoptic climate types for the period from January 1948 to October 1999 has been developed. Through the utilization of the NCEP re-analysis data set (NOAA-CIRES Climate Diagnostics Center, 2000), 22 basic types were recognized using a mathematical analysis of gridded standardized daily sea level pressure from the region over the 50-year period. Along with this, daily precipitation data from Alert and Eureka, Nunavut, Canada, has been analyzed indicating that only a small number of synoptic types account for most of the annual precipitation at each station, which can be directly related to their type frequency. Other, less frequent, synoptic types account for "more efficient" precipitation-bearing situations, in terms of precipitation per day of type occurrence and explain many of the large precipitation occurrences. This classification system is useful for readily identifying specific precipitation and melt events of interest and finding their synoptic types as indicators of those particular days' pressure patterns. This will be an extremely useful tool that will aid in our understanding of the specific climatological scenarios that have lead to extremes in the temperature, precipitation, and mass balance records in the Canadian High Arctic.

References:

Bradley, R.S. and England, J., 1979. Synoptic climatology of the Canadian High Arctic. *Geografiska Annaler*, 61A, pp. 187-201.

Bradley, R.S. and Eischeid, J.K., 1985. Aspects of the precipitation climatology of the Canadian High Arctic. In: Bradley, R.S. (ed.), *Glacial Geologic and Glacioclimatic Studies In the Canadian High Arctic*, pp. 250-271. Contribution No. 49, Department of Geology and Geography, University of Massachusetts, Amherst.

NOAA-CIRES Climate Diagnostics Center. (2000, July). NCEP Reanalysis Electronic Atlas. Retrieved July, 2000 from the World Wide Web:
http://www.cdc.noaa.gov/ncep_reanalysis/index.shtml