

# METEOROLOGICAL RECONSTRUCTION USING FORENSIC SYNOPTIC ANALYSIS

## *The Weather of 1785: A Case Study*

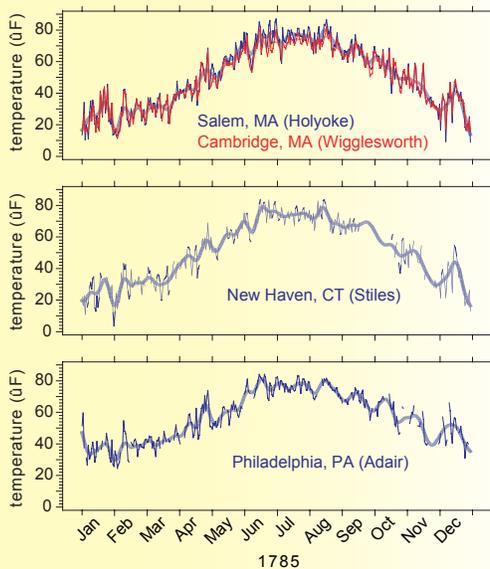
# Forensic techniques

Diaries and various historical observational data were used to reconstruct meteorological maps on a synoptic scale for the northeastern portion of North America for the year 1785. The results show that even small amounts of observational data and anecdotal comments can be used to arrive at a general representation of the weather patterns at the regional synoptic scale. Apparently unrelated non-homogenous data sets, traveler's and trapper's journals, ship logs and protests, and other sources, such as newspaper reports, can be successfully combined to reveal the workings of the atmosphere. Using these data a complete synoptic analysis of the year, at semi-diurnal resolution, has been reconstructed, using the techniques of forensic synoptic analysis.



Data used to reconstruct synoptic weather include:

-  Observational Ledgers
-  Diaries
-  Newspapers
-  Ships Logs & Protests
-  Travelers Journals



# Summary and Conclusions

## Surface Conditions

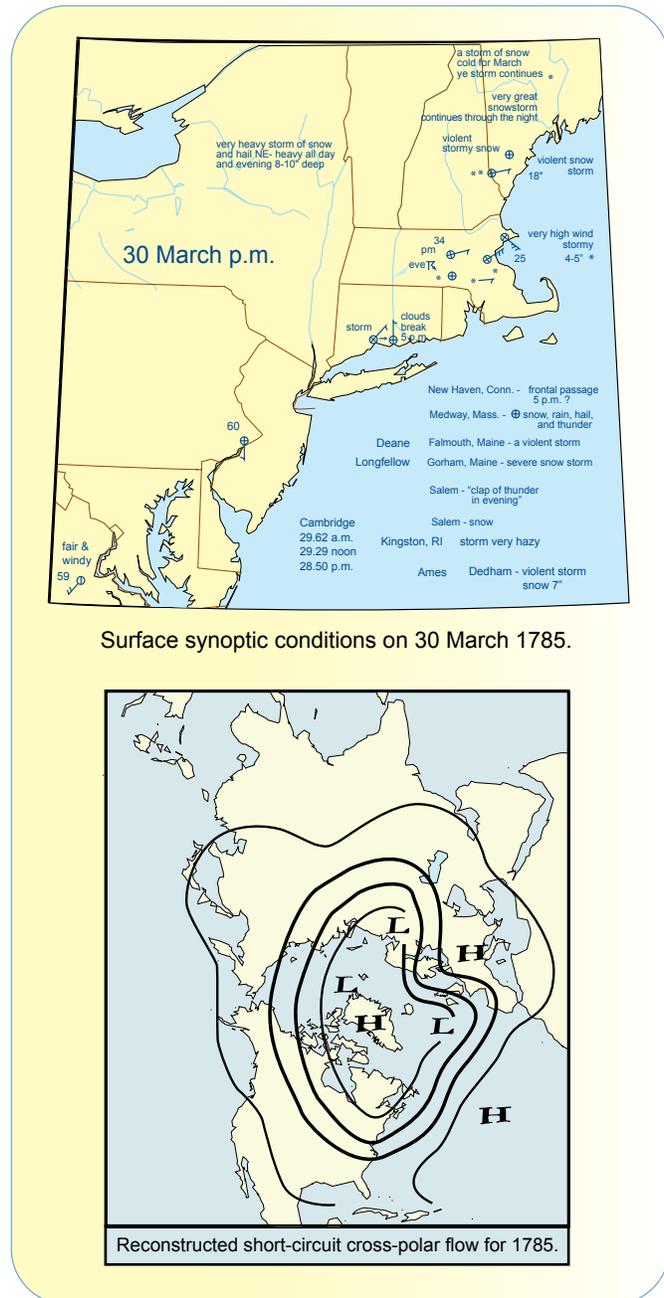
Day-to-day synoptic reconstruction resolves are used to individual weather events. Monthly or annual data does not work. A notable result of surface synoptic analysis on a seasonal basis is the delay in springtime warmth. Although the ranges between summer maxima and winter minima are similar to those of the present-day, the absence of a transition pattern in the spring, and to a certain extent in the fall, indicate a more variable weather pattern in 1785, when compared to the last decade. These results all point to a year in which winter patterns prevail, spring and fall are exceptionally brief, and summer is short.

## Upper Air Flow

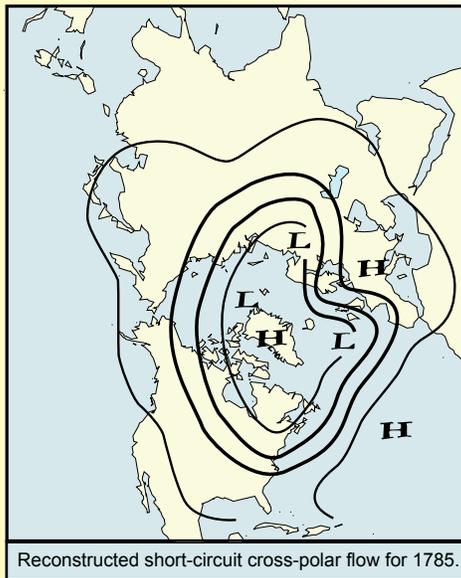
The same techniques used to develop surface weather patterns at the synoptic scale can be used to reconstruct upper air patterns and flow. The consistency with which the pattern defaults to a coastal baroclinic zone can be explained by a larger temperature difference between land temperatures similar to today and much colder sea surface temperatures. What is notable is the strength of the zonal flow throughout most of the year. This conclusion is supported with both forensic synoptic analysis and anecdotal data. There are many reports of ships being "blown off the coast" and either unable to make their primary destination, or having to turn back to Europe. This can only be explained by a coupling of lower-level jetstream winds and the surface.

## Large Scale Northern Hemisphere Circulation

In 1785 the polar front never fully retreated to its average modern-day summer position. This implies that the polar cell was either larger or displaced towards eastern North America and the Atlantic Ocean in 1785. Proxy studies from two dozen locations elsewhere in the northern hemisphere reveal an upper air pattern which, when combined with the results from this study, outline the polar cell itself. It appears that the polar cell was indeed displaced, as data from eastern Asia and the Pacific do not support a global expansion. This produces a 'short-circuit cross-polar flow' shown schematically above.



Surface synoptic conditions on 30 March 1785.



## Selected References

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