ATM 400: Synoptic Meteorology I Homework Assignment #4: Q vectors, fronts, and frontogenesis Due: Tuesday, November 26

- **1.** Draw the Q-vector field (minimum of eight vectors) in the mid-troposphere for a vertically stacked, warm-core low.
- **2.** For each of the scenarios described below, determine if there will be frontogenesis, frontolysis, or neither. Explain your answer with appropriate diagrams and equations.
 - **a**) There is a temperature gradient from NNW to SSE within a field of pure stretching deformation.
 - **b**) At the surface, there a north–south temperature gradient where it is warmer to the north, with ascent on the cold side and decent on the warm side.
- **3.** Consider the attached map of 700-hPa height and temperature for Superstorm 1993 we've been analyzing this semester. Using the expression for <u>kinematic frontogenesis</u> and only examining the area around the low, indicate where you would expect frontogenesis and frontolysis, and explain your answer.

You do not need to do a calculation, but you should use the equation (and its components; i.e., the axis of dilatation) in your explanation. You can also plot frontogenesis in Python (not required, but helpful), but you still must explain the areas of frontogenesis and frontolysis using the equation.