MET 3502 Synoptic Meteorology

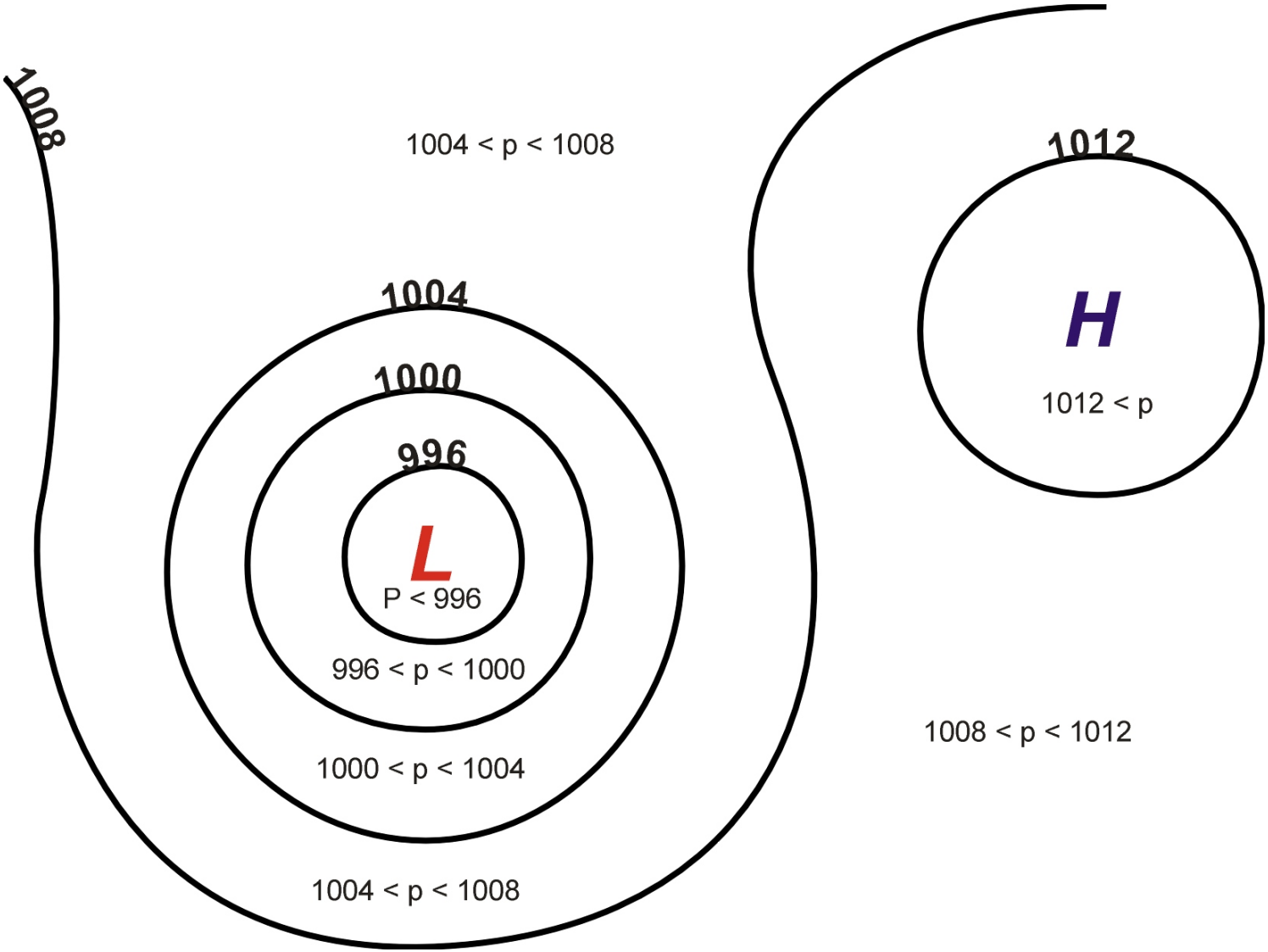
Lecture 4

Contour Analysis

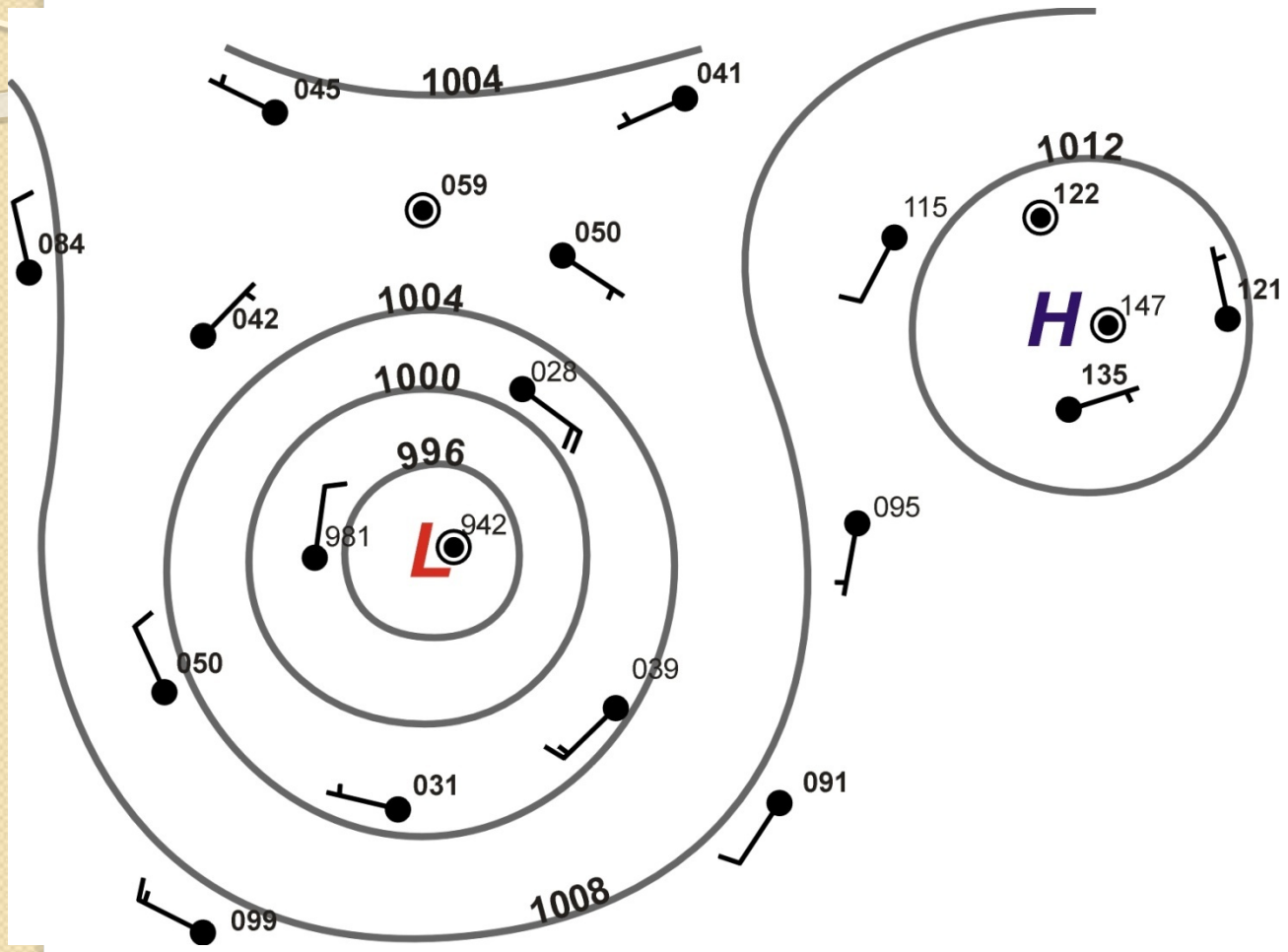
Kinds of Contour Lines

- **Isopleths**: General term for lines along which some scalar has a constant value.
- **Isotherms**: Constant temperature
- **Isodrosotherms**: Constant dew point
- **Isobars**: Constant pressure
- **Isallobars**: Constant pressure change
- **Isohyets**: Constant rainfall
- **Isotachs:** Constant wind speed
- **Streamlines:** Not contours, but arrows that parallel the wind direction.
- **Isohypses** (or simply contours): Constant height of an isobaric surface

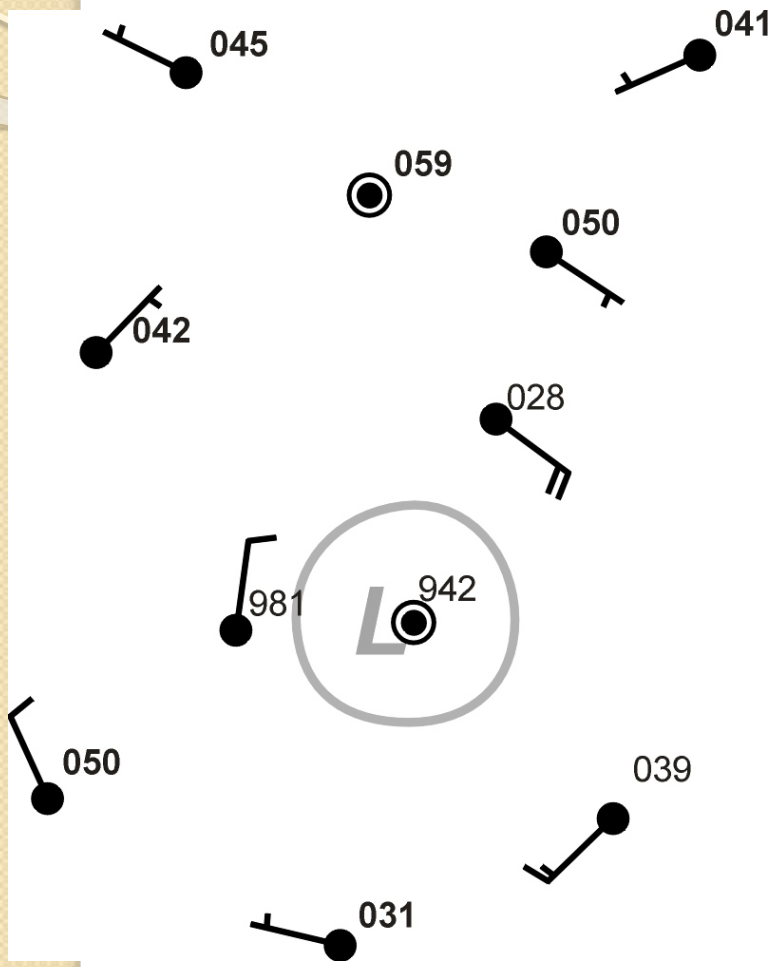
Let's concentrate on Isobars



Relation of Isobars to Data

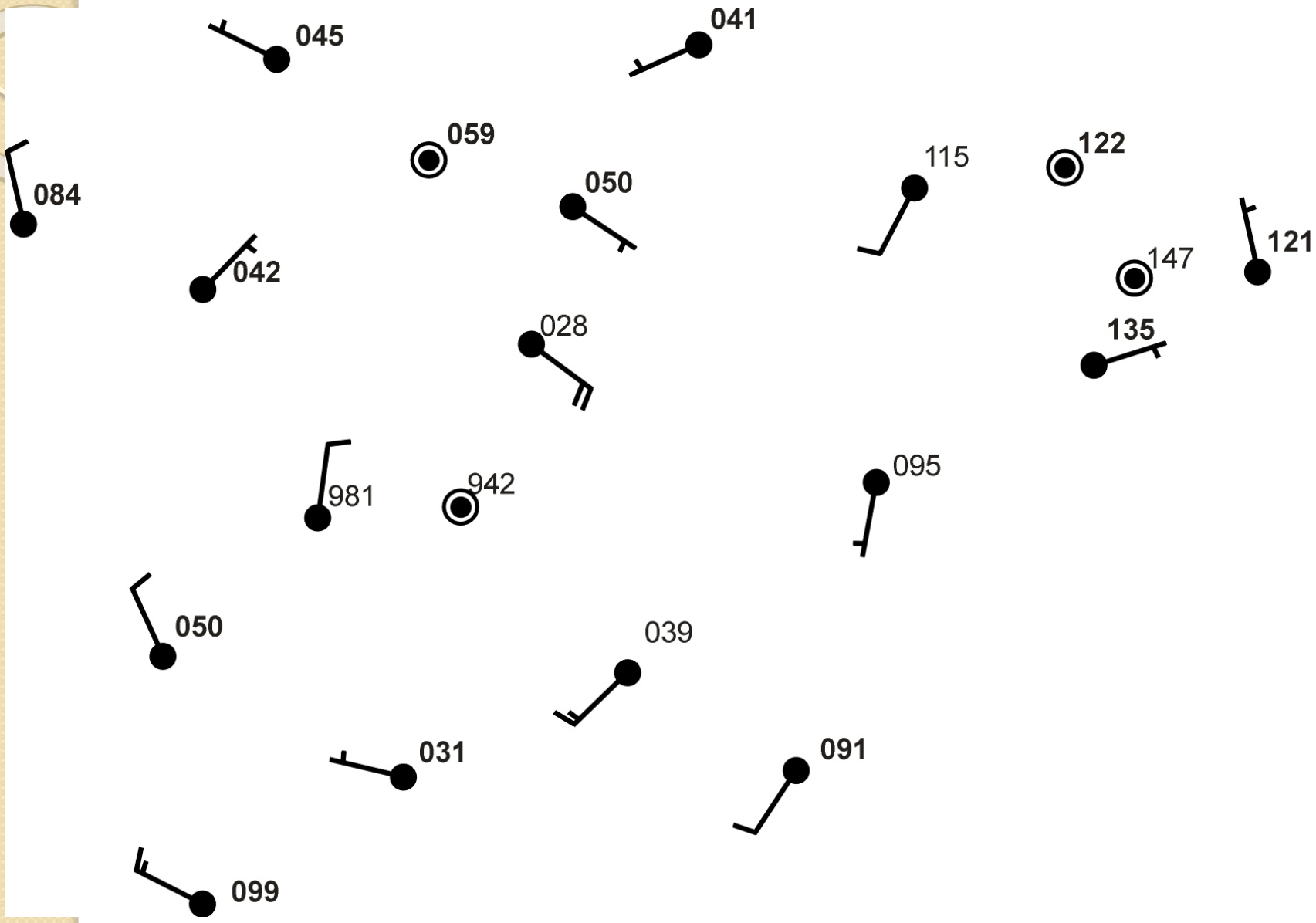


Pressure Analysis



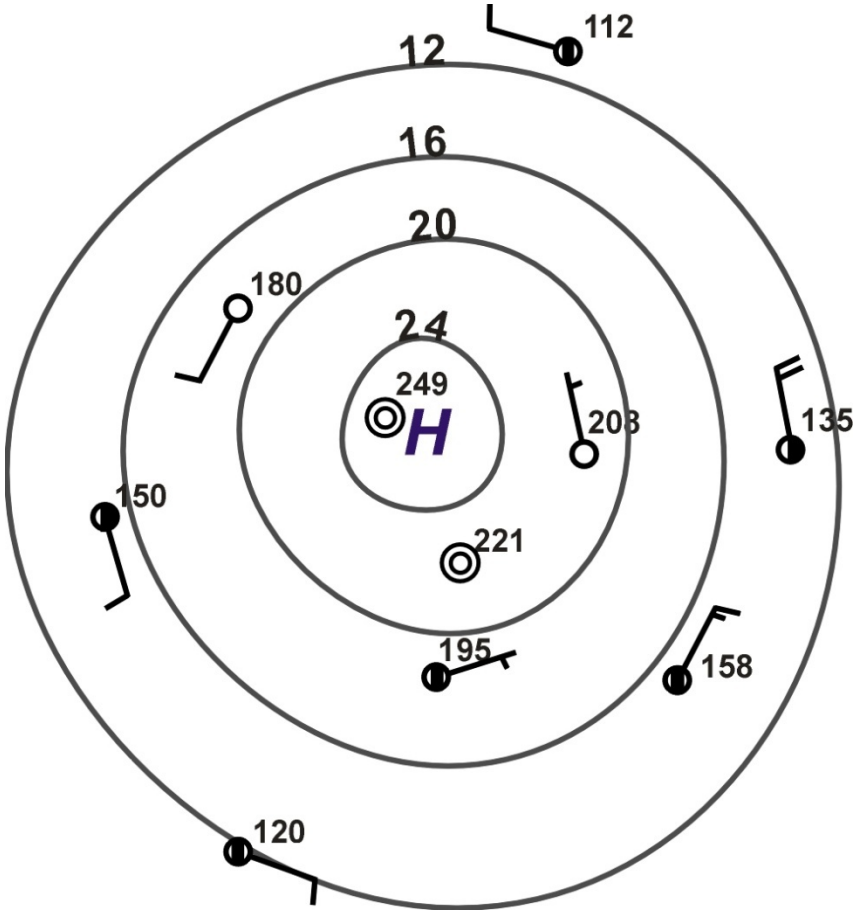
- Trace features from previous map, if available.
- Locate highs and lows
  - Extreme values
  - Places where the wind blows in a circle
  - Near past position
  - Draw innermost closed contours first
- Draw subsequent contours
  - Your contour values should a multiple of 4, for example, 1004 mb, 1000mb, 996 mb, etc
  - Interpolating pressure values
  - Lines parallel the wind
- Wind turns counter clockwise around low pressure

Please print this and practice to draw isobars by yourself, then compare your drawing with slide #4



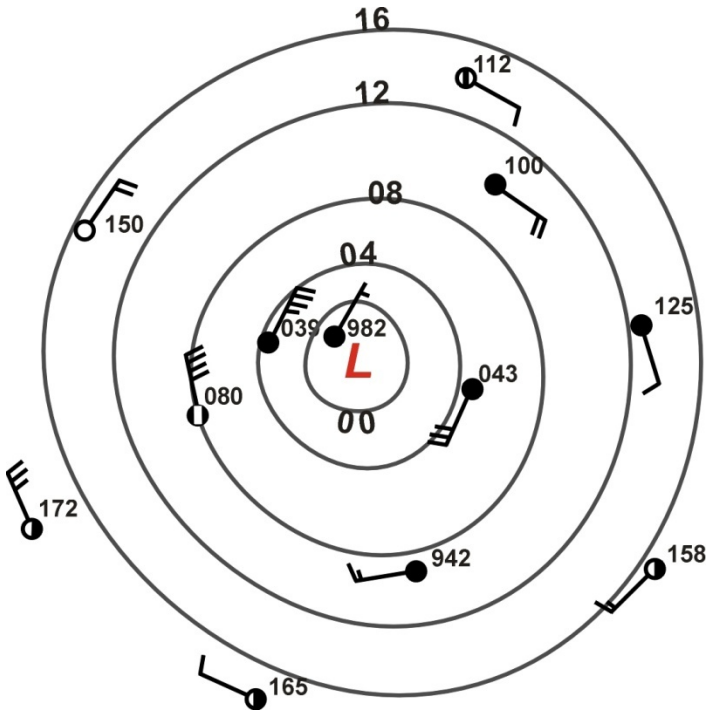
Anticyclones

- High pressure
  - Clockwise flow
  - Counter clockwise in Southern Hemisphere
  - Pressure field broader, flatter and larger than lows
- Wind barbs point out
- Winds
  - Generally calm in the center
  - Weaker than in lows
  - But winds are stronger if the *p* gradient is the same
- Skies
  - Clear near the center,
  - But fog may form at night

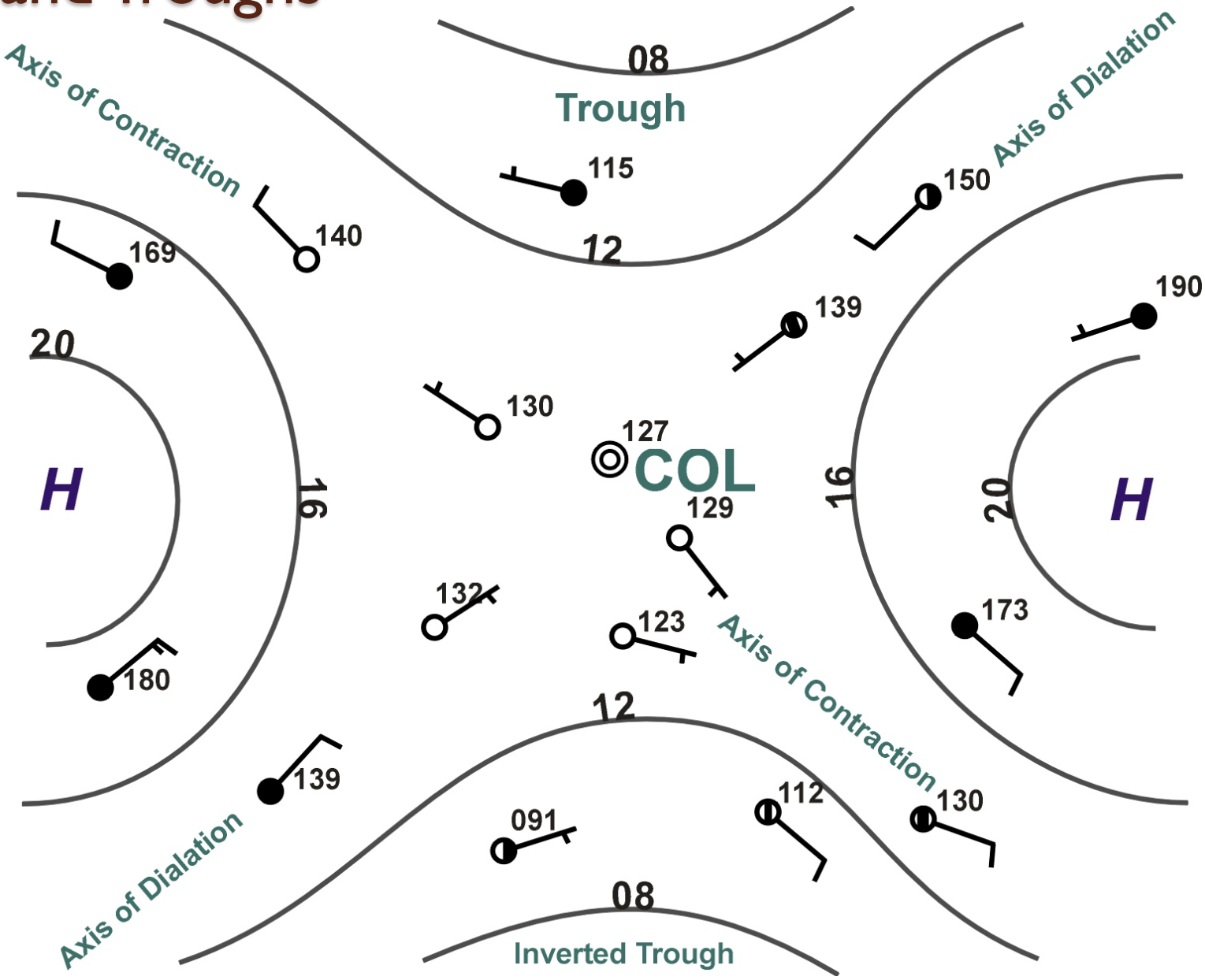


Cyclones

- Low pressure
  - Counterclockwise flow
  - Clockwise in Southern Hemisphere
  - Pressure field narrower, sharper and smaller than highs
- Wind barbs point in
- Winds
  - Only a small area of calm in the center
  - Stronger than in highs
  - But winds are weaker if the *p* gradient is the same
- Skies
  - Cloudy south and east of the center
  - Often clear NW of the center



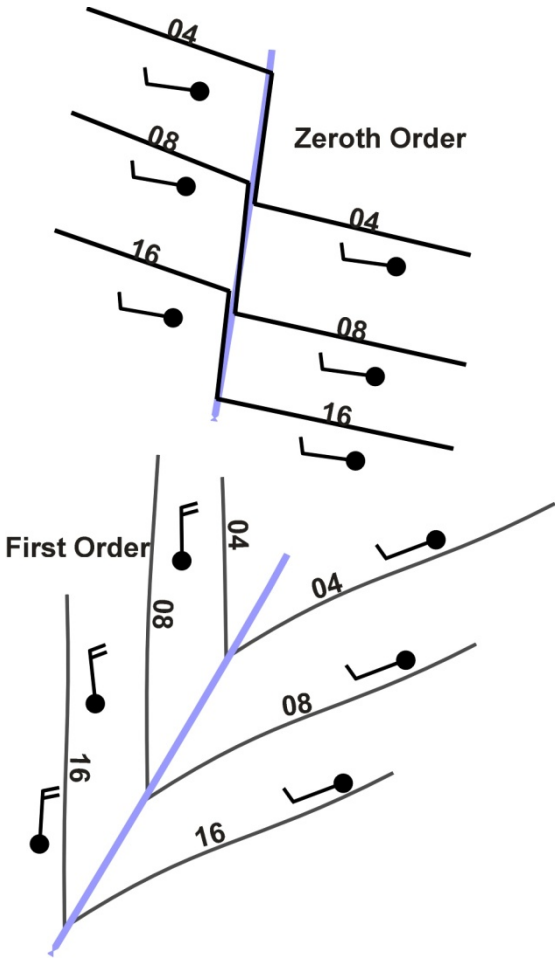
Cols and Troughs



About Cols & Troughs

- A trough is an open, broad area of low pressure that merges into the general poleward decrease of pressure in the middle-latitude westerlies.
- An inverted trough joins into the equatorward decrease of pressure beneath an anticyclone
- A col lies between two cyclones and two anticyclones
- In the case illustrated, the center of the col lies in the calm between the north winds of the western high and the south winds of the eastern high
- A col is a saddle in the pressure distribution with (for example) low pressure north and south and high pressure east and west
- Wind approaches the col from the NW and SE: Axis of contraction
- Wind recedes from the col toward the NE and SW: Axis of dilation
- The flow in the col is nearly pure deformation, ie both nondivergent and irrotational
- Surface fronts form in cols

Discontinuities



- Zeroth-order discontinuities
  - Value itself changes abruptly
  - Temperature and dewpoint at fronts
  - Do not occur for pressure.
- First-order discontinuities
  - Derivative changes abruptly
  - Pressure at fronts
  - Produces first-order discontinuity of wind
- Deformational flow collapses gradients into discontinuities---FRONTS

Summary

- Represent scalars with isopleths that divide > contour value from < contour value
- Drawn subjectively
- Called iso-whatevers. I.E. Isobars
- Features:
  - Anticyclones & Cyclone
  - Cols & troughs, including inverted troughs
  - Deformational flow
- First and second-order discontinuities