Wind Shear

- Example of little or no vertical wind shear:

There is very little change in the speed or direction of the wind with height.

Hodograph

- A hodograph displays the change of wind speed and direction with height (vertical wind shear) in a simple diagram.
- Wind speed and direction are plotted as arrows (vectors) with their tails at the origin and the point in the direction toward which the wind is blowing. This is backward from our station model!!!

Hodograph

- The length of the arrows is proportional to the wind speed. The larger the wind speed, the longer the arrow.
- Normally only a dot is placed at the head of the arrow and the arrow itself is not drawn.
- The hodograph is completed by connecting the dots!

Hodograph

- Why Draw a Hodograph?
  - We don't have to look through a complex table of numbers to see what the wind is doing.
  - By looking at the shape of the hodograph curve we can see, at a glance, what type of storms may form.
    - **Air Mass (garden variety) storms**
    - **Multicellular Storms**
    - **Supercell Storms**
    - **Tornadic Storms**

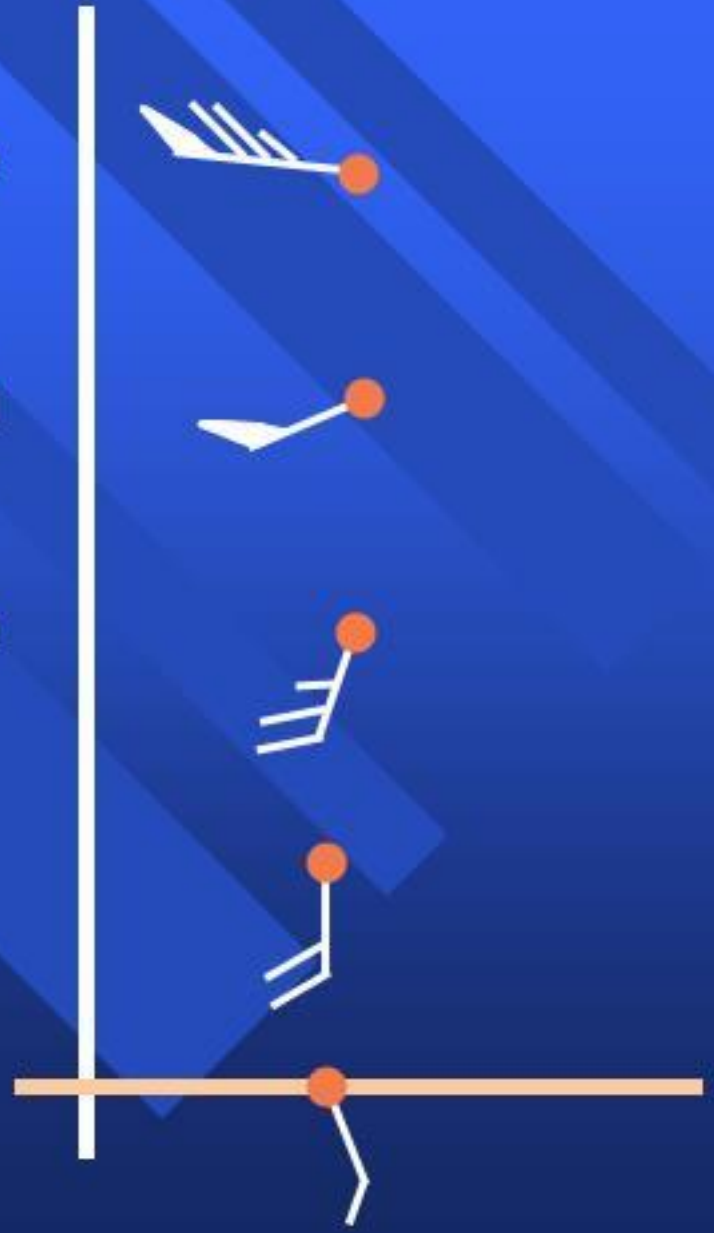
Hodograph -- Example

Height (MSL)	Direction	Speed (kt)
250 m (SFC)	160	10
500 m	180	20
1000 m	200	35
1500 m	260	50
2000 m	280	75

Just by looking at this table, it is hard (without much experience) to see what the winds are doing and what the wind shear is.

Hodograph -- Example

- Let us plot the winds using a station model diagram.
- This is better but it is time consuming to draw and still is not that helpful.



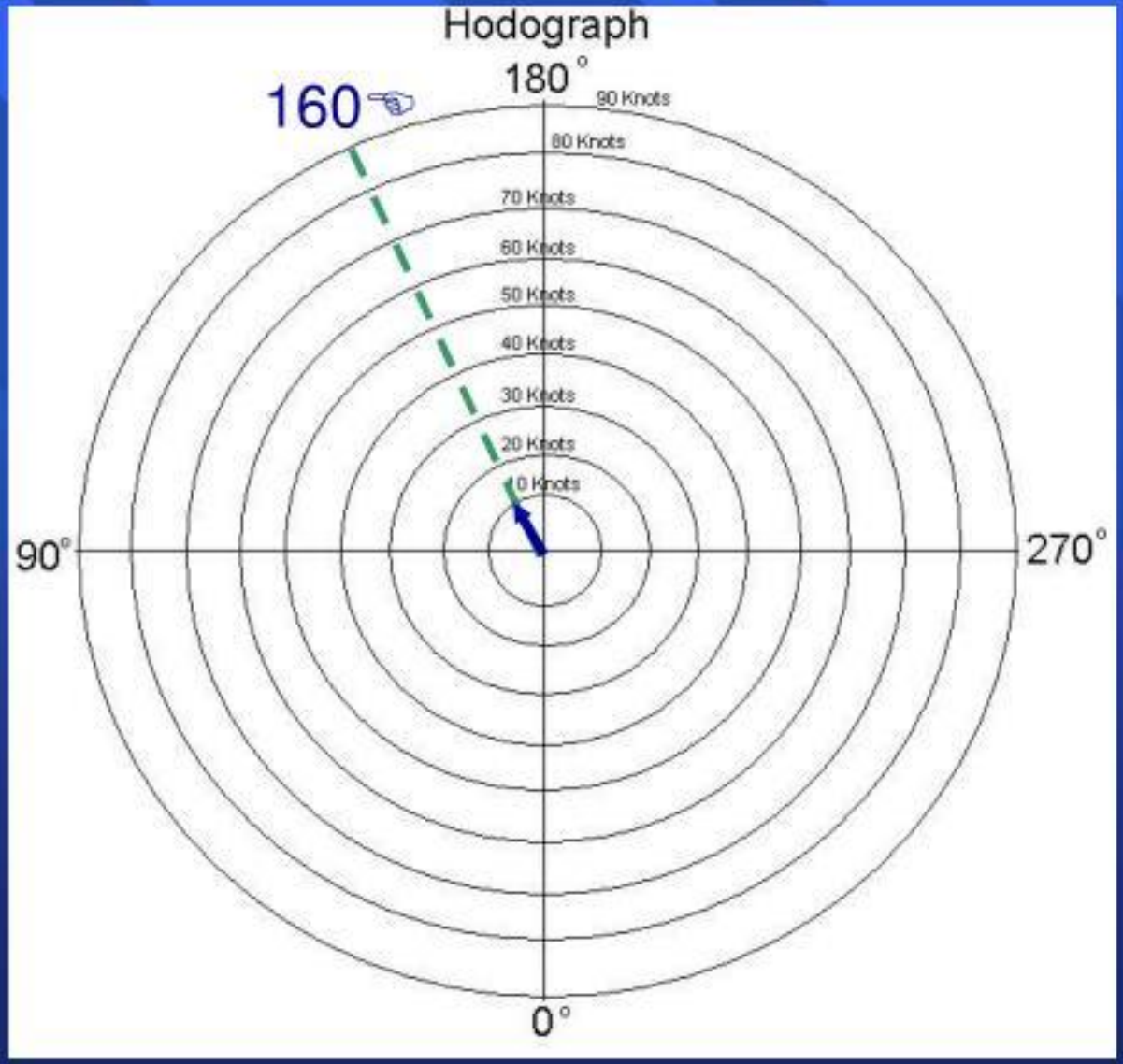
Hodograph -- Example

- Let us now draw the hodograph!

Let us draw the surface observation. **160° at 10 kts**

Since the wind speed is 10 kt, the length of the arrow is only to the 10 knot ring.

The direction points to 160°.



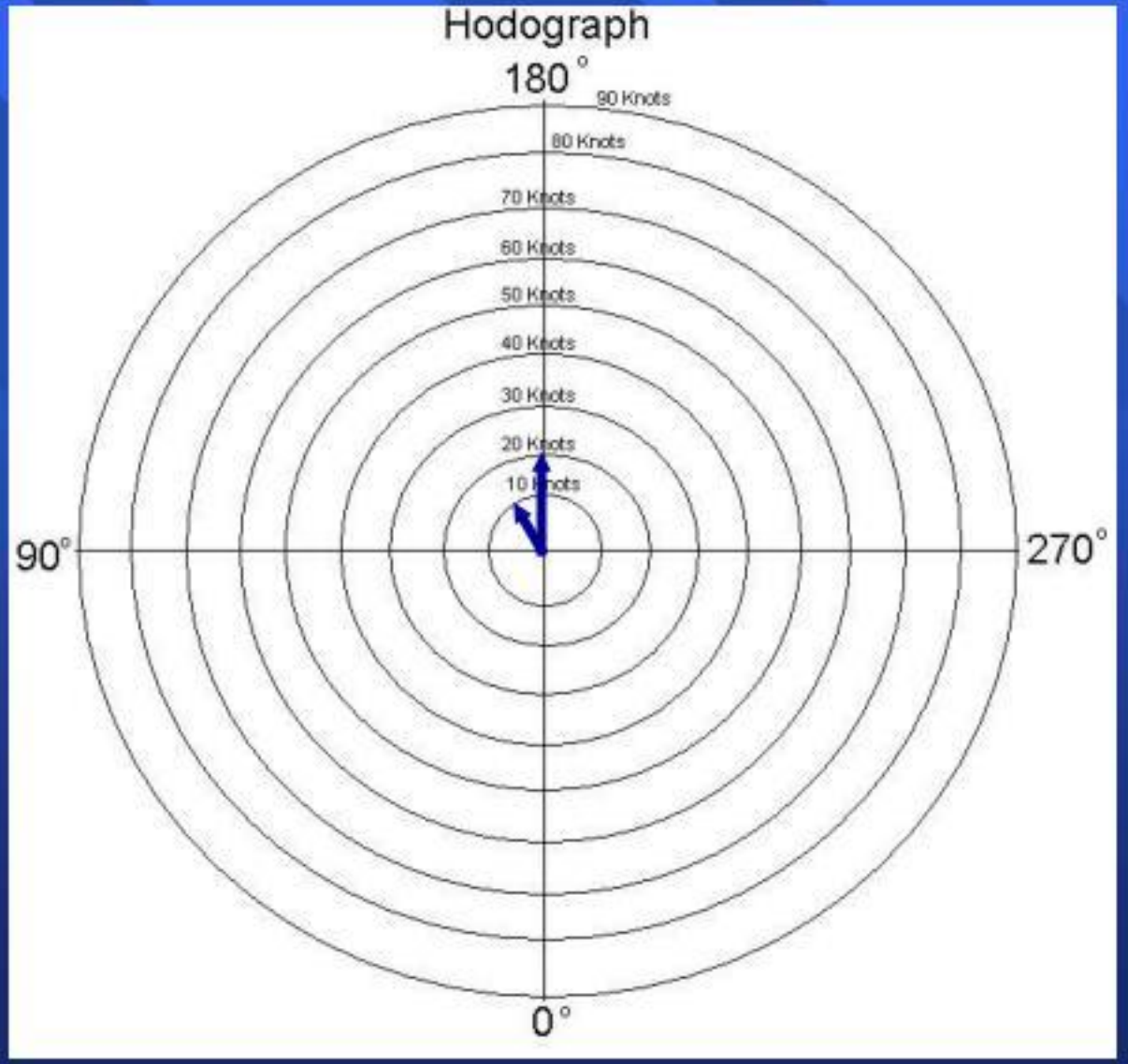
Hodograph -- Example

- Let us now draw the 500 m observation.

Let us draw the 500 m observation: **180° at 20 kts**

Since the wind speed is 20 kt, the length of the arrow is only to the 20 knot ring.

The direction points to 180°.



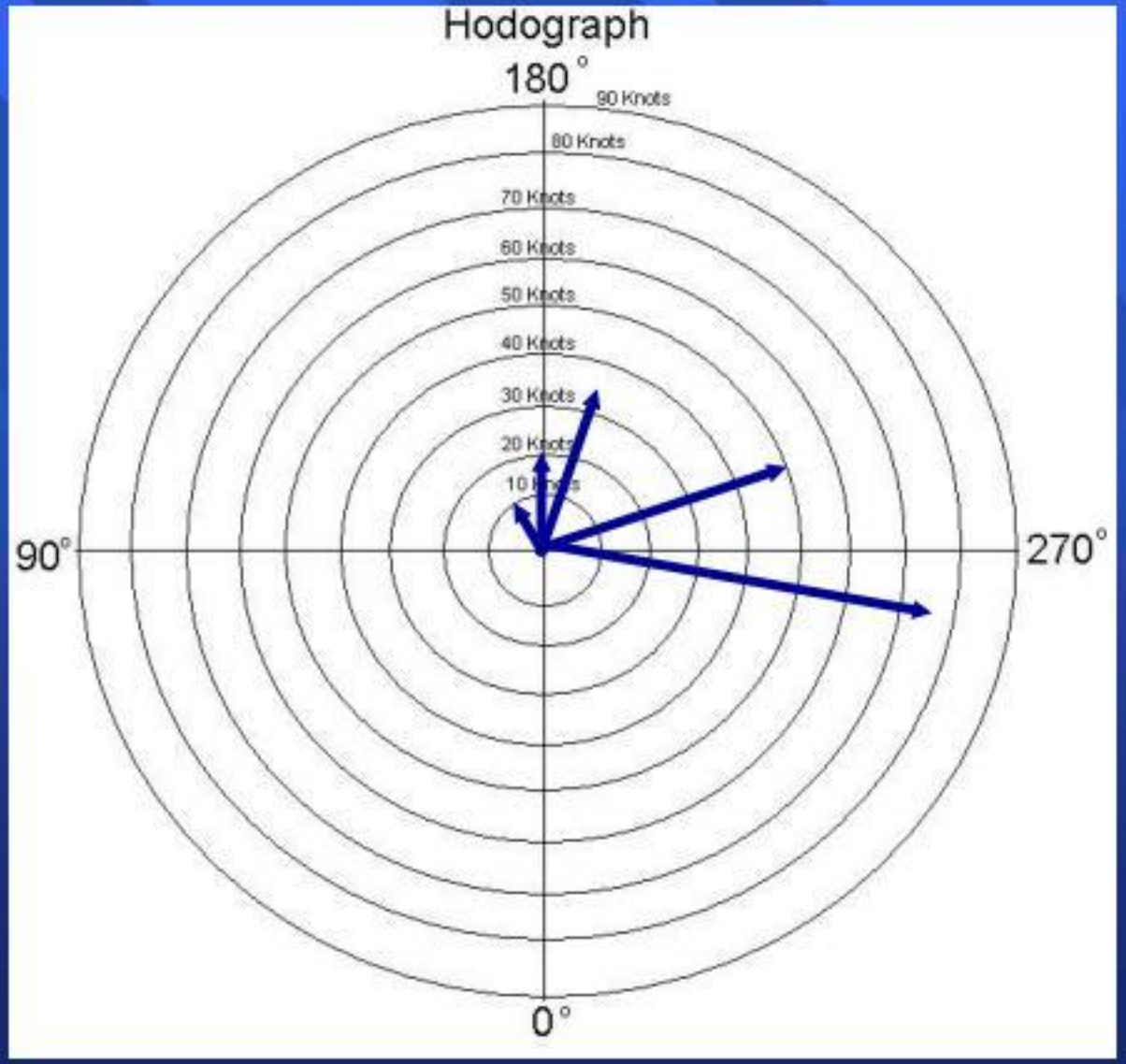
Hodograph -- Example

- Let us now draw the remaining observations.

Let us draw the 500 m observation: **180° at 20 kts**

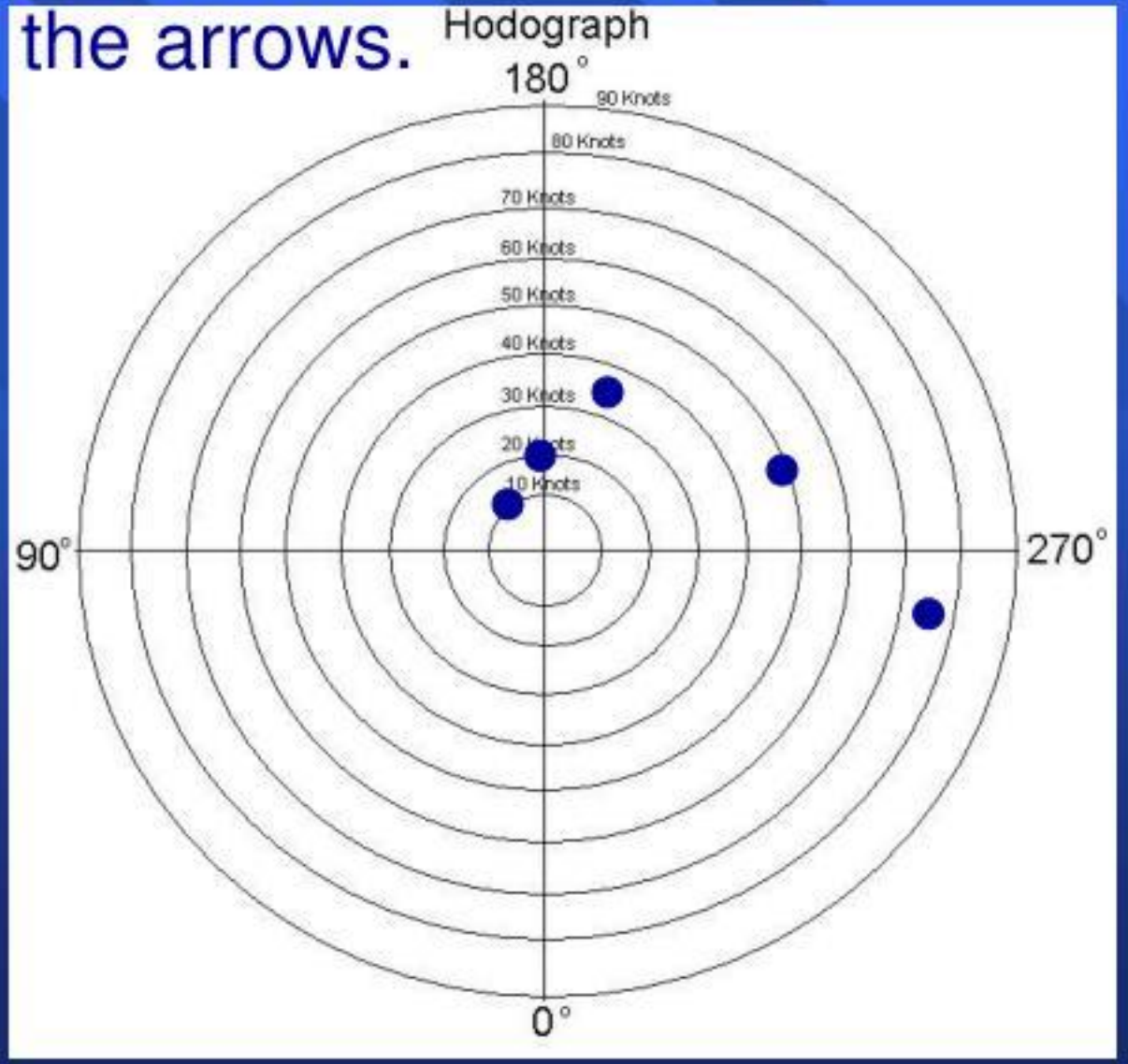
Since the wind speed is 20 kt, the length of the arrow is only to the 20 knot ring.

The direction points to 180°.



Hodograph -- Example

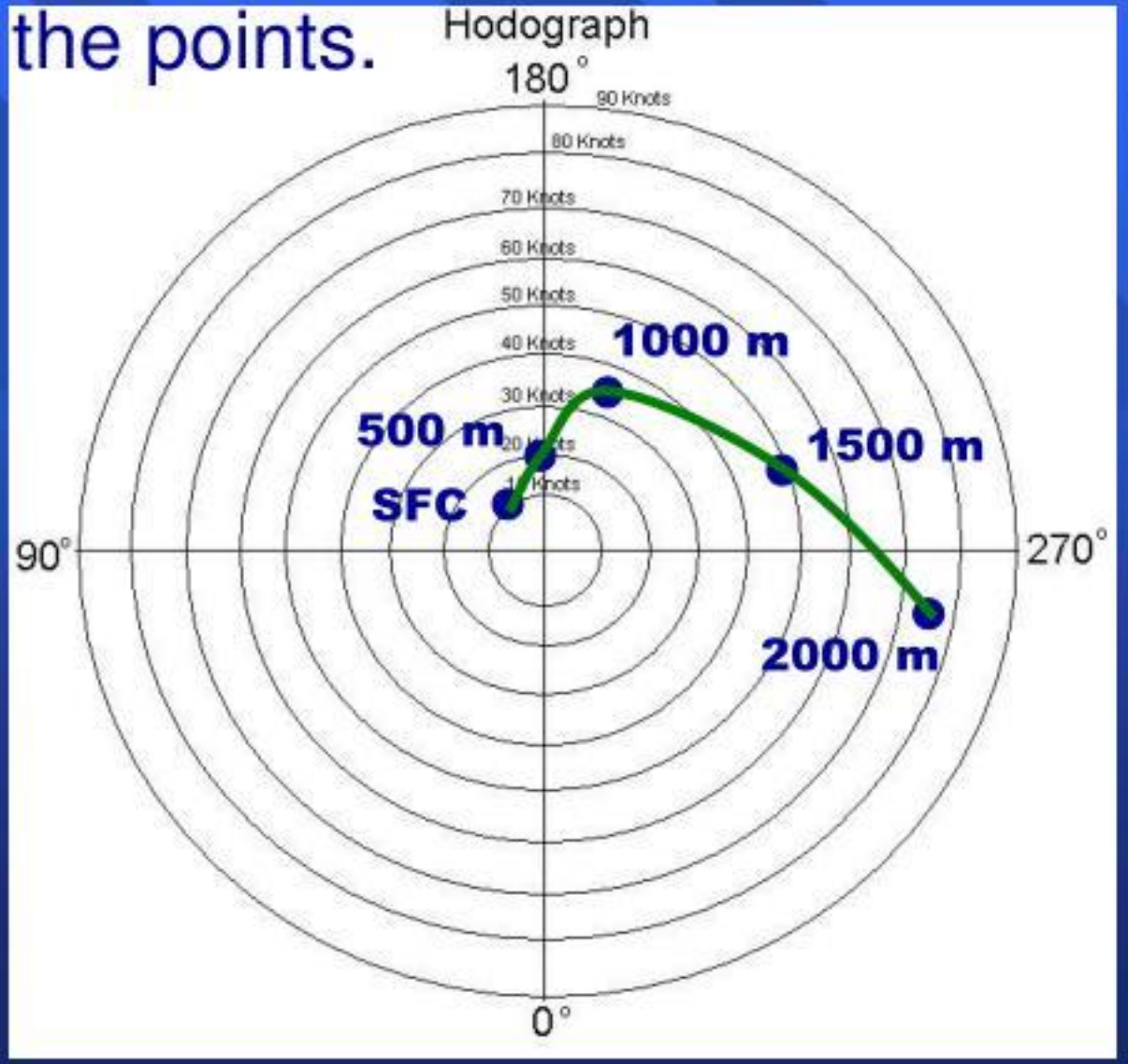
- We now place dots at the end of the arrows then erase the arrows.



Hodograph -- Example

- We then connect the dots with a smooth curve and label the points.

This is the final hodograph!!!



Hodograph -- Example

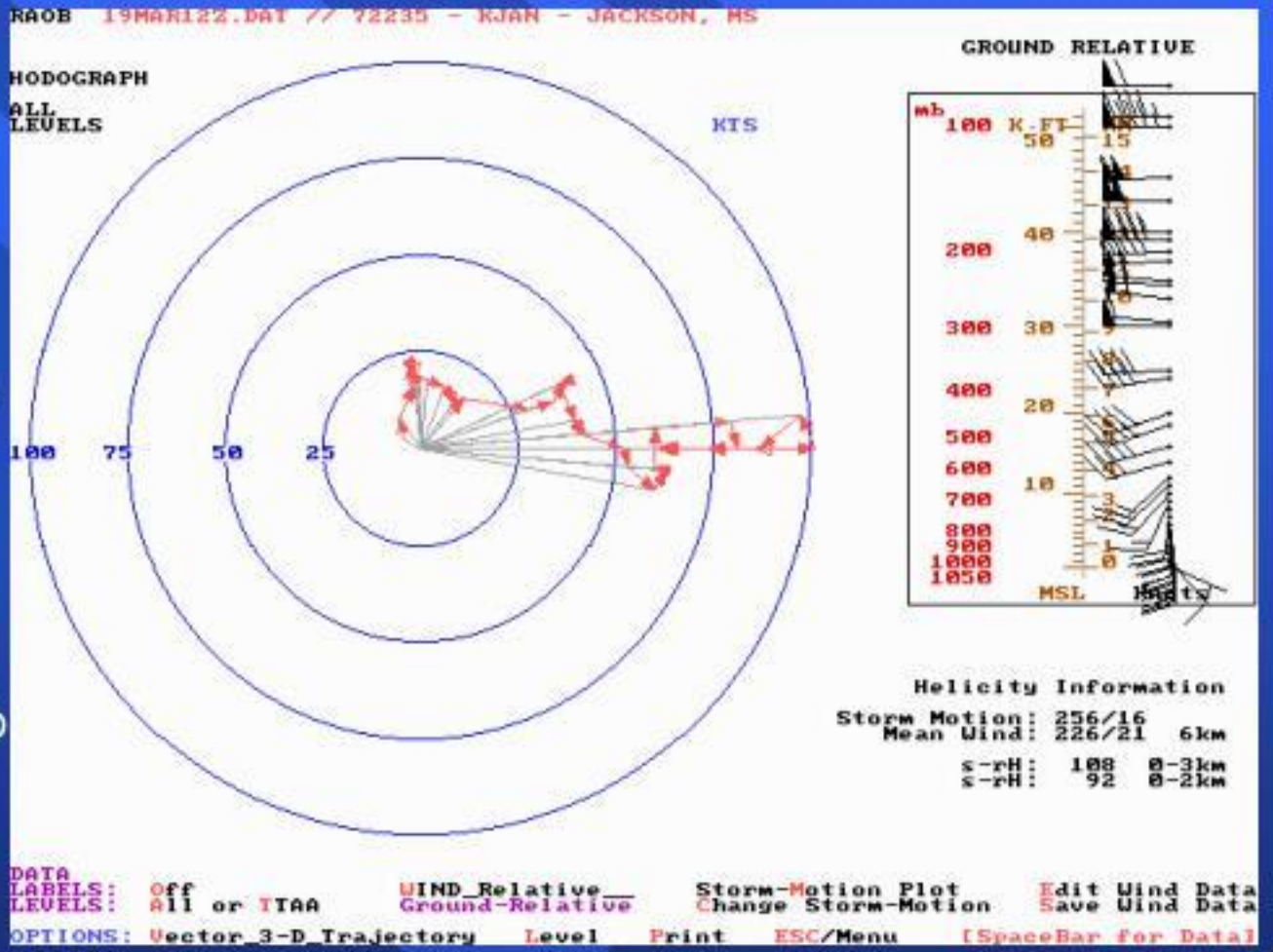
- What can we learn from this diagram?
  - We see that the wind speeds increase with height.
    - » We know this since the plotted points get farther from the origin as we go up.
  - We see that the winds change direction with height.
  - In this example we see that the hodograph is curved and it is curved ***clockwise***.
    - » If we start at the surface (SFC) and follow the hodograph curve, we go in a clockwise direction!

Hodograph -- Example

This hodograph is from Jackson, MS on 19 March 1998 at 12Z.

This is essentially a straight-line hodograph. The winds change direction near the surface and then are out of the west from about 600 mb up.

There is a maximum in the wind speed at about 150 mb then the winds slow down a bit.



This computer generated hodograph does not plot the height levels on the diagram. The height data may be omitted if there are a lot of data points to plot.