

Notes on Skew-T Plots

Skew-T plots are a convenient way to display vertical profiles of atmospheric temperature and water vapor mixing ratio. The name of the plot arises from the fact that the temperature coordinates are diagonal (i.e., “skewed”) rather than perpendicular with respect to the pressure coordinates. This skewing is done to accommodate the general decrease of temperature with height in the troposphere: if standard perpendicular coordinates were used, the atmospheric temperature profile would go too quickly towards the left side of the plot. In a skew-T plot, the typical atmospheric temperature profile goes towards the top of the plot, thus allowing more information to be portrayed.

In a skew-T plot, the vertical profile of temperature is on the right and the vertical profile of dew point is on the left. Dew point, used as a measure of water vapor mixing ratio, is always less than or equal to the temperature. When the dew point is the same as the temperature, the relative humidity is 100% and a cloud is present. In practice, instrumental errors may cause the measured dew point to be slightly less than the measured temperature in a cloud.

Elements of a skew-T plot

- a) Solid horizontal lines are lines of constant pressure. Pressure decreases in the upward direction.
- b) Solid lines going upward and rightward are lines of constant temperature. Temperature decreases in the upward and leftward direction. The atmosphere is isothermal where the temperature profile is parallel to these lines. A temperature inversion (i.e., temperature increases with height) occurs where the temperature profile crosses these lines towards the right when going upwards.
- c) Dashed lines going upward and rightward are lines of constant water vapor mixing ratio. Water vapor mixing ratio decreases in the upward and leftward direction. Water vapor mixing ratio does not change with height where the dew point profile is parallel to these lines. Water vapor mixing ratio decreases with height where the dew point profile crosses these lines towards the left when going upwards.
- d) Solid lines going upward and leftward are lines of constant potential temperature. Potential temperature increases in the upward and rightward direction. The atmosphere follows the dry adiabatic lapse rate where the temperature profile is parallel to these lines. Aside from the presence of strong daytime surface heating, a realistic temperature profile will never cross these lines towards the left when going upwards because the atmosphere would then be absolutely unstable.
- e) Dashed lines going upward and leftward are lines of constant equivalent potential temperature. Equivalent potential temperature increases in the rightward direction. Note how the potential temperature and equivalent potential temperature lines are similar to each other on the left and top sides of the plot where temperatures are cold and the saturation water vapor mixing ratio is correspondingly small. The atmosphere follows the moist adiabatic lapse rate where the temperature profile is parallel to the equivalent potential temperature lines. The atmosphere is conditionally unstable (between the dry adiabatic and moist adiabatic lapse rates) where the temperature profile crosses the equivalent potential temperature lines towards the left when going upwards.

Date/Time:

Station:

