User Guide

PlotSoundPak

PlotSoundPak is a set of MATLAB routines that fetches soundings from a web site operated by the University of Wyoming, plots them on a skew-T_v diagram, and subjects selected samples to various thermodynamic lifting processes. There are three main routines:

Setup

Unzip all the files into a single directory. To use these routines, you must be connected to the internet.

1. **Getplotsoundv.m**

This routine calculates the virtual temperatures of parcels lifted by reversible and pseudo-adiabatic processes and plots tem on a skew-T_v diagram. Note that all the quantities are plotted in density temperature space.

Use

Type "getplotsoundv" at the MATLAB command prompt from within the directory containing the scripts. You will then be prompted to enter a station identifier, which can be *either* the official station name in singe quotes (e.g. 'Majuro', case-insensitive) or the 5-digit station identifier (e.g. 91376, which is Majuro). For a map of radiosonde stations, go to http://weather.uwyo.edu/upperair/sounding.html and pass your mouse over any of the stations indicated in white. The 5-digit station identifier will appear in a box at upper right.

You will next be promoted for a date in time, which must be entered within square brackets, e.g. [2014 9 30 12]. Note that soundings are only taken at 0 and 12 GMT, so the last number must be 0 or 12.

If the routine finds the indicated sounding, its virtual temperature will be plotted in red and its virtual dewpoint temperature will be plotted in green.

The routine then asks for a pressure level from which to lift a test sample. Enter the pressure level (e.g. 950) in hPa. The routine will find the nearest pressure level to that pressure that is an actual measurement point in the sounding, and will plot two quantities:

1. The pseudo-adiabatic virtual temperature (dashed red line)
2. The reversible density temperature (blue dots, which also show you the actual observation points in the sounding).

You can then enter, in succession, any number of other pressure levels from which to lift a sample, until you type 0, which stops the program.

2. Entrain.m

This routine is identical to *getplotsoundv.m* described above, but it also calculates the density temperature of an entraining plume (with an entrainment rate that varies inversely with altitude). Condensation in the plume is pseudo-adiabatic, in the sense that all condensed water is immediately removed, but in this case a phase change to water ice is assumed at temperatures below 0 C. (Just type "entrain" at the MATLAB prompt.) Note that in the final step, the routine plots the density temperature difference between the three processes (reversible adiabatic without ice, pseudo adiabatic with ice phase, and entraining plume with ice phase) and the environment.

Use

Just type "entrain" at the MATLAB prompt; otherwise, follow the instructions for *getplotsoundv*.

3. Buoycon.m

This routine lifts samples from each observation point in a sounding, up to a specified minimum pressure, to all other observation points in the sounding, and calculates the difference between the lifted sample's density temperature and the density temperature of the environment. The routine contours this difference in a space defined by the sample origin pressure and the pressure to which the sample is lifted. The first graph is for a reversibly lifted sample, and the second for a pseudo-adiabatically lifted sample; neither process includes the ice phase.

Use

Type "buoycon" at the MATLAB prompt; otherwise, follow the instructions for *getplotsoundv*. The first graph is for reversible ascent, the second for pseudo-adiabatic ascent. At the beginning of script, one can change the minimum sample origin pressure, the minimum pressure to which samples are lifted, the cut-off values of buoyancies plotted, and whether the y axis is linear or log.