Pearl Ayem – 34404160

**ATSC 303 Lab 12– Upper-Air Measurements**

**Part 1**

1. **Using the data provided in the 2011 Excel spreadsheet (“23Mar2011Sounding.xls”), make a table listing all the significant levels i.e. significant/abrupt changes and extrema in the plotted sounding. Your table should include the height, pressure, temperature, dewpoint temperature, and wind speed and direction at each significant level.**

The following table was generated for the sig points:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pressure (hPa) | Height (m) | Temp (℃) | Temp Dew Point (℃) | Direction (°N) | Windspeed (km/h) |
| 47.9 | 88 | -55.15 | -86.85 | 2 | 1.8 |
| 48.1 | 100 | -54.85 | -85.45 | 2 | 7.56 |
| 52.8 | 121 | -54.65 | -85.25 | 71 | 11.52 |
| 53.7 | 329 | -54.65 | -85.25 | 72 | 13.32 |
| 71.8 | 489 | -54.45 | -84.95 | 78 | 14.04 |
| 72.2 | 492 | -54.45 | -84.95 | 82 | 14.76 |
| 94.7 | 530 | -53.85 | -84.05 | 95 | 16.92 |
| 94.8 | 573 | -52.85 | -84.05 | 112 | 18.72 |
| 126.6 | 797 | -52.35 | -84.05 | 118 | 22.68 |
| 128.7 | 1170 | -52.15 | -84.05 | 119 | 23.4 |
| 149.4 | 1399 | -52.15 | -83.85 | 119 | 24.48 |
| 151.4 | 1472 | -51.95 | -82.55 | 125 | 24.48 |
| 213.2 | 1693 | -51.65 | -82.45 | 126 | 24.84 |
| 219.8 | 1752 | -51.65 | -82.25 | 135 | 24.84 |
| 224.4 | 2081 | -50.55 | -81.15 | 139 | 25.2 |
| 234.9 | 2212 | -50.45 | -80.65 | 139 | 25.2 |
| 265.1 | 2233 | -50.35 | -76.65 | 161 | 25.2 |
| 274.5 | 2656 | -50.35 | -71.45 | 162 | 25.92 |
| 276.8 | 2717 | -50.25 | -69.35 | 162 | 25.92 |
| 280.8 | 3022 | -50.15 | -67.65 | 172 | 25.92 |
| 285.9 | 3355 | -50.05 | -66.85 | 179 | 25.92 |
| 290.4 | 3700 | -48.25 | -65.75 | 179 | 27.72 |
| 336.2 | 4939 | -48.15 | -56.15 | 183 | 28.08 |
| 356.4 | 4972 | -46.45 | -55.55 | 184 | 28.08 |
| 378.1 | 5284 | -43.65 | -55.55 | 184 | 28.08 |
| 404.2 | 5296 | -39.75 | -52.85 | 184 | 28.8 |
| 408.2 | 5451 | -39.15 | -52.35 | 184 | 29.52 |
| 421.1 | 5573 | -37.45 | -50.75 | 186 | 29.52 |
| 433.7 | 5620 | -35.75 | -50.35 | 190 | 29.88 |
| 473.9 | 5788 | -30.85 | -50.15 | 191 | 30.24 |
| 485.3 | 6412 | -29.55 | -47.95 | 191 | 30.6 |
| 488.5 | 6615 | -29.45 | -46.05 | 193 | 30.6 |
| 496.9 | 6829 | -29.05 | -46.05 | 194 | 30.6 |
| 507.7 | 6897 | -27.85 | -45.25 | 195 | 30.96 |
| 508.6 | 7350 | -27.85 | -44.85 | 198 | 30.96 |
| 531.2 | 7743 | -27.85 | -29.95 | 198 | 31.32 |
| 533.6 | 8128 | -27.65 | -29.75 | 199 | 31.68 |
| 631.7 | 9073 | -16.95 | -22.05 | 201 | 32.04 |
| 661.2 | 9172 | -13.85 | -22.05 | 205 | 32.4 |
| 690.6 | 9288 | -11.35 | -16.55 | 205 | 32.4 |
| 718.6 | 9379 | -9.55 | -13.65 | 205 | 32.76 |
| 724.3 | 9433 | -9.15 | -13.45 | 206 | 33.12 |
| 764.8 | 9655 | -6.55 | -12.55 | 208 | 33.12 |
| 766.8 | 10434 | -6.55 | -11.95 | 209 | 33.84 |
| 779.8 | 10728 | -5.65 | -11.55 | 210 | 34.56 |
| 813.1 | 10862 | -3.95 | -11.05 | 212 | 34.92 |
| 819.2 | 11062 | -3.55 | -9.85 | 215 | 36.72 |
| 842.4 | 13305 | -2.15 | -9.55 | 216 | 38.16 |
| 850.2 | 13394 | -1.75 | -9.35 | 216 | 38.16 |
| 875 | 14366 | 0.25 | -9.25 | 217 | 39.96 |
| 916.4 | 14472 | 3.35 | -8.25 | 219 | 40.68 |
| 942 | 16355 | 3.65 | -8.25 | 220 | 40.68 |
| 947 | 16360 | 3.65 | -7.25 | 221 | 43.56 |
| 951.4 | 18115 | 4.35 | -2.35 | 228 | 44.28 |
| 951.8 | 18148 | 4.85 | -2.35 | 229 | 44.28 |
| 970.7 | 20027 | 4.85 | -1.25 | 231 | 44.28 |
| 995.7 | 20139 | 5.05 | -0.85 | 231 | 44.64 |
| 998.3 | 20746 | 5.15 | -0.75 | 231 | 45.36 |
| 999.8 | 20763 | 6.05 | 2.85 | 232 | 48.24 |
| 999.8 | 20844 | 6.05 | 2.85 | 360 | 50.4 |

For visual simplicity, the following plot was constructed using the mandatory and significant points mentioned in this table:

A close up of a map

Description automatically generated

1. **Complete the table of mandatory levels provided in the spreadsheet (it is under a different tab).**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (s) | P (hPa) | Height (m) | T (degC) | TD (degC) | RH (%) | v (m/s) | u (m/s) | DD (degN) | FF (m/s) | FF (km/h) | Lon (degE) | Lon (degN) |
| 2 | 999.1 | 94 | 5.05 | -0.95 | 65 | 1.65 | 2.4 | 235 | 2.9 | 10.44 | -123.24 | 49.25 |
| 236 | 925.2 | 719 | 4.05 | -10.55 | 33 | 0.34 | -8.4 | 92 | 8.4 | 30.24 | -123.25 | 49.25 |
| 498 | 850.2 | 1399 | -1.75 | -11.55 | 47 | 4.14 | -7.39 | 119 | 8.5 | 30.6 | -123.28 | 49.26 |
| 1214 | 699.7 | 2922 | -10.95 | -14.35 | 76 | 6.72 | 0.95 | 188 | 6.8 | 24.48 | -123.31 | 49.3 |
| 2368 | 499.9 | 5408 | -28.75 | -46.75 | 16 | 4.84 | 5.93 | 231 | 7.7 | 27.72 | -123.23 | 49.38 |
| 3076 | 400.1 | 6967 | -40.45 | -48.85 | 41 | 7.76 | 3.65 | 205 | 8.6 | 30.96 | -123.2 | 49.42 |
| 3924 | 300.0 | 8865 | -53.75 | -67.15 | 19 | 12.98 | 8 | 212 | 15.2 | 54.72 | -123.16 | 49.49 |
| 4426 | 250.0 | 10031 | -53.95 | -78.45 | 4 | 10.98 | 1.13 | 186 | 11 | 39.6 | -123.13 | 49.54 |
| 5034 | 200.1 | 11476 | -49.75 | -83.55 | 1 | 11.3 | -2.04 | 170 | 11.5 | 41.4 | -123.12 | 49.59 |
| 5802 | 150.1 | 13364 | -48.45 | -82.75 | 1 | 9.59 | 3.35 | 199 | 10.2 | 36.72 | -123.1 | 49.64 |
| 6798 | 100.0 | 16006 | -51.15 | -84.65 | 1 | 3.64 | 3.45 | 223 | 5 | 18 | -123.06 | 49.7 |
| 7664 | 70.0 | 18311 | -52.85 | -85.85 | 1 | 4.05 | 3.19 | 218 | 5.2 | 18.72 | -123.03 | 49.75 |
| 8490 | 50.0 | 20488 | -51.25 | -84.65 | 1 | 2.69 | -2.78 | 134 | 3.9 | 14.04 | -123.02 | 49.76 |

1. **Plot the dry-bulb and dewpoint temperatures at the mandatory and significant levels (i.e. use the entire data set) on the blank tephigram provided (use a pencil). Use a dot to denote your points plotted at the significant levels, and an open circle to denote your points plotted at the mandatory levels. /10 NOTE: If you are unable to print out the tephigram and plot the points by hand, you can instead open up the PDF in Paint/Powerpoint/whatever other photo or image editor you have, and plot the points using software instead.**
2. **Why do we only plot:** 
   1. **Mandatory levels**

These are reported in to correspond to the standard heights in upper air charts, and make it easy to compare.

* 1. **Significant levels**

Rising rawinsondes record over 5000 rows of data points since they record the weather at approximately ∆z ≈ 5 m increments. To reduce the amount of data transmitted to weather centers, only significant points are reported and straight-line segments are fit in between these significant points.

1. **On your tephigram, clearly mark and label: a. The planetary boundary layer /2 b. The tropopause. /2 Give an explanation for your placement of each.**
2. **Determine the static stability vs. height of the sounding using the nonlocal apex method. Be sure to show your work on the tephigram. /4 HINT: see Background section for resources.**

**Part 2**

1. **Using the data provided in the 2017 Excel spreadsheet (“Sounding23Mar2017.xls”), plot the temperature and dewpoint profiles vs. pressure using Excel, or a programming language. Also make a plot with the wind speed profile, and another with the wind direction (you should have 3 plots total for this question). /6**