

IC6.1: Optional Job Sheet Answer Key

Introduction to the Top-Down Methodology

Question 1. Where are the clouds supportive of ice crystal growth? Based on the NAM40 time-height plot, infer when ice crystals are possible in south central Texas.

The entire western half of Texas has cloud top temperatures colder than -20 C and therefore definitely cloud supportive of ice growth. Parts of East Texas and southeast Texas are borderline with cloud top temperatures between -10 and -20 C, but still supportive of ice growth. We selected a point near Austin, Texas for the time height plot. Near-saturation conditions exist up to around -15 C from ~21-01 UTC 24-25 February. Thus, there at least an 80% chance the cloud will contain ice crystals.

Question 2. Which soundings will support ice in the cloud layer?

Again, looking for near-saturation to temperatures colder than -10 C. Ardmore, Dallas, Abilene, and Austin model soundings all have near-saturation conditions from -20 to -40 C which should be enough for saturation with respect to ice, and because of the seeder feeder mechanism these all appear favorable for the formation of ice in the cloud. All 3 RAOBS also have near-saturation conditions above ~500 mb, plenty cold for the presence of ice. It should be noted that none of the soundings were shown to be saturated at temperatures colder than -10 C.

Question 3. What is the maximum temperature in the warm layer? + 5 °C

Question 4. Is the warm layer unsaturated (circle one)? YES

Question 5. Based on this warm layer, will precip melt, partially melt, or remain as snow (circle one)? Melt

Question 6. What is the wet-bulb zero height? 649 feet, below warm layer it is entirely below freezing

Question 7. What is the surface wet-bulb zero temperature in the Dallas area?

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MSAS 25°F, NAM20 29°F

Question 8. Is this supportive of snow (circle one)? NO

Question 9. What are the low-level lapse rates like--Steep? What does that say about precipitation type?

Unimportant since surface temperatures well below freezing.

Question 10. Based on the top-down approach you have taken with this sounding, put it all together and make a forecast of just P-type and the evolution of the P-type using the NAM 40 sounding for the Dallas/Ft. Worth Metroplex from 18 Z on the 24th through 12 Z on the 25th:

At 18 UTC sleet is the forecast because the warm layer is sufficient to melt precipitation yet surface wet-bulb temperatures are very cold (~25 F) and the maximum wet-bulb temperature is -10 C in the cold layer. By 00 UTC the warm layer is saturated and still +4 C, thus sleet mixed with freezing rain should be expected by 03 UTC. Additionally, the near surface cold layer is greater than 2500 feet deep and colder than -6 C, typically this means all sleet. By 12 UTC temperatures in the warm layer aloft sufficiently cool such that a sleet and snow mixture could be expected, but a caveat to this forecast is that there may not be ice present in the cloud.

Question 11. Using the top-down approach, what is the expected P-type and evolution from 18 Z on the 24th through 12 Z on the 25th for Austin based on this sounding?

At 18 UTC Austin will have rain. According to the NAM20, the surface cold air surge is strong enough to push Austin to 0C, and freezing rain is possible. By 12 UTC on the 25th everything dries out above 925 mb and any precip around that time would be freezing rain or drizzle.

Question 12. Using the top down approach, what is the expected P-type and evolution from 18Z on the 24th through 12 Z on the 25th for Ardmore based on this sounding?

At 18 UTC the warm nose is 1C and unsaturated, so snow is likely. The warm layer aloft never warms to above 1 C and by 12 UTC it is below freezing, thus snow is likely throughout the forecast period.