A Dry-line seen in IR and WV Imagery

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During the evening of May 17, 1996, a dry-line extended from north Texas into southeastern Nebraska. As the dry-line propagated eastward, severe weather erupted along the line. From approximately 4:30-7:30 pm CDT(see images below), hail from 3/4 inch to 2 3/4 inch in size was reported in Nebraska and Kansas. The dry-line (and the storms which developed with it) was clearly indicated by digital RAMSDIS GOES-9 imagery on the Infrared and Water Vapor products (see imagery). The dry-line was not evident on analog MICROSWIS imagery. Until this, the only method for locating a dry-line was by meso-analysis. The capabilities of RAMSDIS can now provide an improved forecasting tool for locating the dry-line in areas where observations are sparse or even between observations.

A dry-line is known to propagate eastward during the day and then retreat west during the evening and night. The westward movement is produced as a nocturnal inversion forms west of the dry-line. This decouples the boundary layer and allows the easterly ageostrophic wind ahead of the dry-line boundary to "push" it back to the west. In the inversion west of the boundary, the much drier air cools very rapidly which gives rise to a sharp, thermal discontinuity. Forecasting movement during the day is accomplished by examining the thermodynamic properties in the morning. However, forecasting movement at night is much more difficult due to the lack of north Texas, western Kansas and Oklahoma panhandle observations. Hopefully, RAMSDIS will provide a more useful alternative.

The RAMSDIS GOES-9 system processes digital data opposed to MICROSWIS which processes analog data. The difference here is that an analog signal uses a continuous stream of data relying on amplitude strength to assign numerical values. This method can be easily subject to noise and frequency variations. The digital method uses discrete values which are not as easily affected by noise. The new GOES-9 satellite is three-axis stabilized, meaning it remains stationary in space. This allows the instruments to be continuously pointed at the earth. The old satellite was spin stabilized, meaning the instruments rotated with the spacecraft.

This points to the RAMSDIS imagery having a much better resolution and thus enabling features such as the dry-line to be detected. On the IR imagery, the satellite may be seeing the cooling air behind the boundary as the inversion developed. Notice the boundary was not as clearly visible when temperatures to either side of the boundary were equal. On the water vapor imagery, only the line itself has an absence of vapor. The satellite may be detecting descending air along the boundary as geostrophic winds descend the potential temperature surfaces.

RAMSDIS digital imagery provides a very practical use and even more specialized uses as shown here. The ability to see the dry-line without surface analysis will provide forecasters with advance detection on dry-line location as well as forecasting dry-line retreat. Both of these tasks were previously difficult and time-consuming. Hopefully, this will save some of that time.

Figure 1. GOES-9 2100Z 17 May 1996 IR image

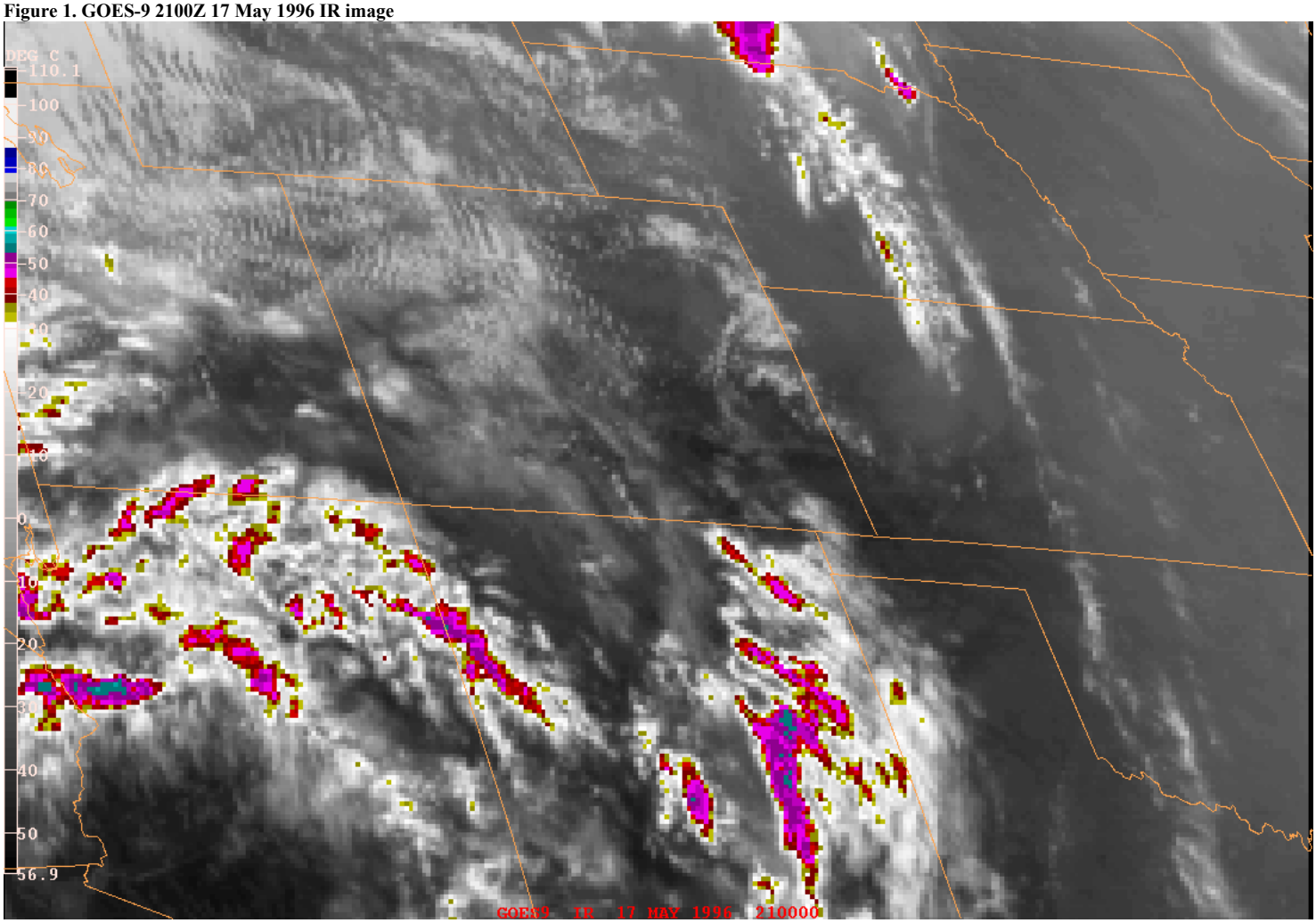


Figure 2. GOES-9 2130Z 17 May 1996 IR image

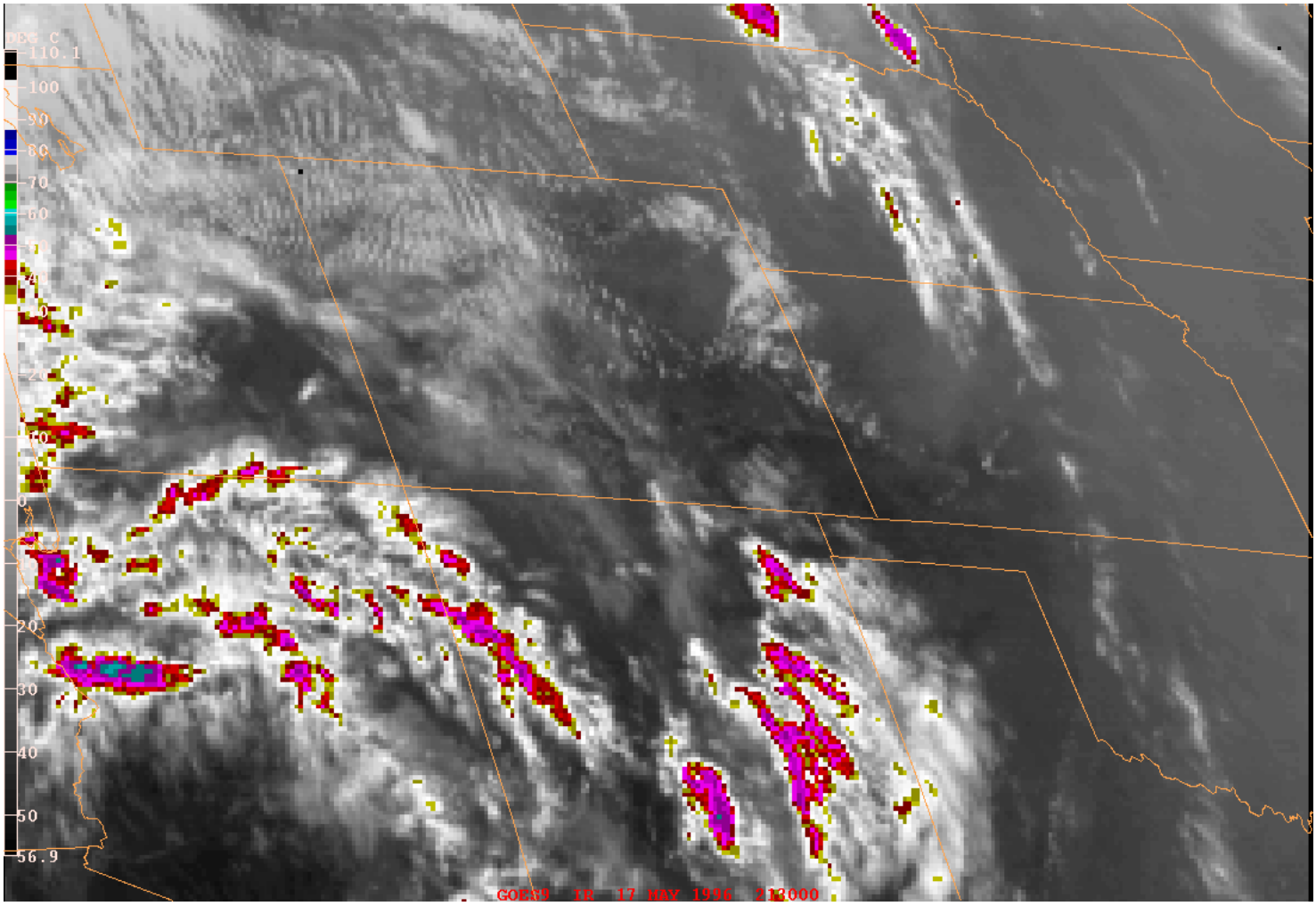


Figure 3. GOES-9 2215Z 17 May 1996 IR image

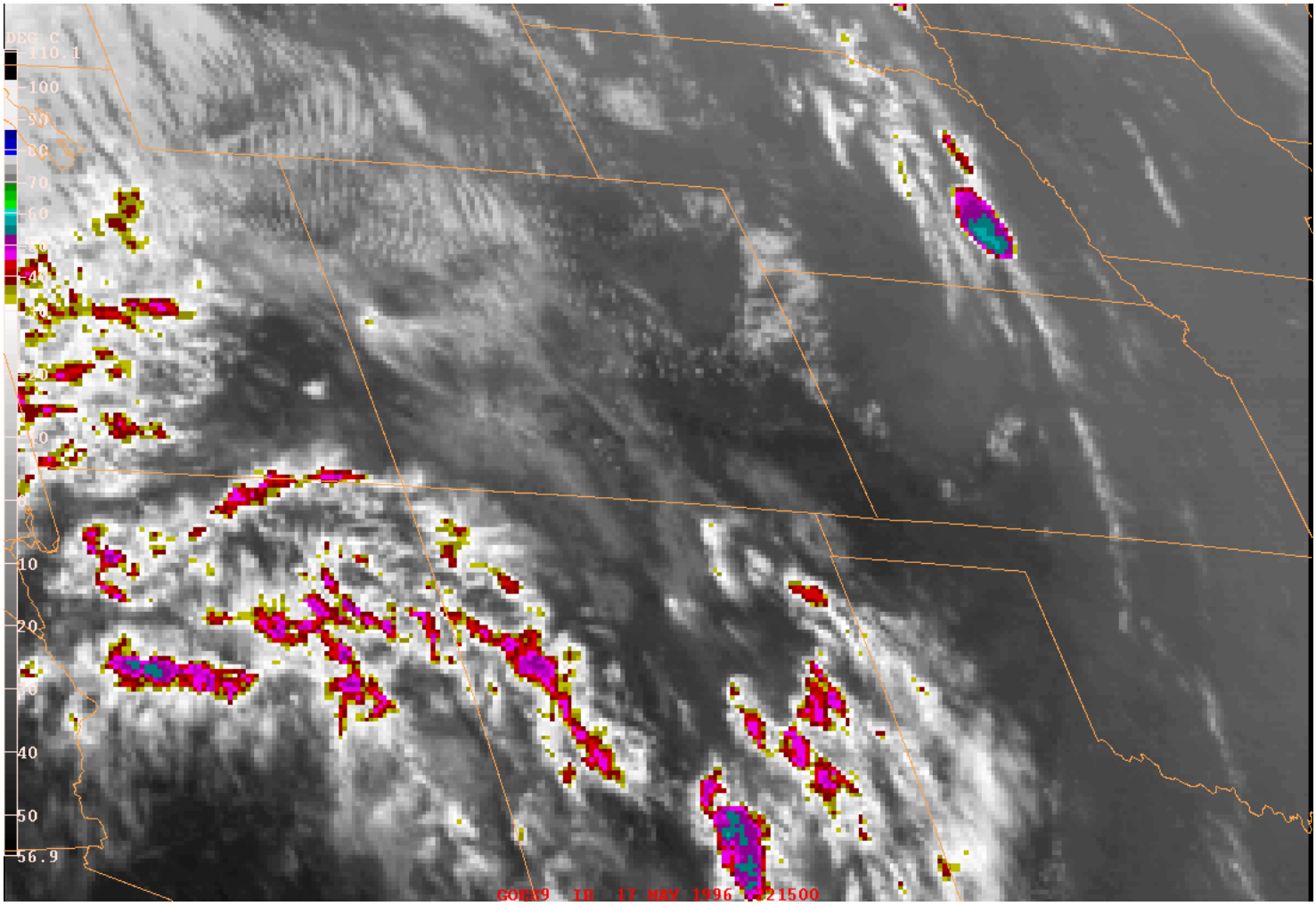


Figure 4. GOES-9 2245Z 17 May 1996 IR image

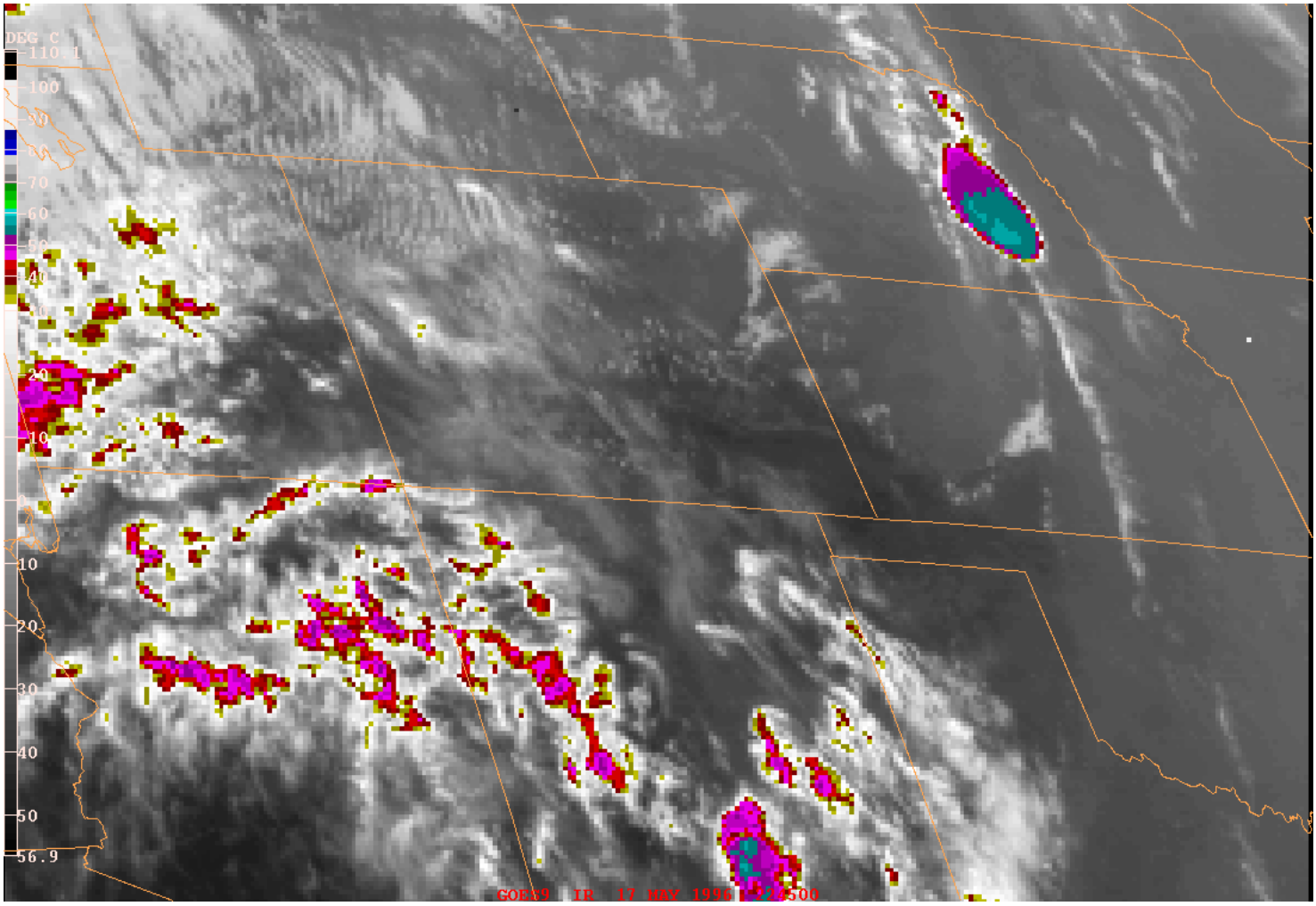


Figure 5. GOES-9 2315Z 17 May 1996 IR image

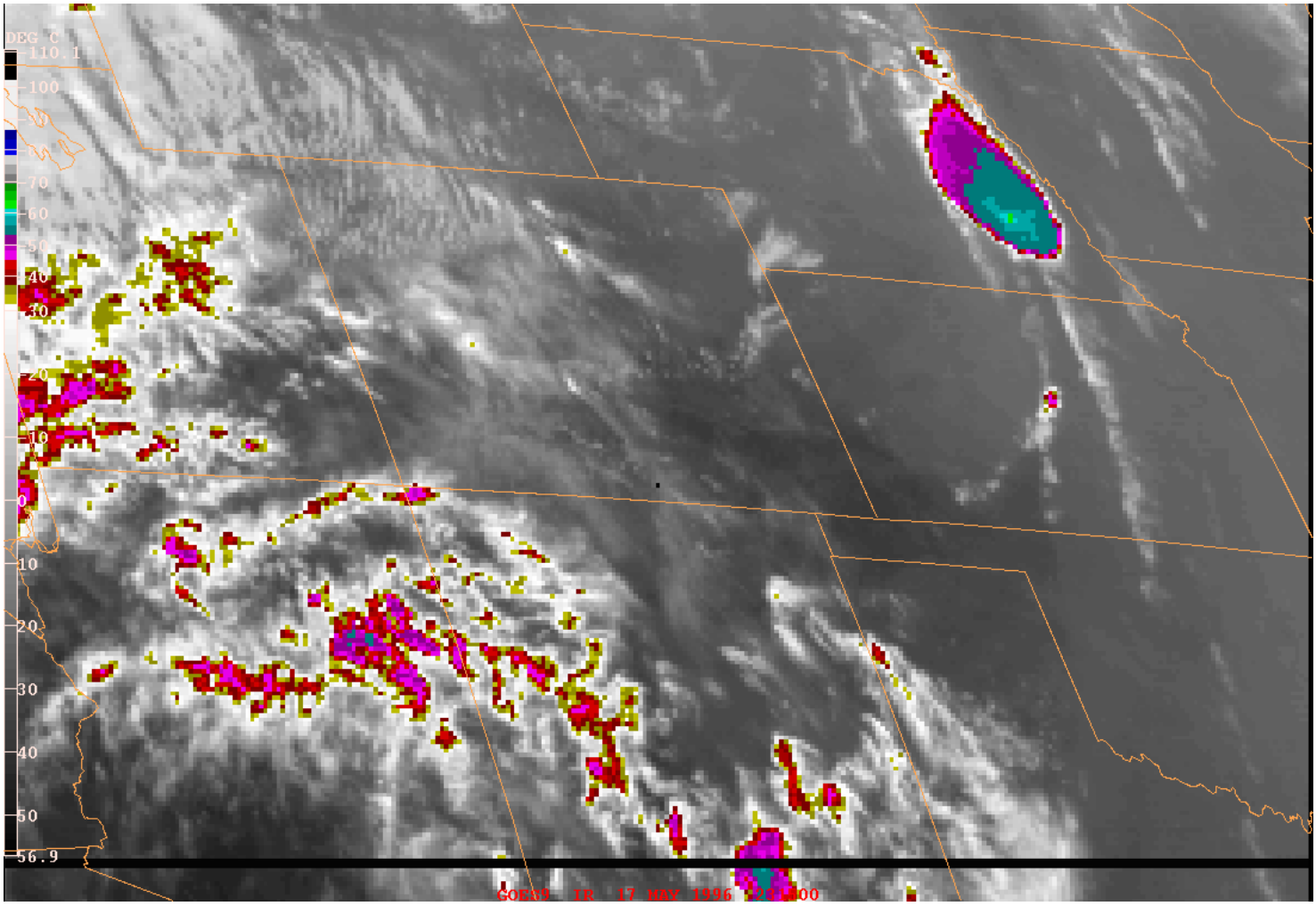


Figure 6. GOES-9 2345Z 17 May 1996 IR image

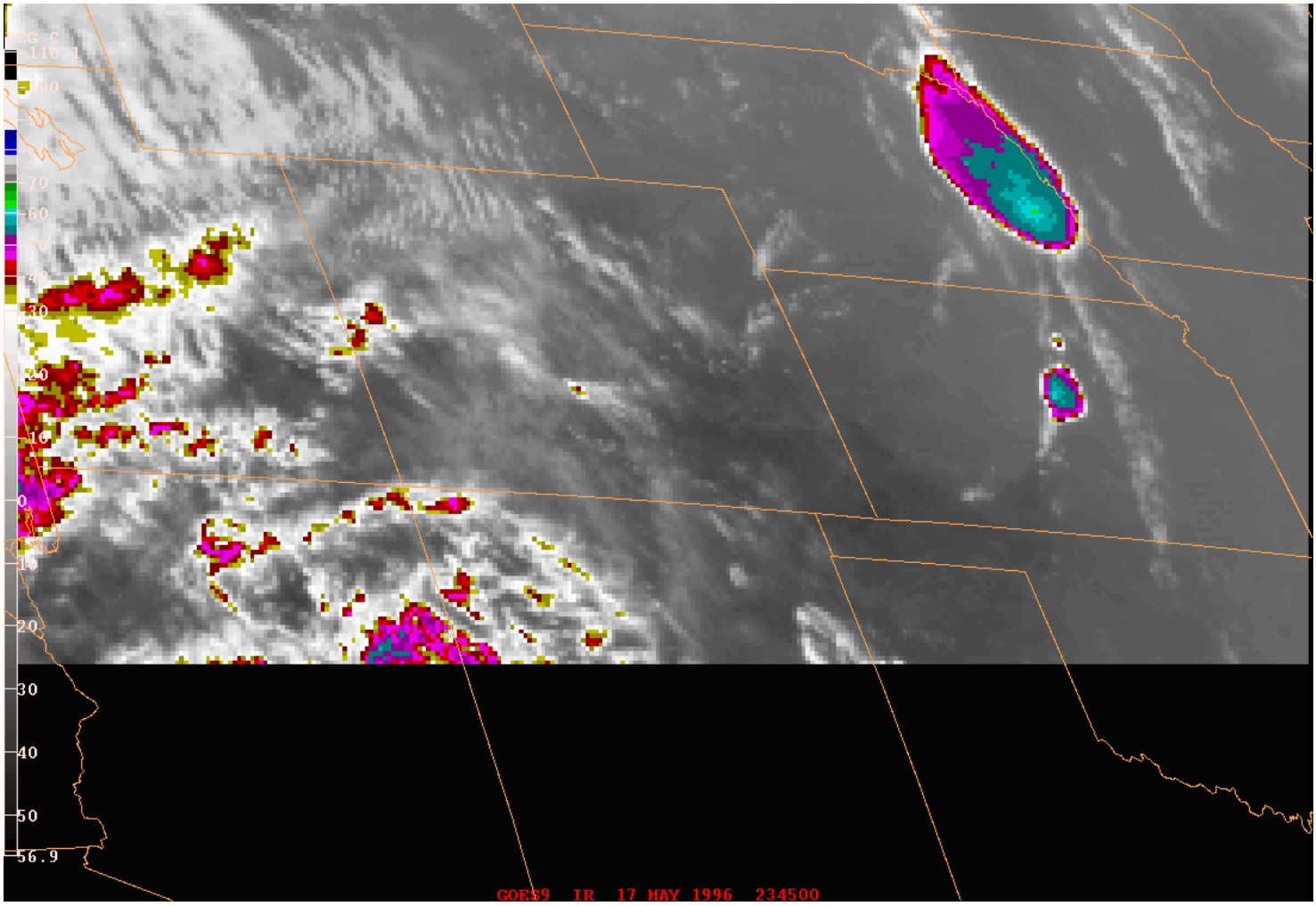


Figure 7. GOES-9 0000Z 18 May 1996 IR image

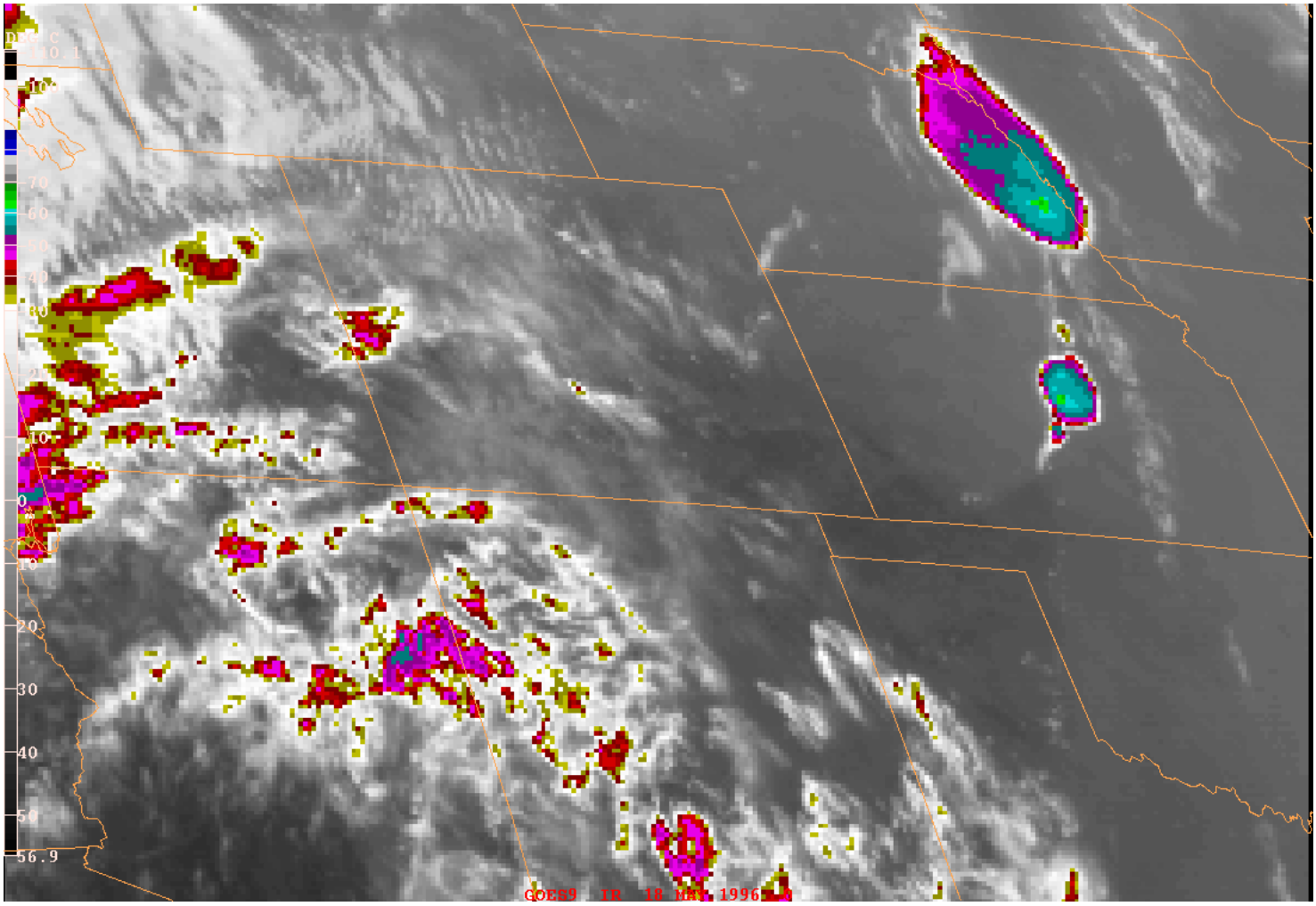


Figure 8. GOES-9 0045Z 18 May 1996 IR image

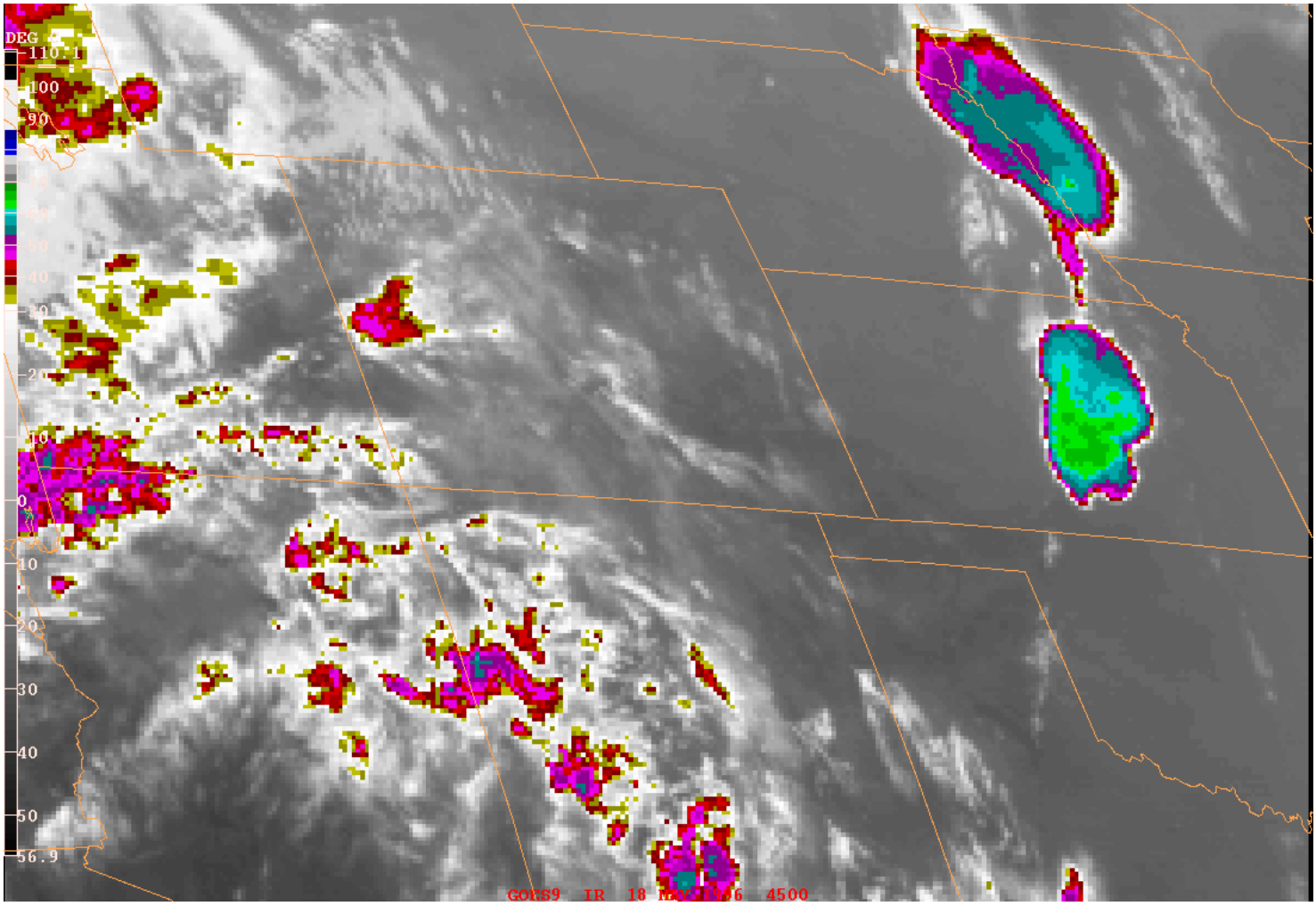


Figure 9. GOES-9 0145Z 18 May 1996 IR image

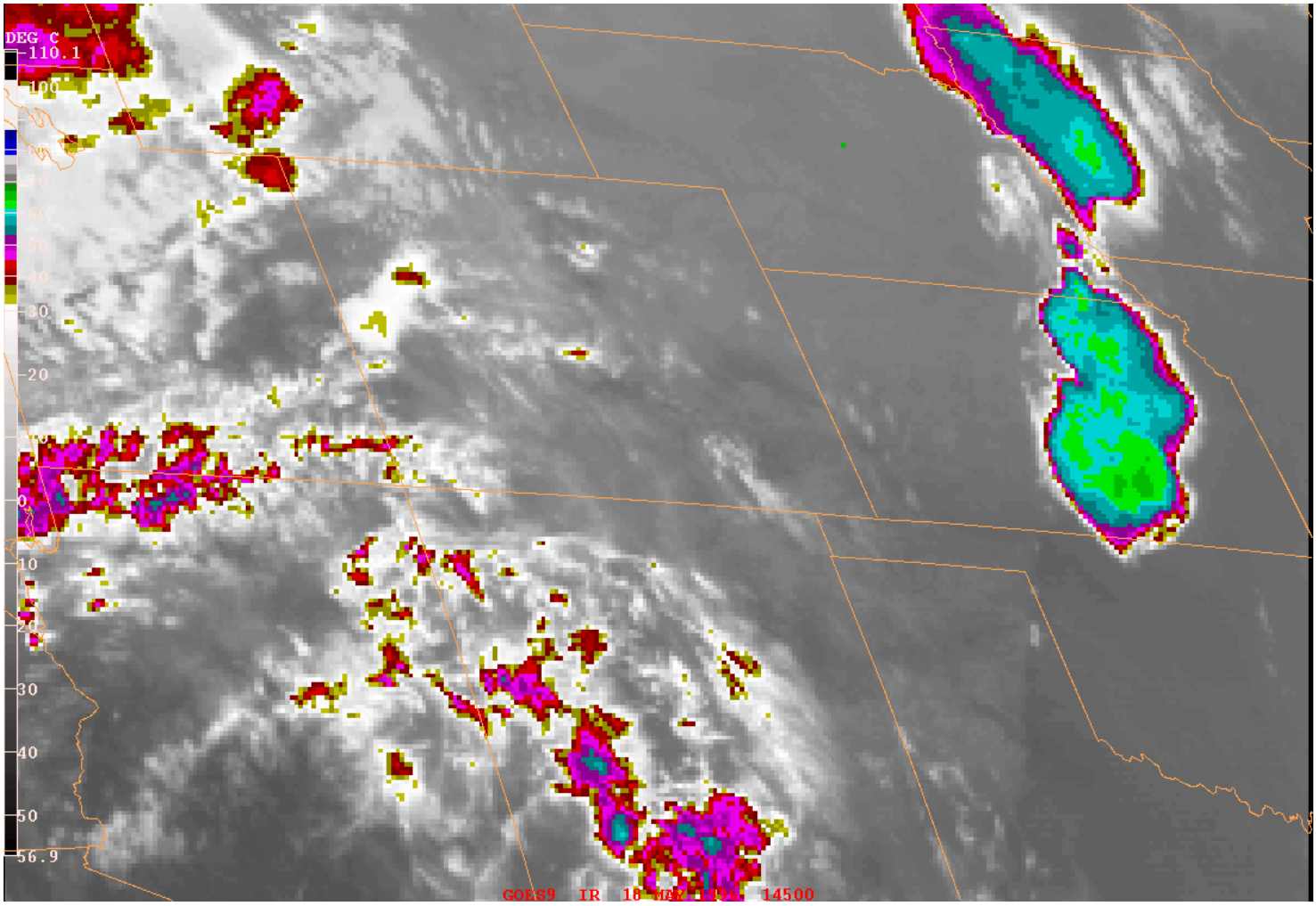


Figure 10. GOES-9 2100Z 17 May 1996 WV image

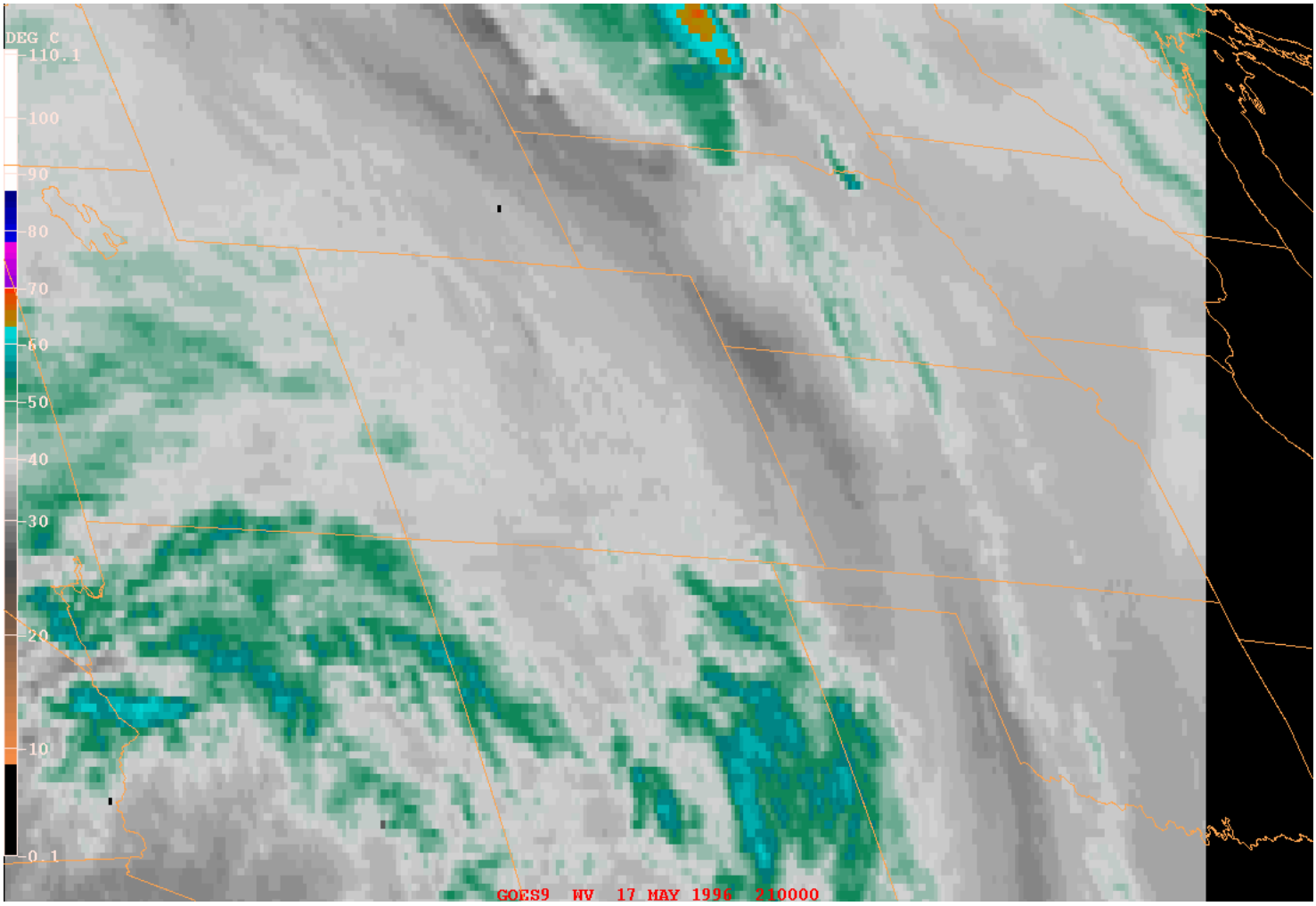


Figure 11. GOES-9 2130Z 17 May 1996 WV image

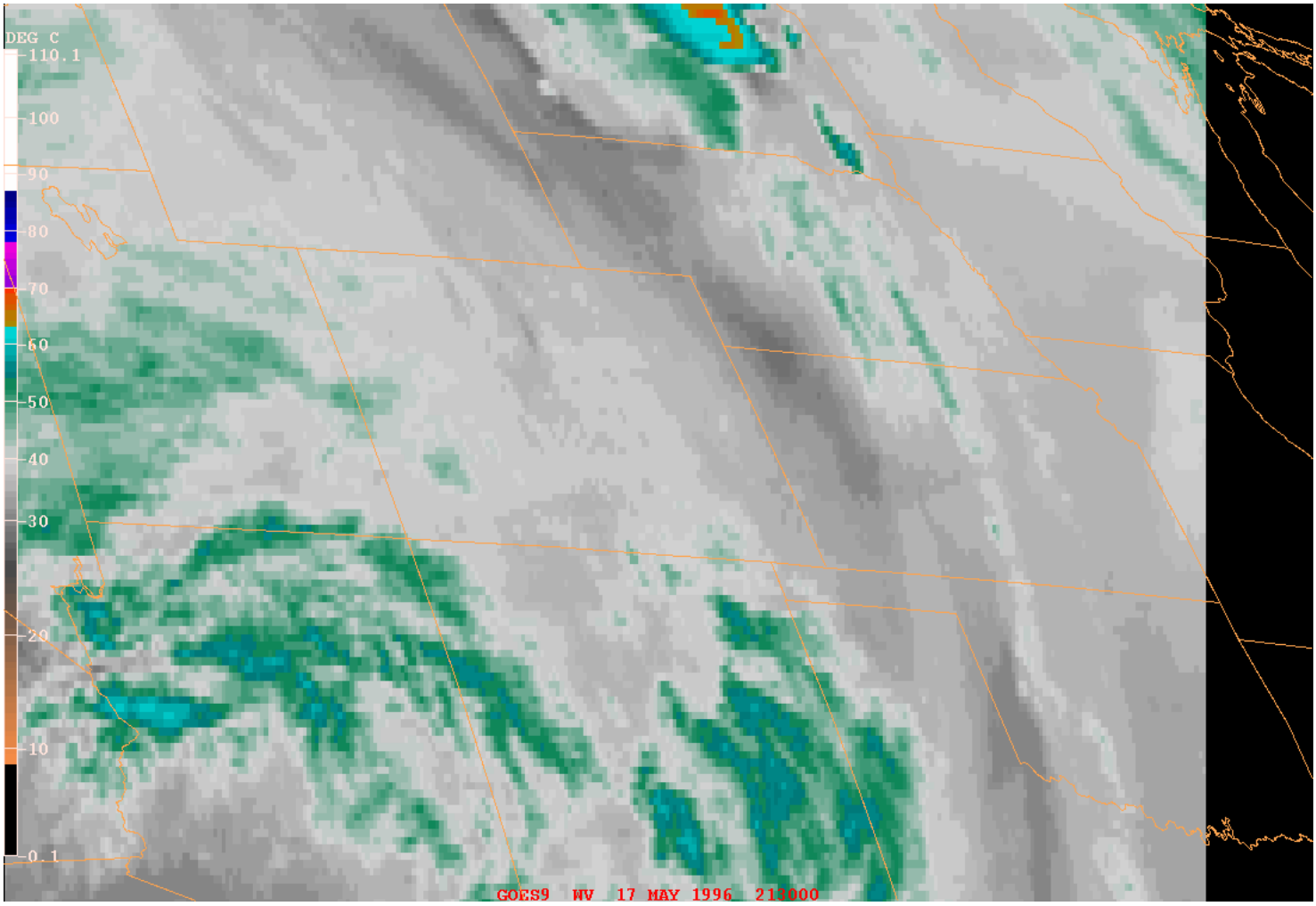


Figure 12. GOES-9 2200Z 17 May 1996 WV image

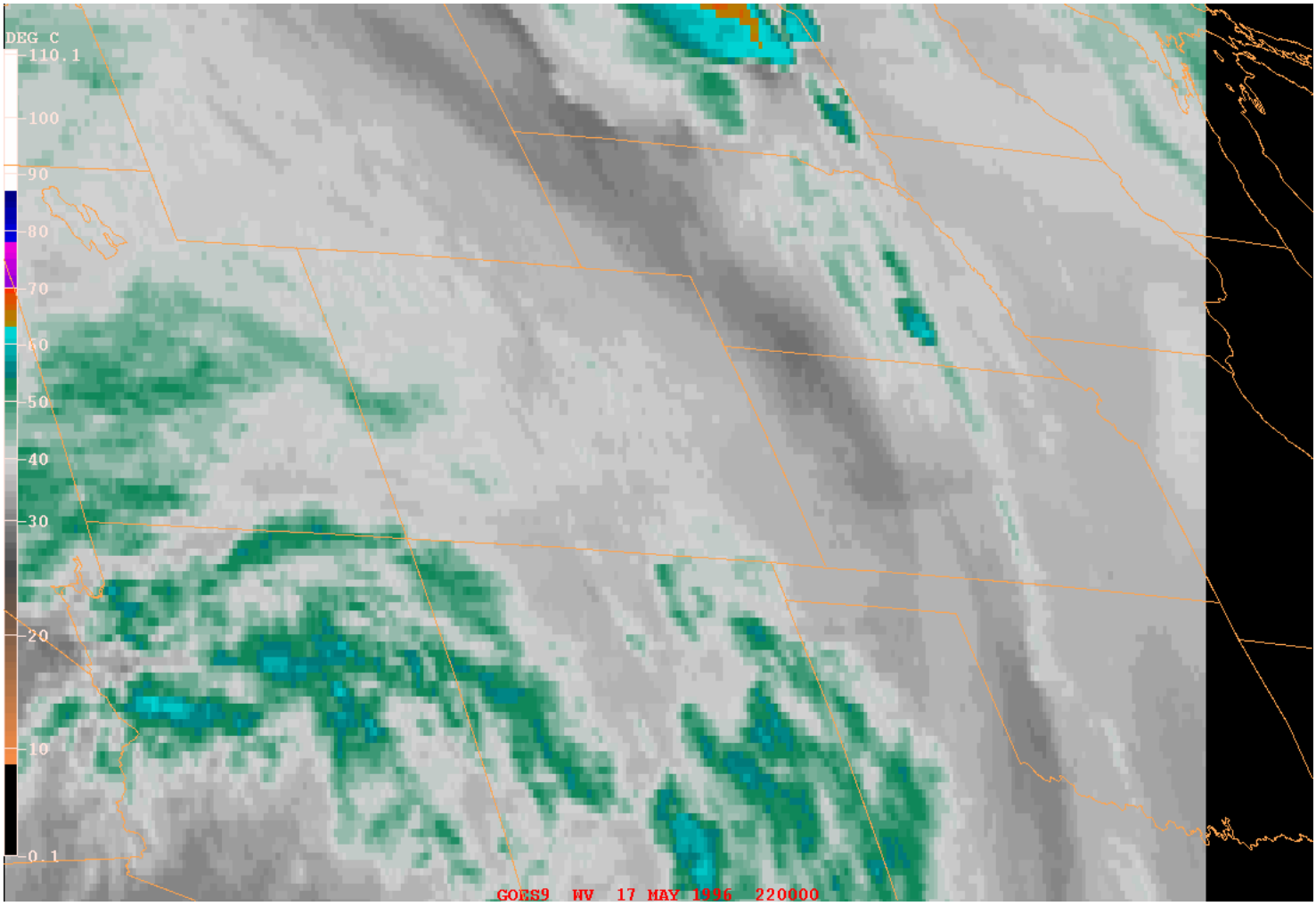


Figure 13. GOES-9 2230Z 17 May 1996 WV image

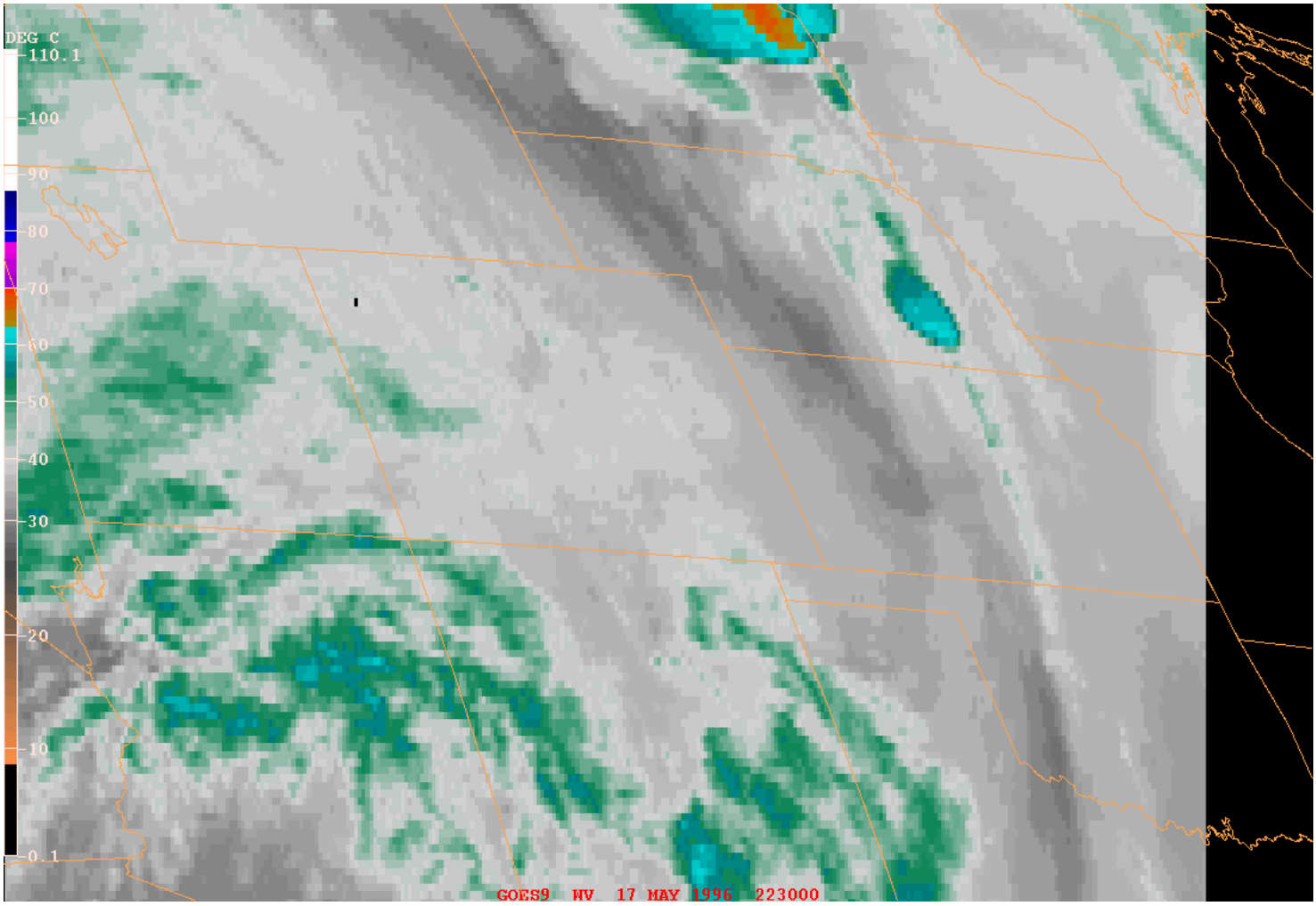


Figure 14. GOES-9 2300Z 17 May 1996 WV image

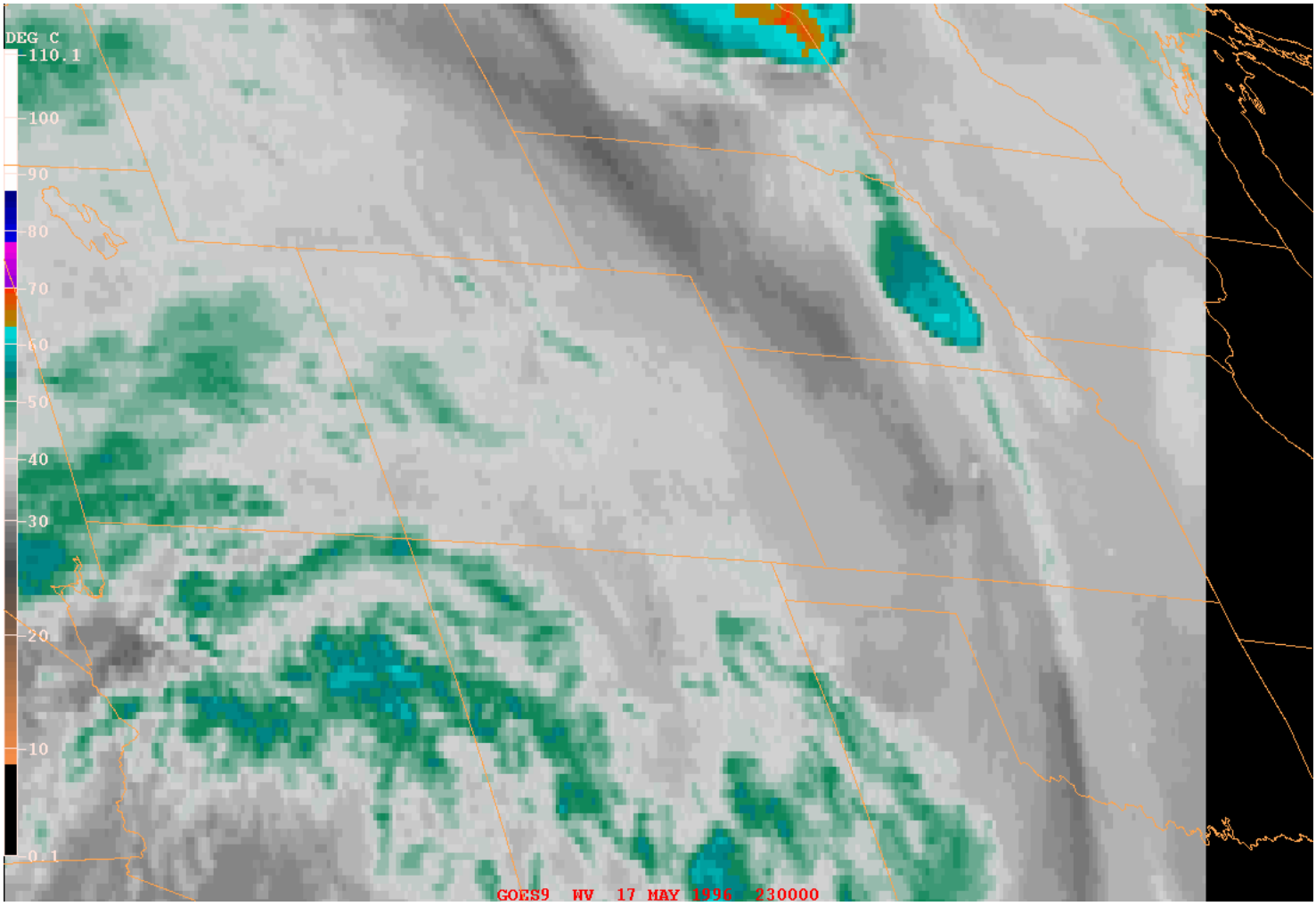


Figure 15. GOES-9 2330Z 17 May 1996 WV image

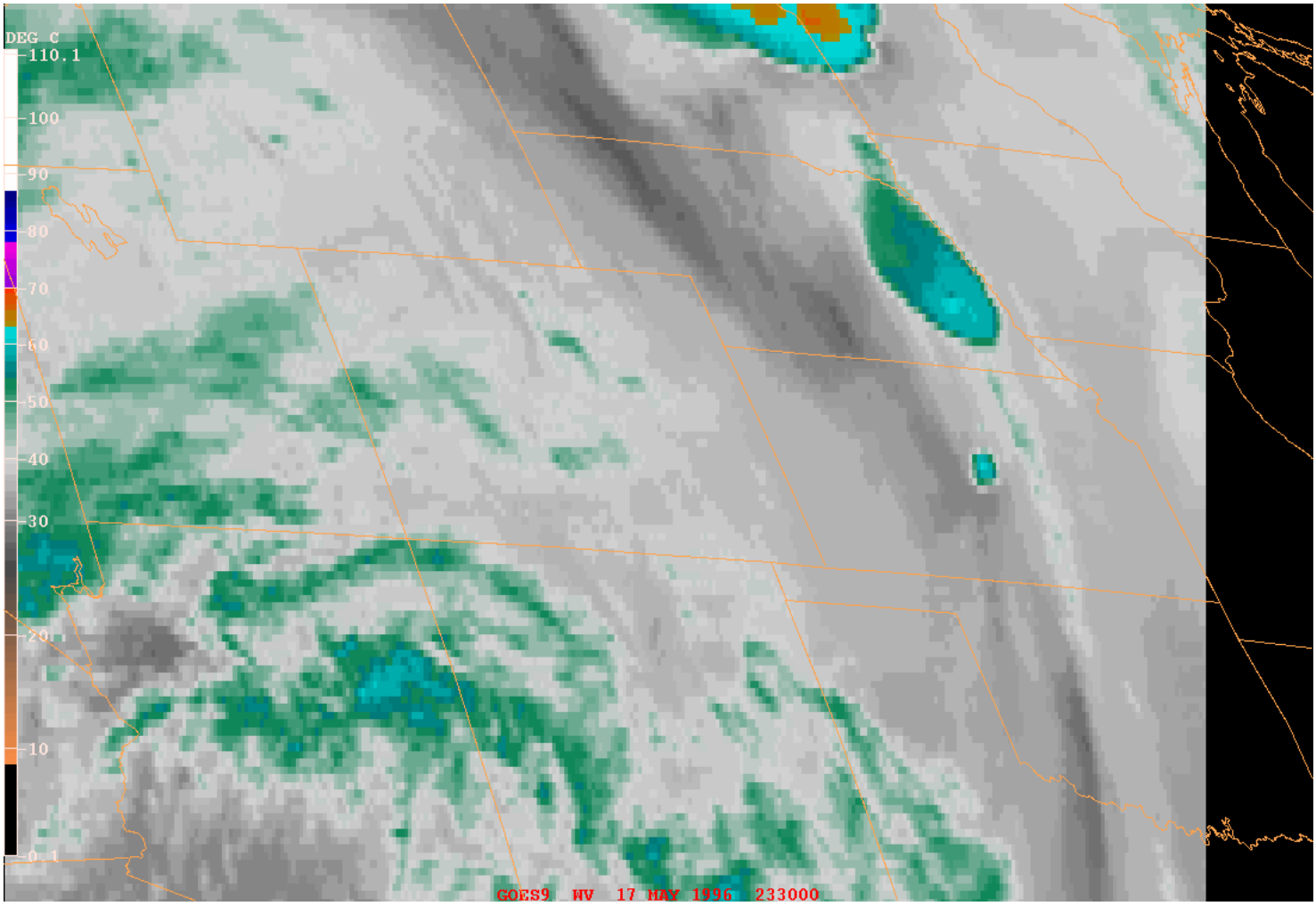


Figure 16. GOES-9 0000Z 18 May 1996 WV image

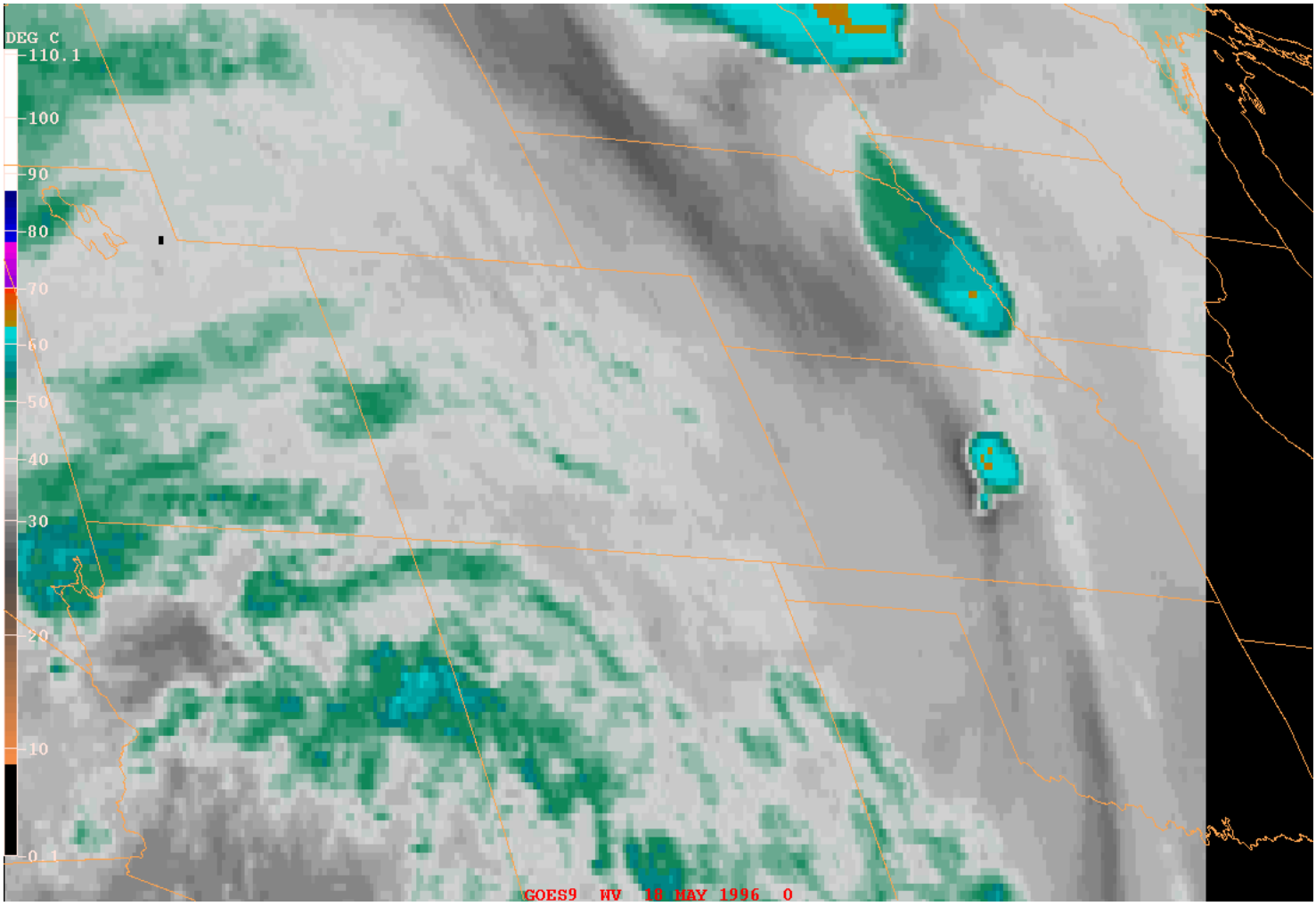


Figure 17. GOES-9 0100Z 18 May 1996 WV image

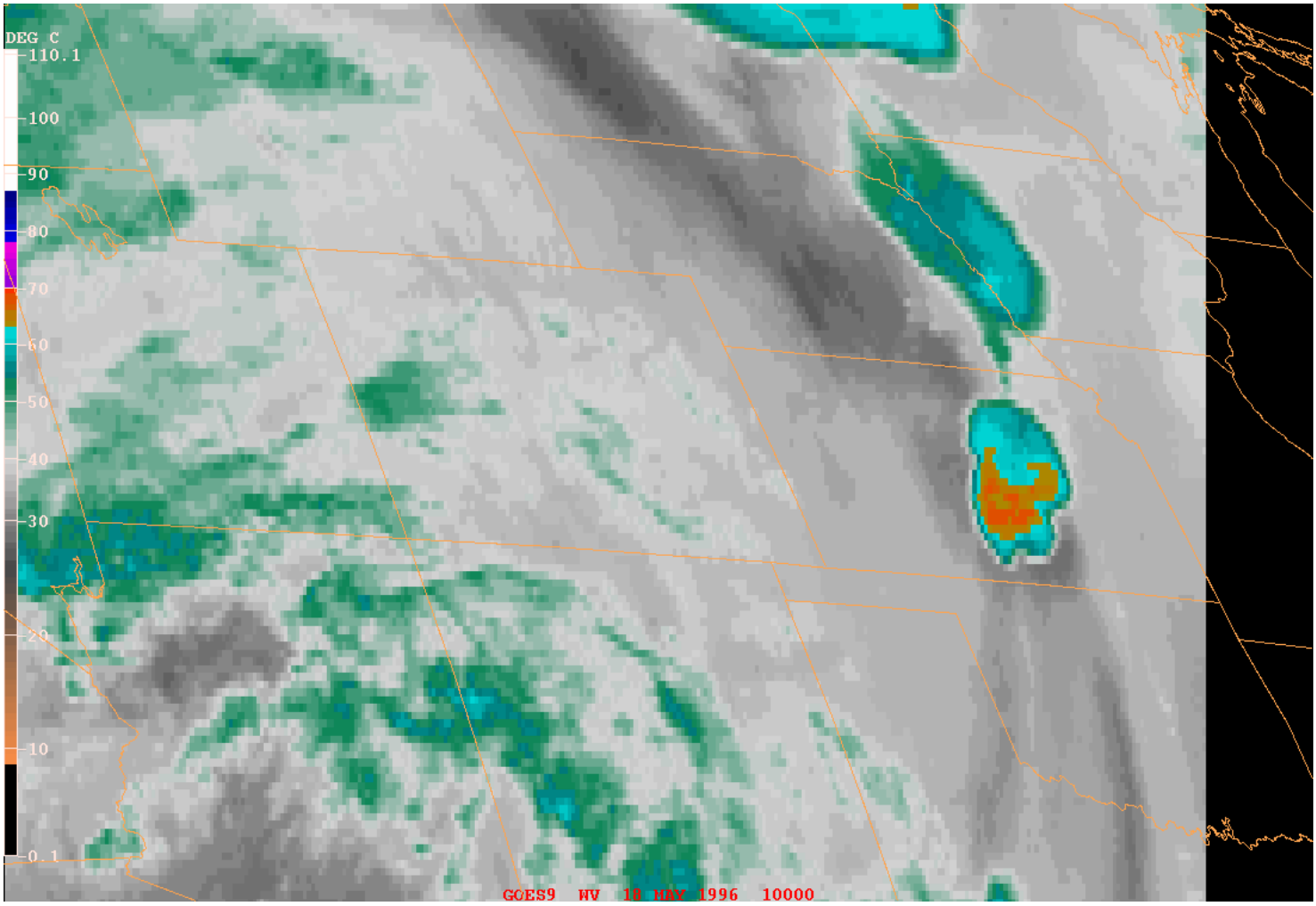
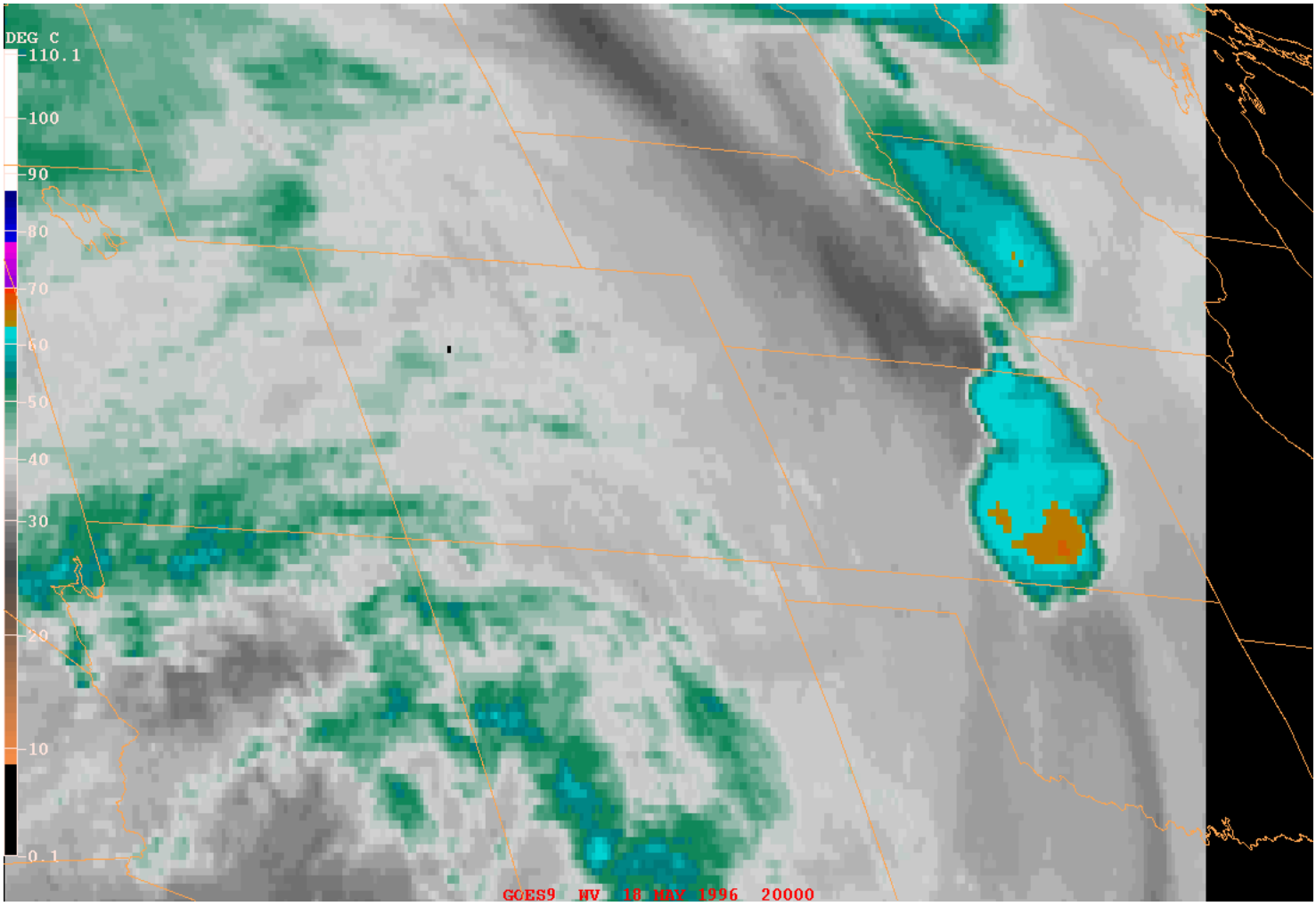


Figure 18. GOES-9 0200Z 18 May 1996 WV image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