PICTURE OF THE MONTH

An Atmospheric Undular Bore along the Texas Coast

J. CHRISTOPHER CLARKE

Department of Atmospheric Science, Colorado State University, Fort Collins, Colorado

9 April 1997 and 26 July 1997

ABSTRACT

An unusual cloud feature was noted over the south Texas coast on the morning of 14 March 1997. This feature shares some characteristics with the “morning glory” bores that are seen along the coast of northern Australia.

On the morning of 14 March 1997, an unusual cloud feature was seen over south coastal Texas. A series of cloud bands was captured by satellite moving south along the gulf coast of Texas. Figure 1 shows the cloud structure at 1545 UTC. This image was taken from GOES-8 channel 1 (visible) data. The cloud bands are optically very reflective and quite shallow since they are nearly invisible on infrared images. As many as 16 thin ropelike cloud bands are noted, forming arcs from well into the Gulf of Mexico into the interior of Texas. This cloud pattern resembles a “morning glory,” an atmospheric undular bore that is sometimes seen along the coast of the Gulf of Carpentaria in northern Australia (Smith 1988).

This feature was formed in the predawn hours north of the Corpus Christi area. Figure 2 shows a 1200 UTC skew T analysis from Corpus Christi (CRP). Note the very large inversion (+10°C) above the surface. An analysis of the synoptic situation (Fig. 3) shows a very strong late winter cold front pushing south through the region. It would appear that the cold front interacted with the nocturnal boundary layer inversion in the warm, subtropical air over south Texas to produce the bore. This cloud system was associated with a surface wind shift but not with a surface temperature or dewpoint change and was referred to by National Weather Service bulletins as a “prefrontal trough.” These characteristics, along with decreasing wave strength (as noted by horizontal width and optical reflectivity of the cloud bands) are indicative of an undular bore.

As the bore moved south through the Rio Grande valley, it appears to have interacted with cold air spilling in from higher terrain to the south and west of the Texas border. Where this interaction occurred, a large thunderstorm developed. Brownsville, Texas, radar reported echoes from this storm stronger than 60 dBZ and indicated a mesocyclone. Additionally, softball-sized hail was reported. This strong storm, the only one reported from many hundreds of kilometers, moved slowly to the east into the Gulf of Mexico. The isolation of this strong storm makes it likely that the bore was quite important for storm genesis and intensification.

This weather event offers many interesting features for further study, but, for the time being, the purely esthetic qualities of the satellite image of this feature are to be appreciated.

Acknowledgments. This work was supported by the Colorado Agricultural Experiment Station under Grant COLO692. Special thanks to Jack Doeslek of the Cooperative Institute for Research in the Atmosphere (CIRA) for his assistance in obtaining this image.

REFERENCES

Fig. 1. GOES-8 satellite image of an undular bore over south coastal Texas, 1545 UTC 14 March 1997.

Fig. 2. Skew T analysis from Corpus Christi (CRP) 1200 UTC 14 March 1997.
Fig. 3. Surface synoptic map over Texas and NCEP analysis: 1500 UTC 14 March 1997.