CENTRAL REGION TECHNICAL ATTACHMENT 93-23

AN EXAMPLE OF THE UTILITY OF PCGRIDDS TIME AND CROSS SECTIONS FOR AVIATION FORECASTING OF CLOUD HEIGHTS

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1. Introduction

On April 8,1993, a high amplitude trough at 500 mb was located from Minnesota to east Texas. At the surface, western Kansas was covered by a weak high pressure ridge in the wake of a cold front stretching from Wisconsin to Louisiana. A deep north-northwest flow was evident by 0000 UTC on April 9, 1993, across the central High Plains. This synoptic feature had moved approximately 300 miles east during the previous 24-hours.

2. Case Study

The gridded model output for the RAFS 1200 UTC run on April 7, 1993, revealed an interesting relative humidity feature in southwest Kansas. Figure 1 is the time section for the Dodge City latitude/longitude. This time section indicated that a narrow band of 65%+ relative humidity was forecast at 700 mb during the afternoon of Thursday, April 8.

The 36-hour cross section (Figure 2) for 0000 UTC Friday, April 9, indicated a similar moisture maximum at 700 mb centered near Dodge City. The NGM 1000 mb to 500 mb mean relative humidity forecasts valid at 1200 UTC April 8 and 0000 UTC April 9, did not clearly identify this moist layer. Interpolating from the AFOS graphics I4D and I6D, the values dropped from about 55% at 1200 UTC to 40% by 0000 UTC. The NGM FRHT68 FOUS output (Figure 3) for Dodge City showed "layer-2" (R2) relative humidity values of 47% to 52% between 1200 UTC and 0000 UTC.

The higher resolution products from PCGRIDDS not only indicated the likelihood of a cloud layer, but also pointed out that the moisture would be located at 700 mb. Figure 4 is the 0000 UTC April 9 sounding from Dodge City, which verified the presence of this moist layer near 700 mb. The temperature/dew point depression at 710 mb was just 3.20°C. Looking at the surface observations from Dodge City (Figure 5) and Garden City (Figure 6) from 1800 UTC to 2300 UTC, cloud heights were between 4,500 ft and 7,500 ft above ground level. Since the elevations at these airports are about 2,500 ft msl, the 700 mb level is

approximately 7,500 feet above ground. Thus, rather than taking a "wild guess" at the height of the cloud layer, a forecast of 70 SCT or C70 BKN was appropriate.

3. Using PCGRIDDS for Aviation Forecasts

Recent changes in aviation forecast procedures have accented the need for higher resolution model output. Gridded model output is now available at six-hour intervals from the RAFS. Twelve-hour model output can be obtained from both the ETAX and RAFS. Using time sections and entering the latitude and longitude of the airport, a forecaster can see the changes of many different parameters in both time and space on a single display. This allows the forecaster to focus on what the numerical guidance is showing for the exact location of the airport. However, an obvious limitation is the accuracy of the model.

Some examples of useful parameter combinations include: 1) relative humidity and divergence of the total wind, 2) potential temperature, relative humidity, and wind barbs, 3) absolute vorticity and vertical velocities, and 4) wind barbs and isotachs. The only limitation to the number of overlays that a forecaster can create is his/her imagination.

4. Conclusion

This case study illustrates a rather accurate model forecast of an essentially non-significant cloud feature. However, without the gridded model output and PCGRIDDS, this detailed information would not have been available to aviation forecasters. The wide variety of parameters available coupled with a better model resolution should permit the forecaster to make better point forecasts for airports.

5. Acknowledgements

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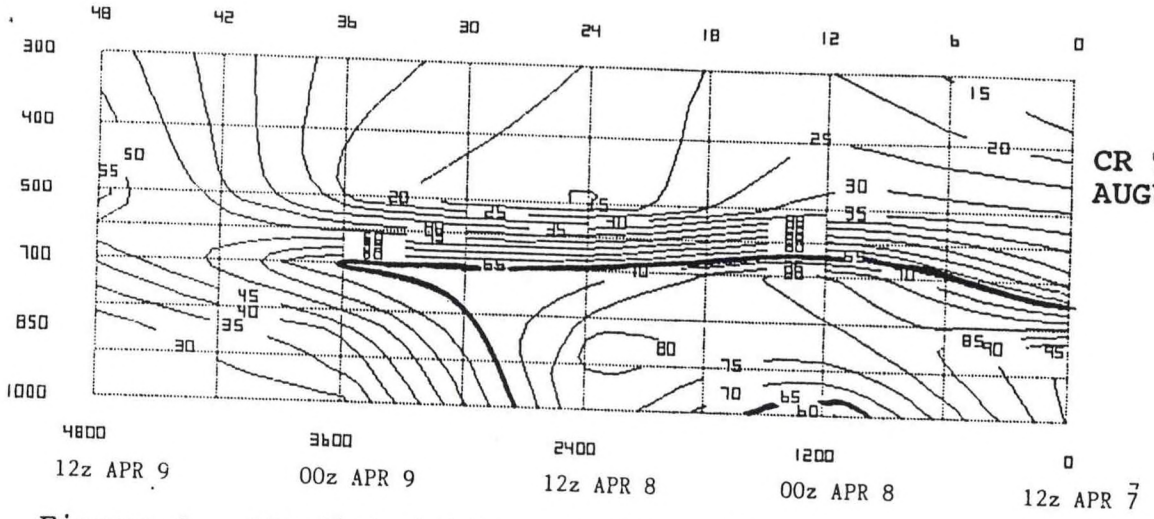

Figure 1. Predicted time section of relative humidity for Dodge City, Kansas (DDC) from the RAFS run of 1200 UTC, April 7, 1993. Heavy line outlines the area of 65%+ relative humidity.

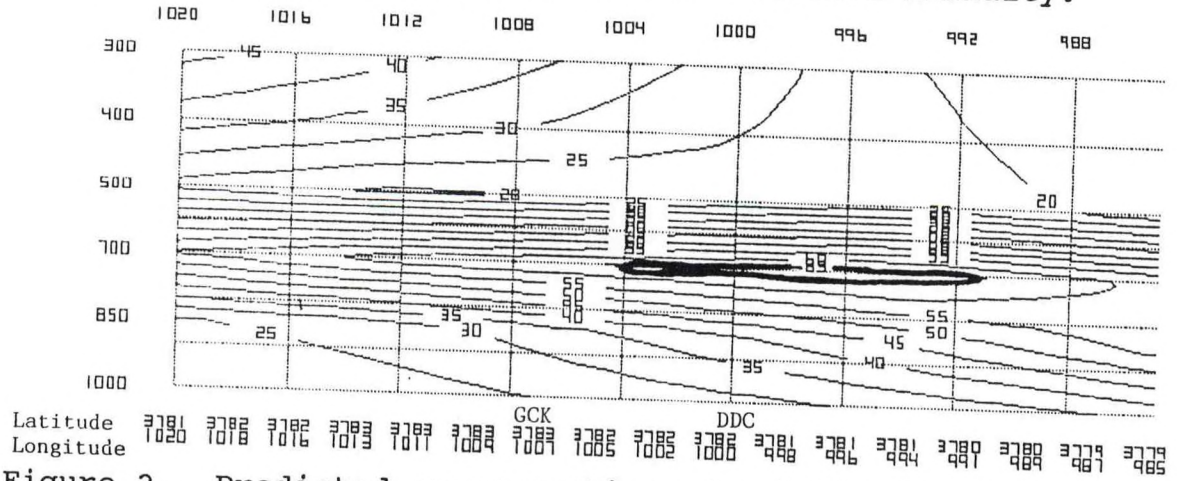

Figure 2. Predicted cross-section of relative humidity valid at 0000 UTC, April 9, 1993. Latitude/longitude of data points are indicated below the cross-section. The locations of Dodge City and Garden City, Kansas are shown by DDC and GCK respectively.

TOPNGMFRH
TTAA00 KTOP 071544

SELECTED NGM FOUS OUTPUT FOR: 04/07/12Z

	12Z WED	18Z WED	00Z THU	06Z THU	12Z THU	18Z THU	00Z FRI	06Z FRI	12Z FRI	STA: DDC
DDFF	2001	3314	3314	3324	3322	3412	3512	3610	2308	BLYR WIND
VVV	+02.6	+00.0	-00.5	-02.1	-02.1	-01.3	-02.3	-02.9	-02.9	700 VV
LI	-02	+02	+01	+03	+06	+06	+05	+07	+06	LIFTED IDX
T1	+48	+48	+51	+46	+39	+50	+55	+55	+55	BLYR T(F)
TD1	+47	+40	+36	+36	+34	+27	+23	+21	+19	BLYR TD(F)
T3	+05	+02	+04	+02	+00	+02	+06	+07	+08	922-872 T
T5	+01	-01	-04	-06	-07	-06	-03	-01	+00	816-755 T
HH	550	547	548	544	540	544	548	551	553	THICKNESS
R1	97	73	56	67	82	41	29	27	25	BLYR RH
R2	51	67	66	57	51	52	47	31	46	965-473 RH
R3	16	22	23	23	18	24	23	42	50	473-181 RH
PTT	----	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6HR PRECIP

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Figure 3. NGM FRHT68 FOUS output from model run of 1200 UTC, April 7, 1993 for Dodge City, Kansas (DDC)

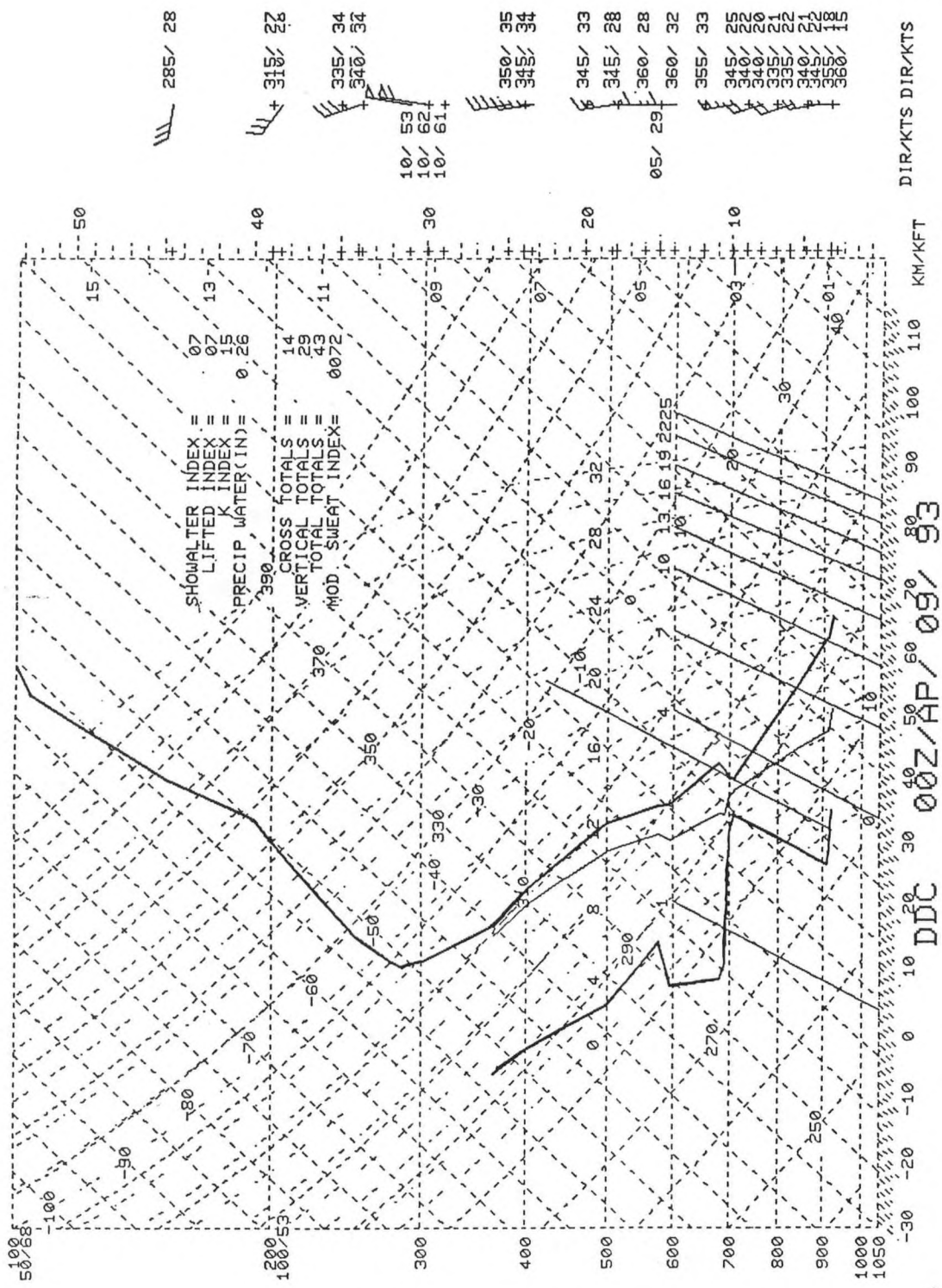

Figure 4. Plot of rawinsonde sounding for Dodge City, Kansas (DDC) for 0000 UTC, April 9, 1993.

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TOPSAODDC
TTAA00 KDDC 082356
DDC SA 2356 A02A CLR BLO 120 10+ 125/56/28/3512/990/ 56003 10060 20035
DDC SA 2256 A02A CLR BLO 120 10+ 122/52/27/3518/990
DDC SA 2156 A02A 75 SCT 10+ 124/59/28/3617G25/990/ PK WND 3327/2109
DDC SA 2056 A02A 75 SCT 10+ 127/52/30/3516G23/991/ 52013 PK WND 3227/1959
DDC SA 1956 A02A 60 SCT 10+ 131/56/31/3320G29/992/ PK WND 3529/1949
DDC SA 1856 A02A 48 SCT 10+ 140/53/32/3522G27/994/ PK WND 3527/1845
DDC SA 1756 A02A CLR BLO 120 10+ 144/51/35/3618G26/995/ 50007 10051 20035 PK WN
D 3528/1733
PL
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Figure 5. Surface observations from Dodge City, Kansas (DDC) from 1756 UTC to 2356 UTC on April 8, 1993.

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TTAA00 KGCK 082352
GCK SA 2350 CLR 20 136/57/26/3413/993/FEW DSPTG SC/ 610 1400 60
GCK SA 2250 70 SCT 20 136/57/27/3215/993
GCK SA 2250 70 SCT 20 136/57/27/3215/993
GCK SA 2150 70 SCT 20 138/59/26/3417/994
GCK SA 2050 E70 BKN 20 146/58/28/3218/996/ 607 1100
GCK SA 1950 E60 BKN 20 146/57/27/3318G25/996
GCK SA 1850 E50 BKN 20 149/55/29/3320/997
GCK SA 1750 E45 BKN 20 157/51/30/3415G22/998/ 007 1100 31
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Figure 6. Surface observations from Garden City, Kansas (GCK) from 1750 UTC to 2350 UTC on April 8, 1993.