

DOE-ARM Water Vapour IOP '97 26 September 1997 AERI Validation Case

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\$Date: 1998/02/09 23:17:19 \$
\$Id: README,v 1.1 1998/02/09 23:17:19 paulv Exp \$
\$Log: README,v \$
Revision 1.1 1998/02/09 23:17:19 paulv
Initial revision

The file validation_case_970926.tar contains the AERI-00 and -01 measured radiances averaged from 0500-0700UTC, 970926 and best estimate atmospheric temperature and water vapour profiles from the DOE ARM WVIOP97 at the ARM CART SGP Central Facility, Lamont Oklahoma USA. Also included are PostScript files of plots of the measurements.

Any questions or comments about the data can be referred to:

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Tar file contents:

-r--r--r--	1 paulv	staff	3901 Feb	9 17:12	README
-r--r--r--	1 paulv	staff	217945 Feb	9 17:12	aeri_ch1_00_01_0500-0700_ave.asc
-rw-r--r--	1 paulv	staff	288739 Feb	9 13:28	aeri_ch1_00_01_comparison.ps
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File translation table:

README

This file

DATA

aeri_ch1_00_01_0500-0700_ave.asc Channel 1 (520-1800cm-1) AERI-00 and -01

1. Temperature level rmse (166 profiles) : 1sttrms.ps(.gif)
2. Water Vapor level rmse (166 profiles) : 1stwrms.ps(.gif)

Simulated NAST-I Brightness Temperature spectra

1. NAST-I Nadir viewing mid-lat winter spectrum : nastisp0.gif(.ps)
2. NAST-I 45 degree viewing mid-lat winter spectrum : nastisp45.gif(.ps)

***** For AMS presentations *****

Jan. 7/1998

1. HIS & HIRS/2(TOVS IR) BT Spectrum & CHannel plot
hishirsbt.gif (ps)
2. ATOVS & TOVS Temperature RMS profile
atovstovstrms.gif (ps)

Jan. 6/1998

1. ATOVS Temperature & Water Vapor W.F. :
atovswft.gif (ps)
atovswfw.gif (ps)
2. ATOVS Vs. TOVS water vapor retrieval RMS :
atovstovsrhms.gif (ps)
3. AIRS Vs. ATOVS Temperature & water vapor RMS :
airsatovsrmsst.gif (ps)
airsatovsrmsrh.gif (ps)

***** End *****

- **3. Ozone Information Content for 0.1;0.3 & 0.5 1/cm Resolutions:
ozoinfdnew.gif

Noises are scaled to square root of resolution

- **4. Temperature/Ozone/Carbon monoxide spectra for 0.05;0.1&0.2 1/cm
resolutions :
gassp0.05.gif
gassp0.1.gif
gassp0.2.gif

- ✓ **5. Temperature/Ozone/Carbon monoxide W.F. for 0.05;0.1&0.2 1/cm
resolutions :
gaswf0.05.gif
gaswf0.1.gif
gaswf0.2.gif

- **6. Gas spectra with resolution at 0.1 & 0.63 1/cm and
spectral coverages of 3.8-12 & 3.8-15 micron :
gasasp0.1.gif
gasbsp0.1.gif
gascsp0.6.gif
gasdsp0.6.gif

- **7. Gas spectra with resolution at 0.1 & 0.3 & 0.5 1/cm and
spectral coverages of 3.8-12 micron :
gasesp0.1.gif
gasfsp0.3.gif
gasgsp0.5.gif

- **8. Gas Tem/H2O W.F. with resolution at 0.1 & 0.63 1/cm and
spectral coverages of 3.8-12 & 3.8-15 micron :
gasawf0.1.gif
gasbwf0.1.gif
gascwf0.6.gif
gasdwf0.6.gif

**9. Gas Tem/Ozone W.F. with resolution at 0.1 & 0.3 & 0.5 1/cm
 and spectral coverages of 3.8-12 :
 gasewf.0.1.gif
 gasfwf.0.3.gif
 gasgwf.0.5.gif

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 <u>1stwrms.gif</u>	13-Feb-98 16:27	9k	
 <u>1stwrms.ps</u>	13-Feb-98 16:27	9k	
 <u>airsatovsrmsrh.gif</u>	06-Jan-98 13:41	7k	
 <u>airsatovsrmsrh.ps</u>	06-Jan-98 13:42	9k	
 <u>airsatovsrmst.gif</u>	06-Jan-98 13:42	9k	
 <u>airsatovsrmst.ps</u>	06-Jan-98 13:42	18k	
 <u>atovstovsrhrms.gif</u>	06-Jan-98 13:41	7k	
 <u>atovstovsrhrms.ps</u>	06-Jan-98 13:42	8k	
 <u>atovstovstrms.gif</u>	07-Jan-98 10:11	8k	
 <u>atovstovstrms.ps</u>	07-Jan-98 10:09	9k	
 <u>atovswft.gif</u>	06-Jan-98 13:41	14k	
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 <u>co rmse nf111.gif</u>	18-Feb-98 13:49	10k	

Co retrieval is by
 regression
 - How many pressure
 levels?

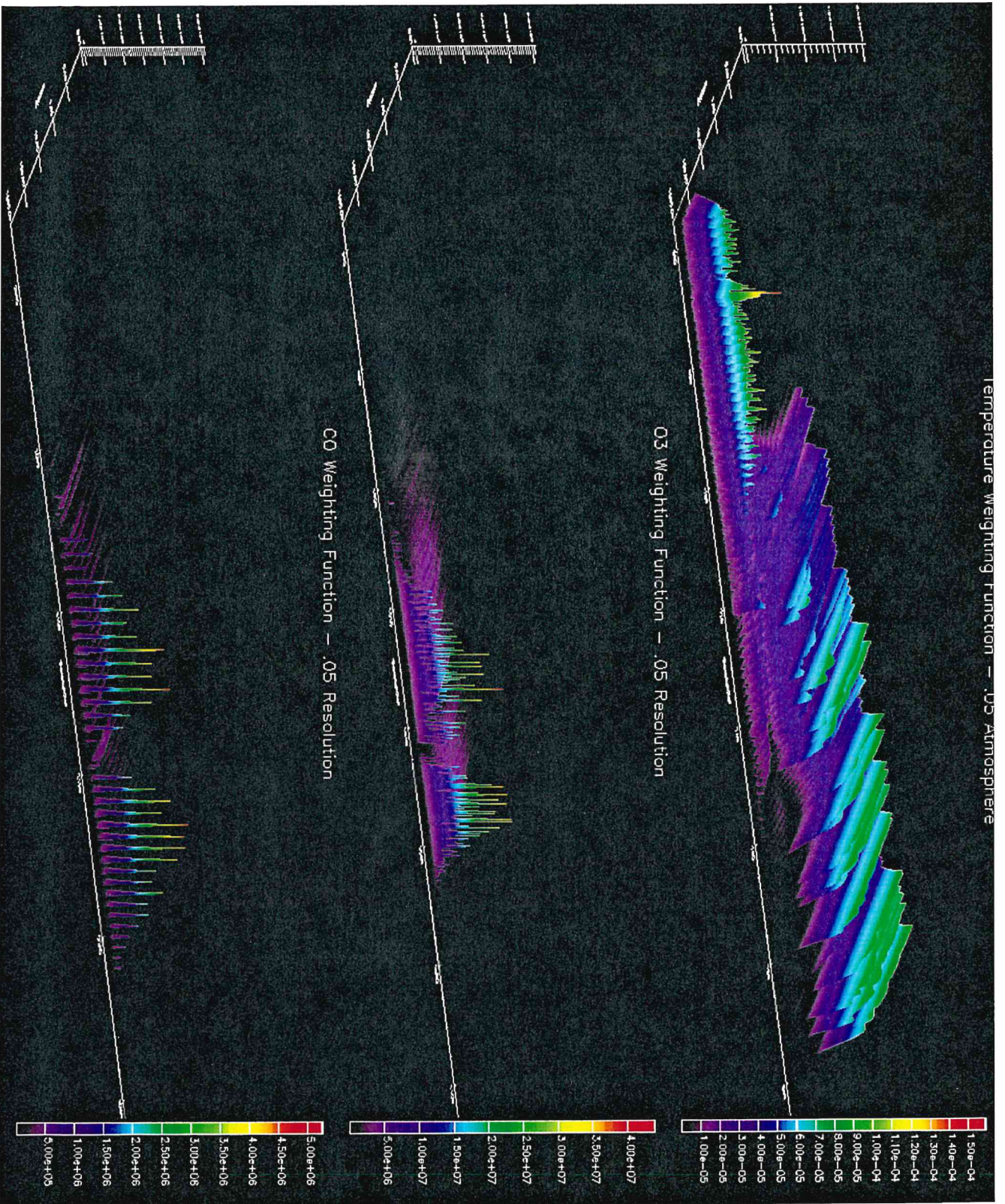
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	<u>evtrms.gif</u>	06-Feb-98 14:46	8k
	<u>gasasp0.1.gif</u>	22-Dec-97 16:47	16k
	<u>gasawf.0.1.gif</u>	22-Dec-97 17:21	53k
	<u>gasbsp0.1.gif</u>	22-Dec-97 16:47	16k
	<u>gasbwf.0.1.gif</u>	22-Dec-97 17:20	59k
	<u>gascsp0.6.gif</u>	22-Dec-97 16:47	15k
	<u>gascwf.0.6.gif</u>	22-Dec-97 17:22	38k
	<u>gasdsp0.6.gif</u>	22-Dec-97 16:48	14k
	<u>gasdwf.0.6.gif</u>	22-Dec-97 17:22	44k
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	<u>gasewf.0.1.gif</u>	22-Dec-97 17:23	40k
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	<u>gasqsp0.5.gif</u>	22-Dec-97 16:49	15k
	<u>gasqwf.0.5.gif</u>	22-Dec-97 17:24	33k
	<u>gassp0.05.gif</u>	22-Dec-97 17:29	57k
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	<u>gassp0.2.gif</u>	22-Dec-97 17:31	43k
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	<u>goessp.gif</u>	22-Dec-97 16:51	5k
	<u>goeswf.gif</u>	22-Dec-97 17:26	39k
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	<u>hishirsbt.ps</u>	07-Jan-98 08:52	67k
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	<u>nasti.wf.ps</u>	16-Feb-98 17:07	340k
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	<u>nasti trmse.dfrc.ps</u>	04-Mar-98 12:21	10k
	<u>nasti wrmse.dfrc.gif</u>	04-Mar-98 12:21	9k
	<u>nasti wrmse.dfrc.ps</u>	04-Mar-98 12:21	9k
	<u>nastisp0.gif</u>	13-Feb-98 16:41	654k
	<u>nastisp0.ps</u>	13-Feb-98 16:41	115k
	<u>nastisp45.gif</u>	13-Feb-98 16:41	654k
	<u>nastisp45.ps</u>	13-Feb-98 16:41	115k
	<u>ozoinfdnew.ps</u>	22-Dec-97 18:02	10k

Temperature Weighting Function - .05 Atmosphere

O3 Weighting Function - .05 Resolution

CO Weighting Function - .05 Resolution

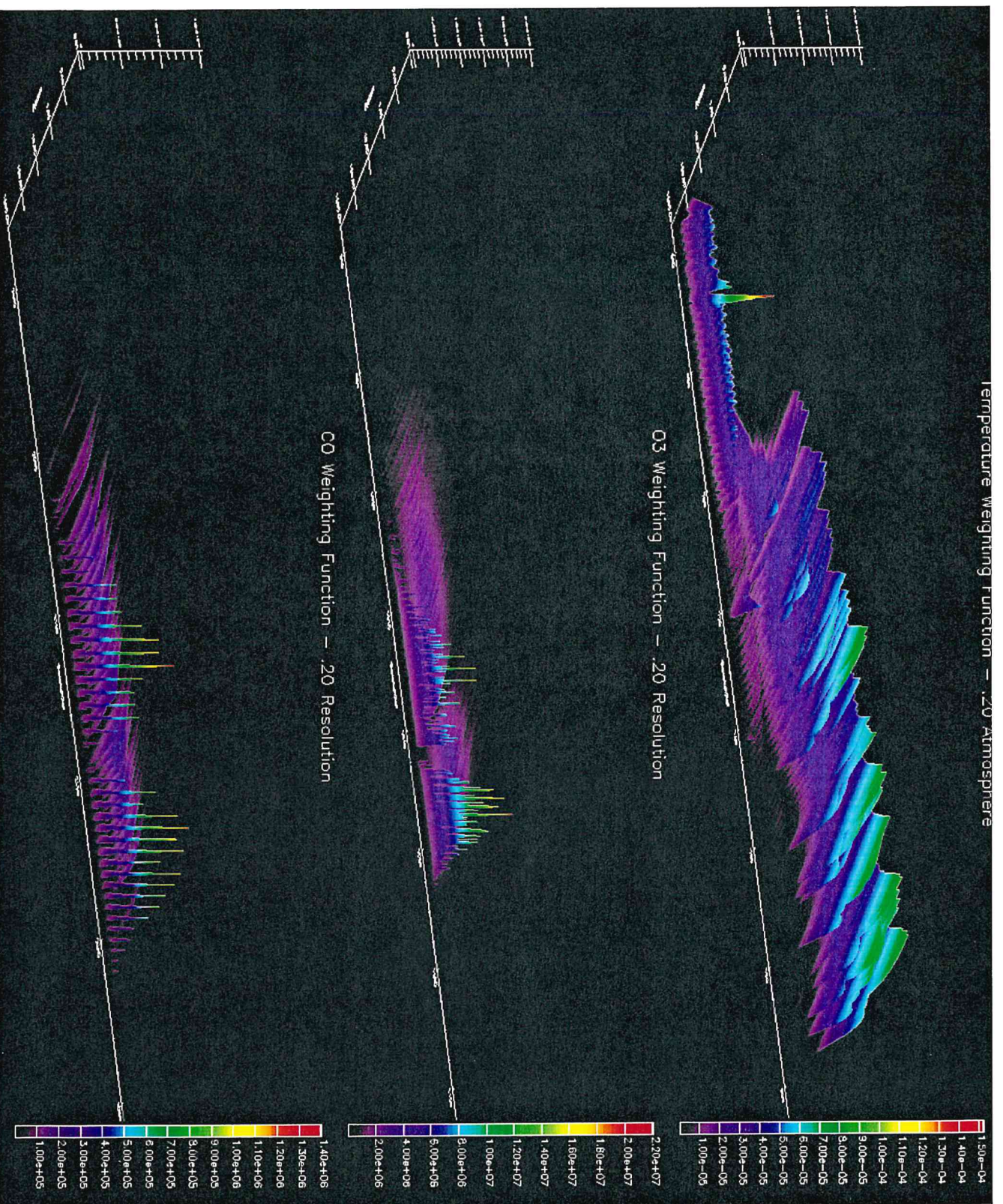


0.05 cm⁻¹
resolution

Temperature Weighting Function - .20 Atmosphere

O3 Weighting Function - .20 Resolution

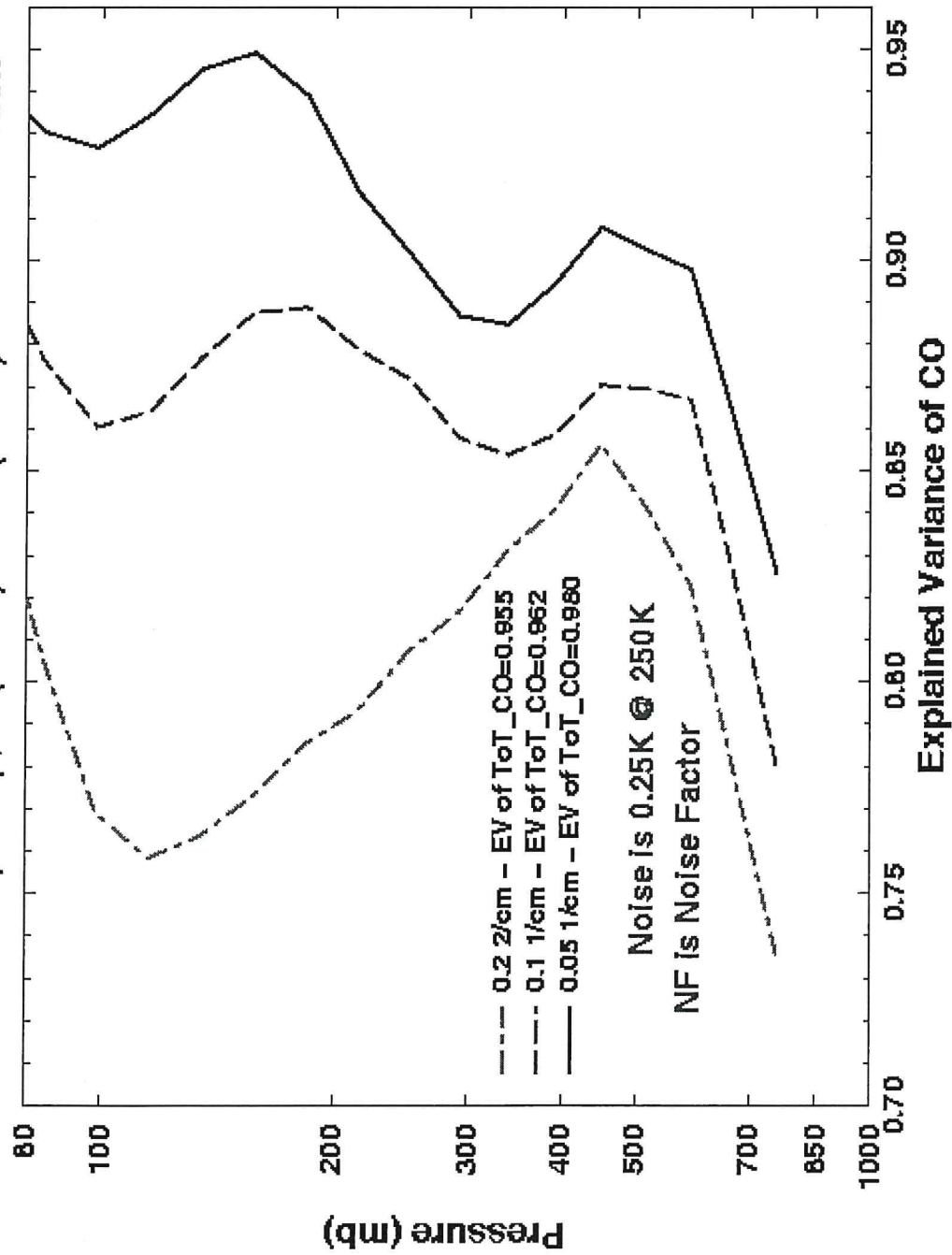
CO Weighting Function - .20 Resolution



0.2 cm⁻¹
Resolution

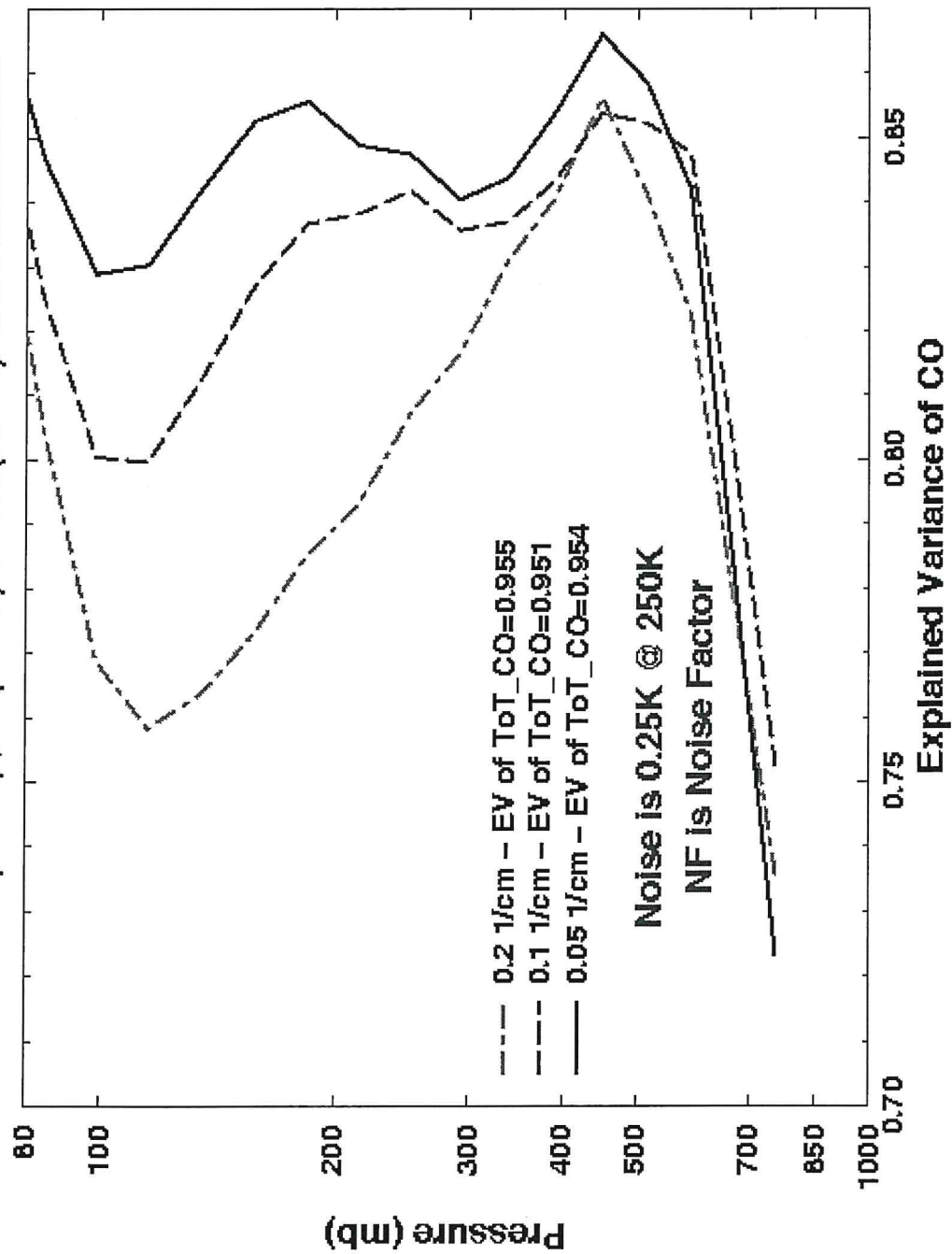
CO Information Content Analysis

GAS @ 0.2(NF=1) ; 0.1(NF=1) & 0.05(NF=1) 1/cm Resolution



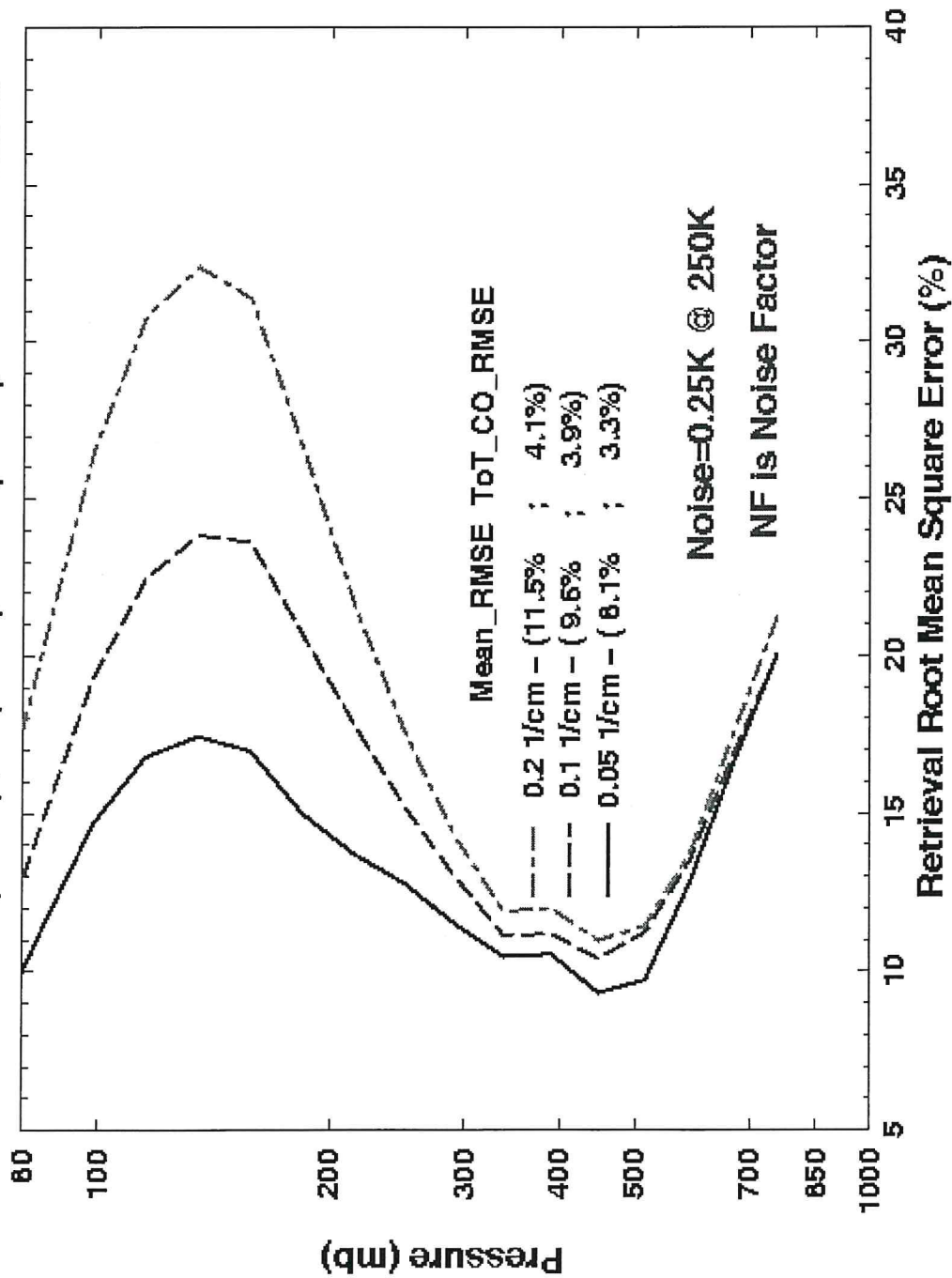
CO Information Content Analysis

GAS @ 0.2(NF=1) ; 0.1(NF=2) & 0.05(NF=4) 1/cm Resolution



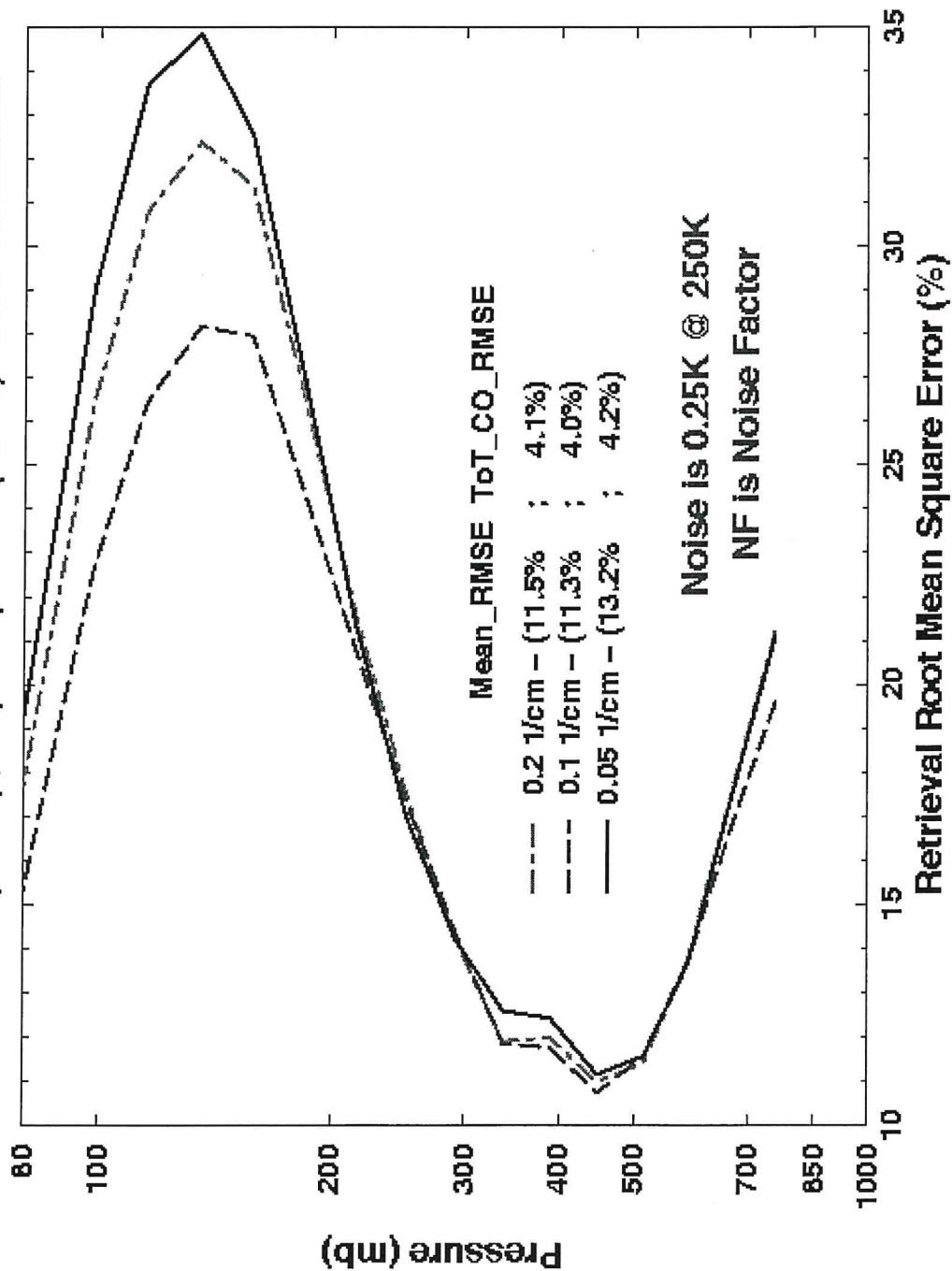
CO Retrieval Error Analysis

GAS @ 0.2(NF=1) ; 0.1(NF=1) & 0.05(NF=1) 1/cm Resolution



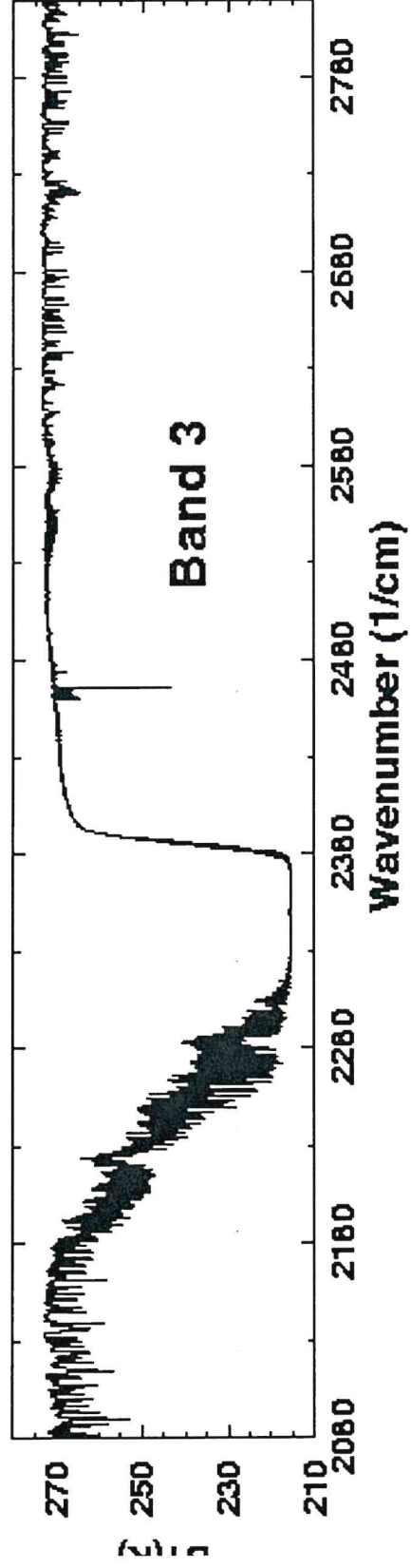
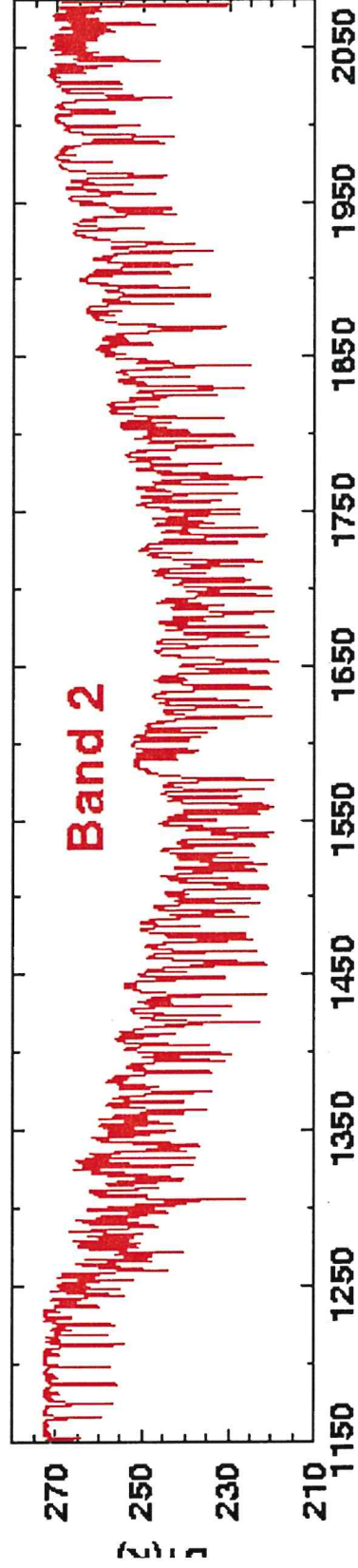
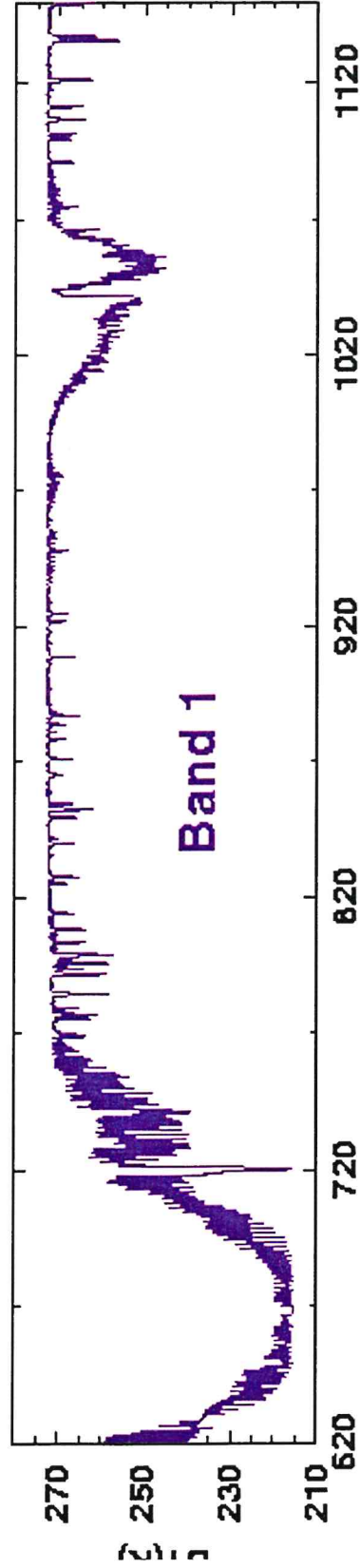
CO Retrieval Error Analysis

GAS @ 0.2(NF=1) ; 0.1(NF=2) & 0.05(NF=4) 1/cm Resolution



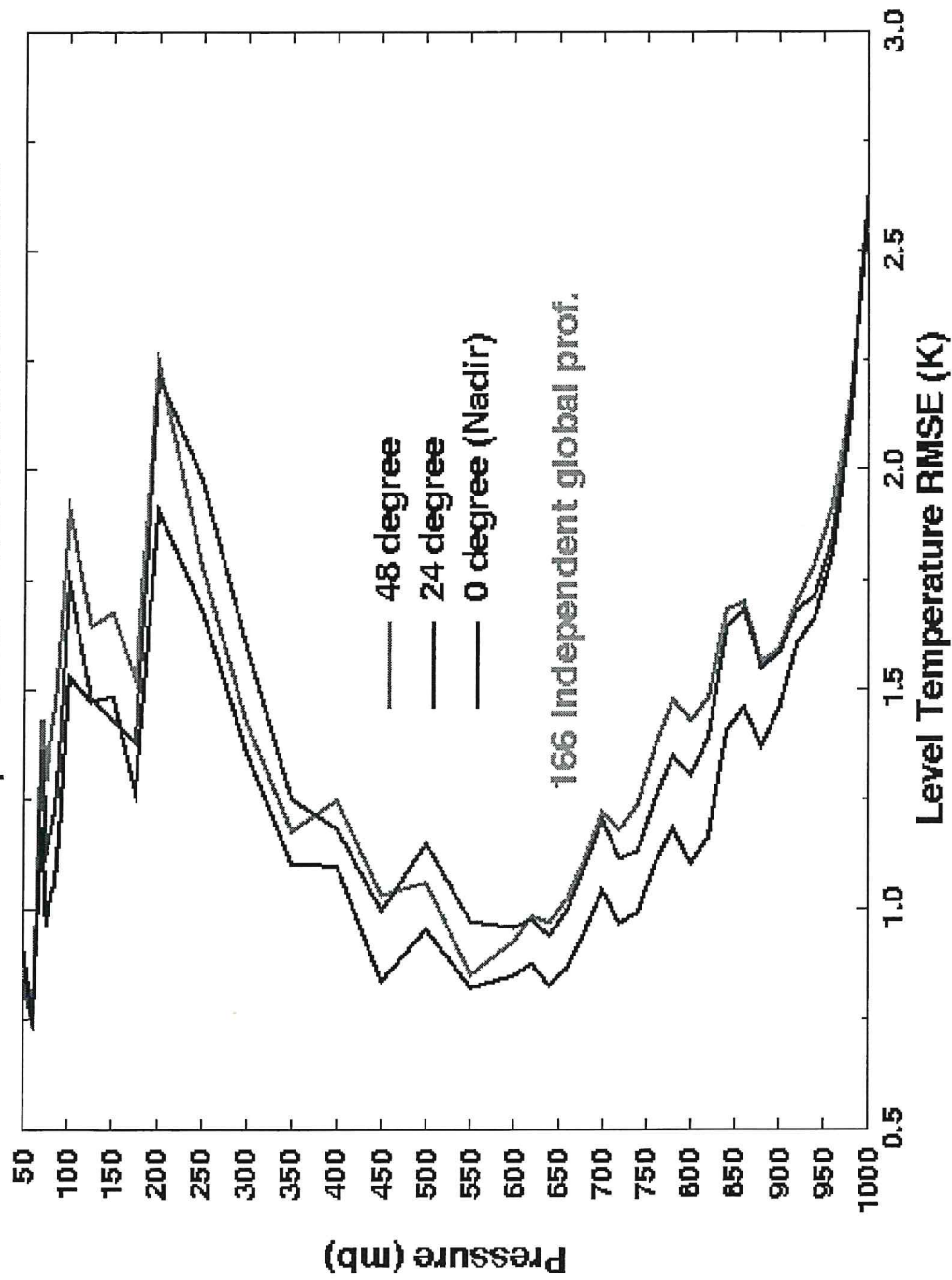
NAST-I Brightness Temperature Spectra

Mid-Latitude Winter ; Zenith Angle = 45 Degree



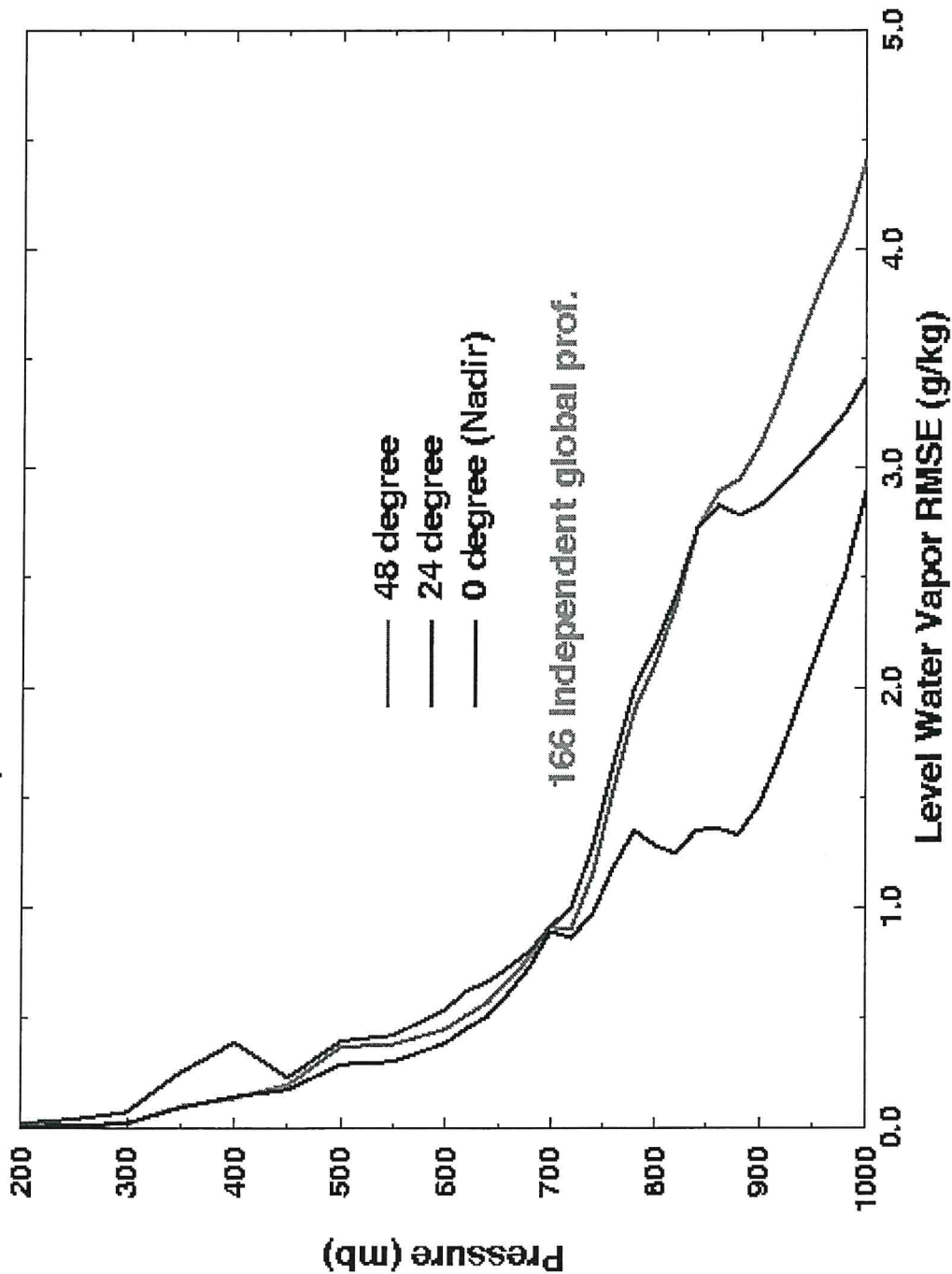
NAST-I Preliminary Temperature Performance

2.5 times of spec. noise + 0.2K forward model error



NAST-I Preliminary Water Vapor Performance

2.5 times of spec. noise + 0.2K forward model error



Retrieval Temperature/Water Vapor Entropy Reduction

[ert.gif](#)

[erq.gif](#)

Note on Entropy Reduction

Entropy Reduction = Increase in Information

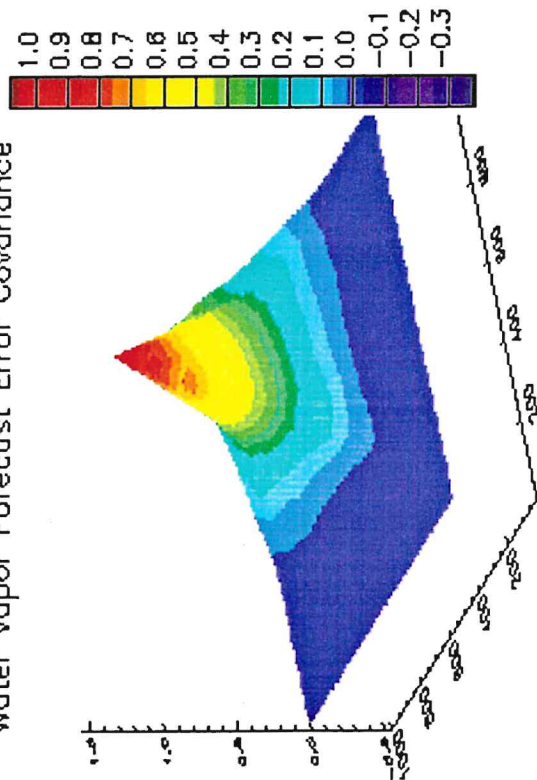
The increase in information is equated to the decrease in entropy (ENTROPY REDUCTION) resulting from the retrieval process using satellite measurements. In another words, the increase in information in a profile of temperature and water vapor due to the retrieval can be characterized in terms of the reduction of entropy from forecast error covariance (top left panel) to the retrieval error covariance (top right panel - GHIS ; bottom right panel - GOES).

An entropy reduction of X units represents a retrieval error which is half the forecast error in X independent pieces of information (or one quarter the forecast error in X/2 pieces on information, etc.) For example, a value of 6 for temperature profile is equivalent to halving of forecast error in 6 independent pieces of information; this can be interpreted as 6 atmospheric layers only if the correlations of error between these layers are negligible or are preserved in the retrieval process.

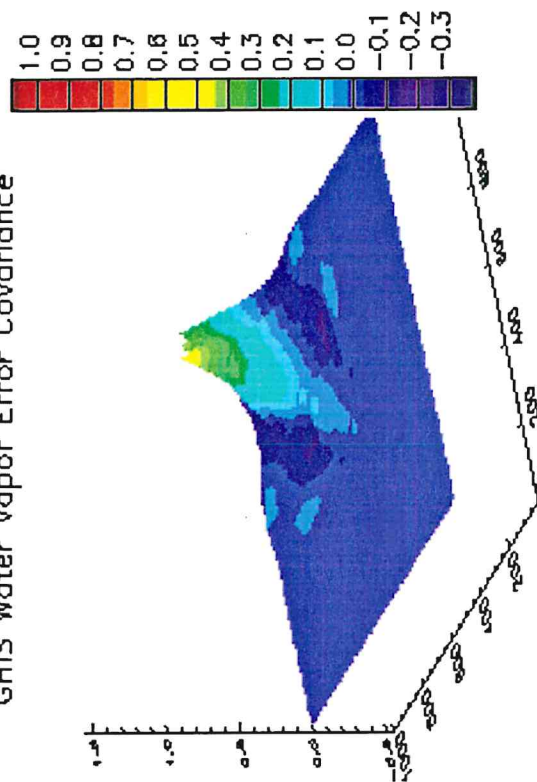
A value of about 1 unit in water vapor retrieval may represent a halving of error in the local column water vapor only, with no additional information on the profile.

Name	Last modified	Size	Description
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 erq.gif	02-Jan-98 13:53	14k	
 ert.gif	02-Jan-98 13:53	17k	

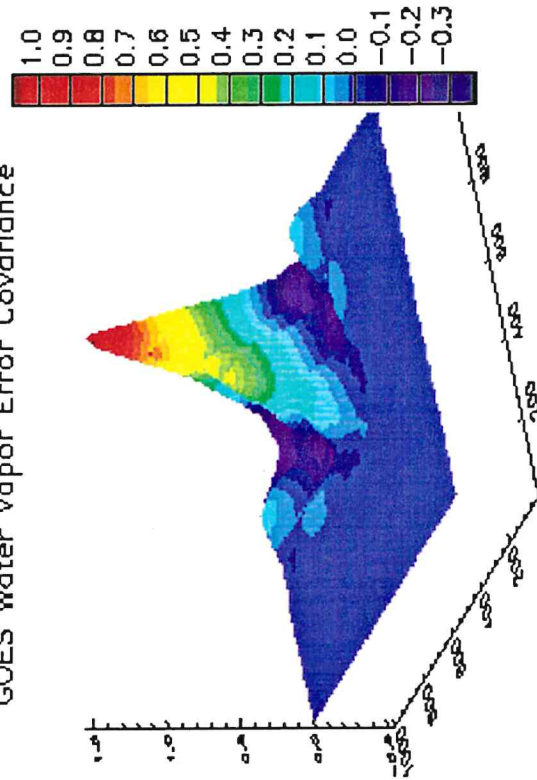
Water Vapor Forecast Error Covariance



GHIS Water Vapor Error Covariance



GOES Water Vapor Error Covariance



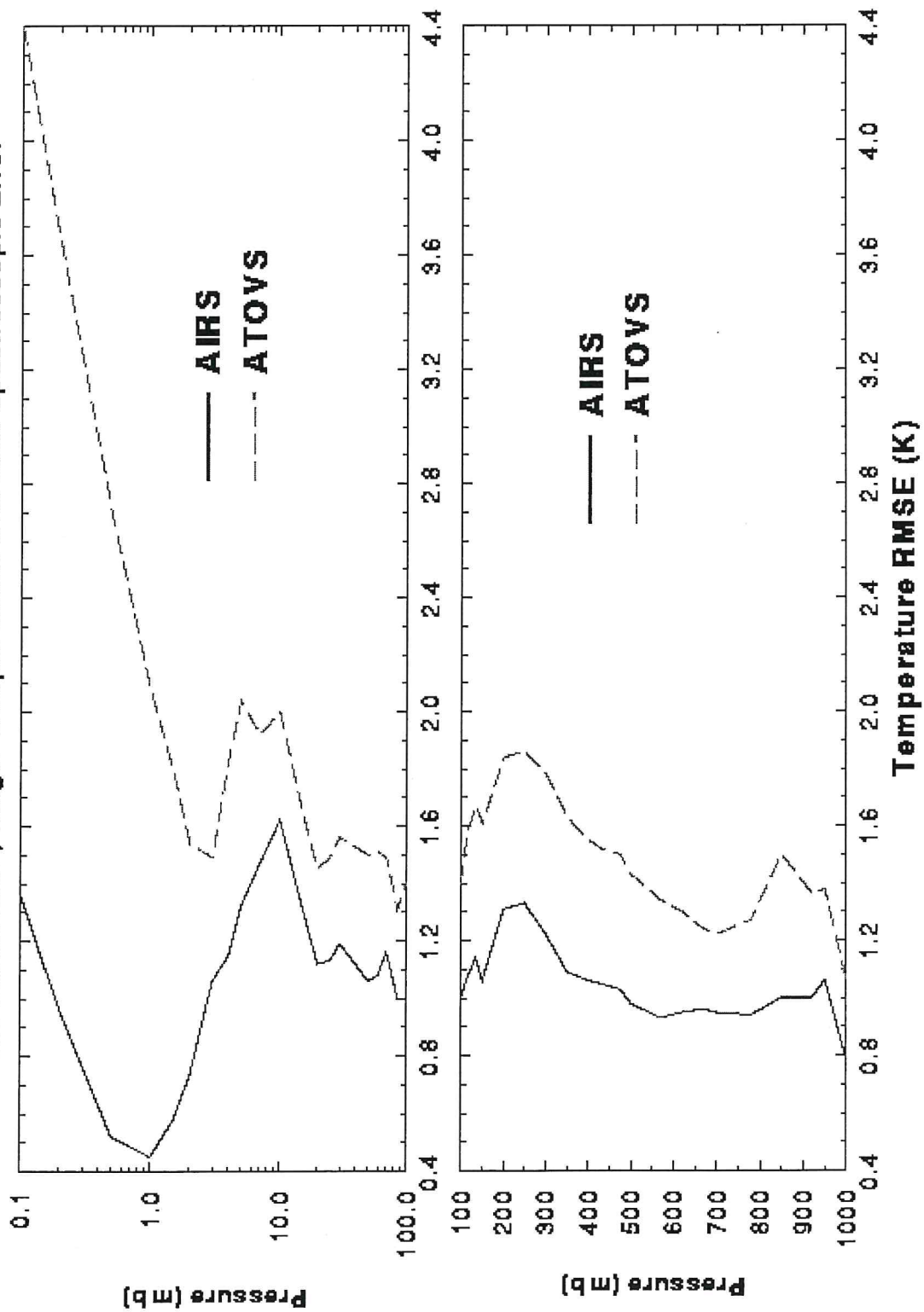
WATER VAPOR

GHIS Entropy Reduction = 1.02

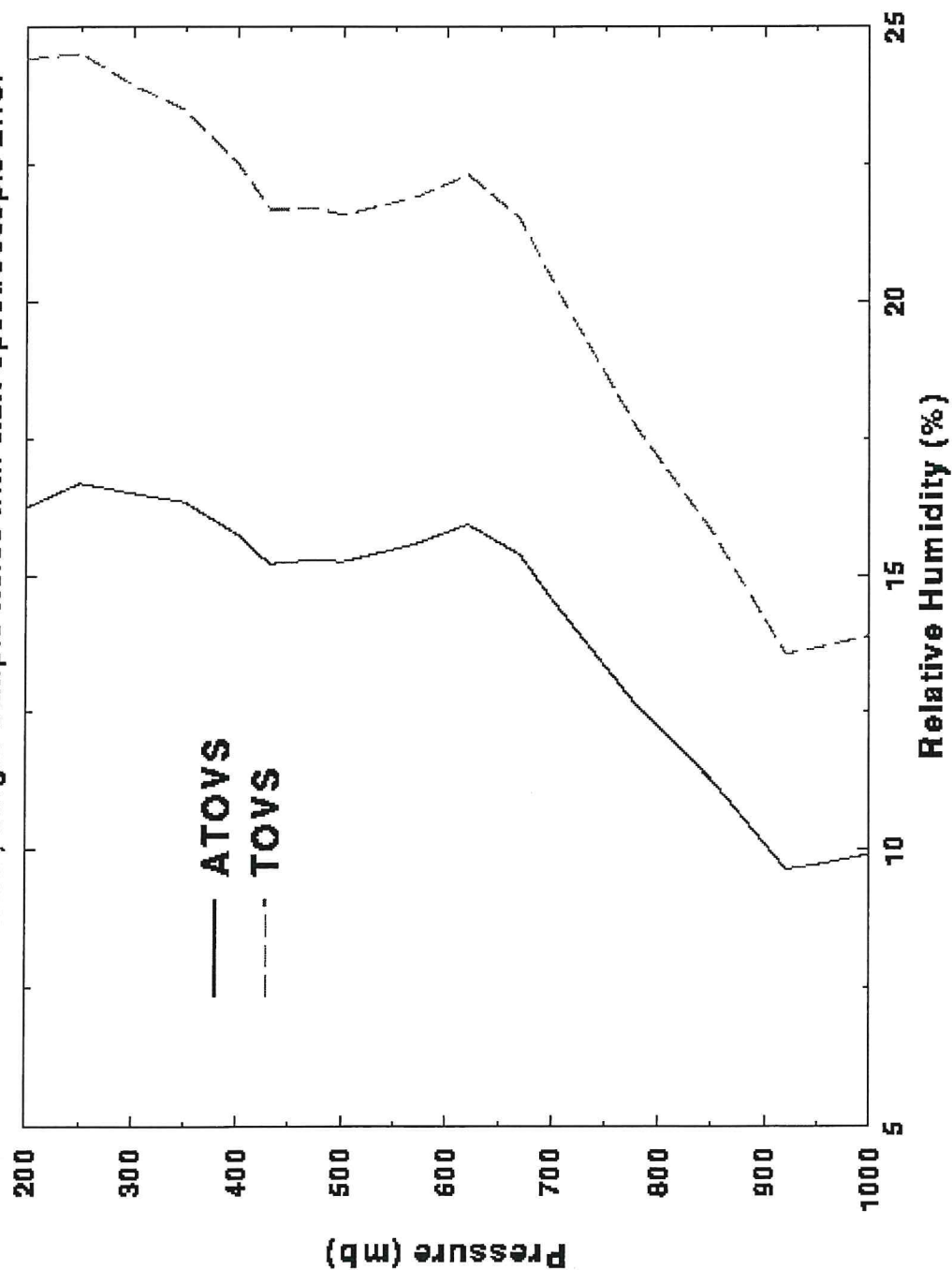
GOES Entropy Reduction = 0.20

**GHIS has 5.08 times
as much information as GOES**

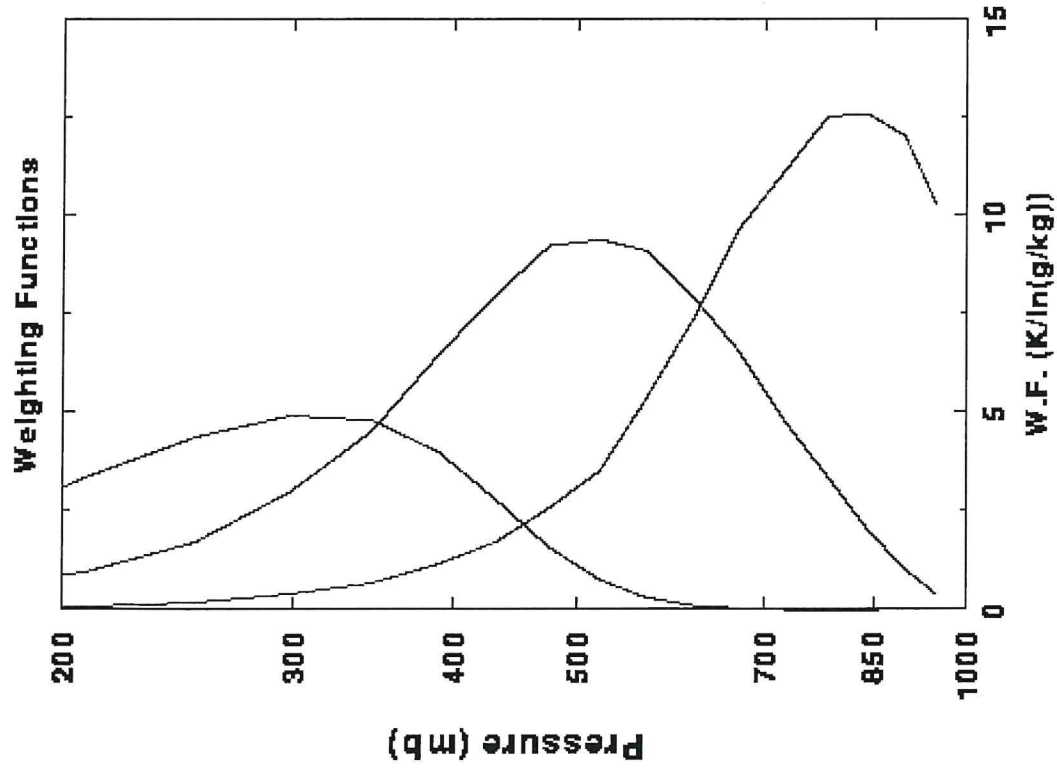
1KM-layer Mean Temperature Root Mean Square Error
880 TIGR Rv1s ; Single Sample Noise with 0.2K Spectroscopic Error



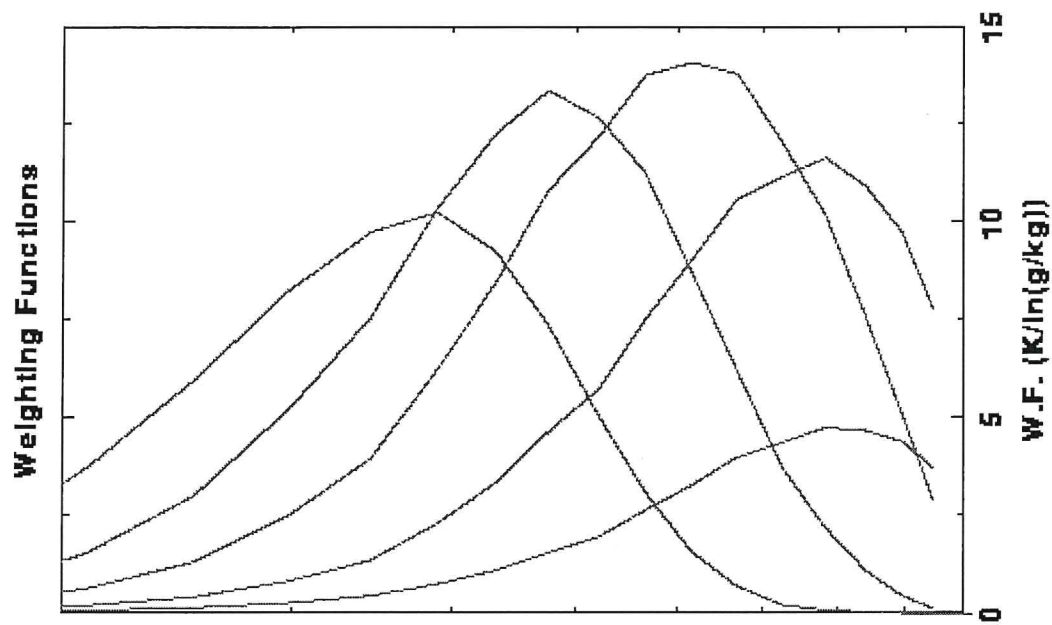
**1KM-layer Mean Relative Humidity Root Mean Square Error
880 TIGR Rv1's ; Single Sample Noise with 0.2K Spectroscopic Error**



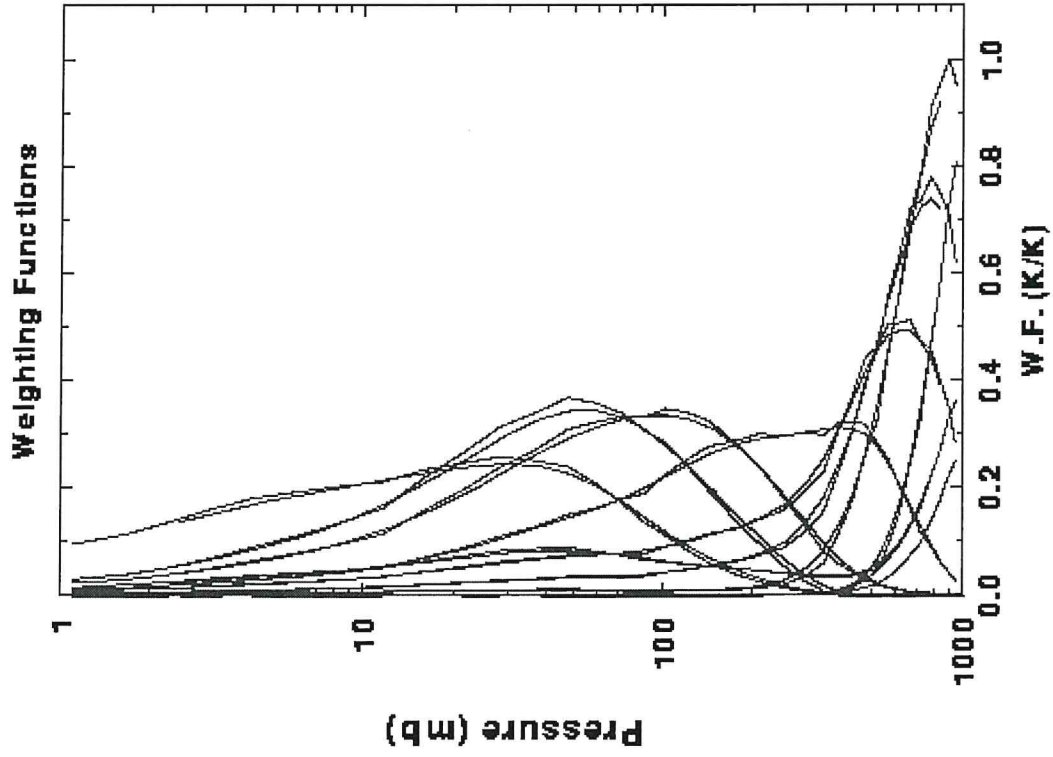
HIRS/3 Water Vapor



AMSU/MHS Water Vapor



HIRS/3 Temperature



AMSU/MHS Temperature

