Interdecadal Trend of LWCF from NCEP/NCAR Reanalyses

S-K Yang
M. Kanamitsu
A. Jim Miller
W. Ebisuzaki

CPC/NCEP/NOAA

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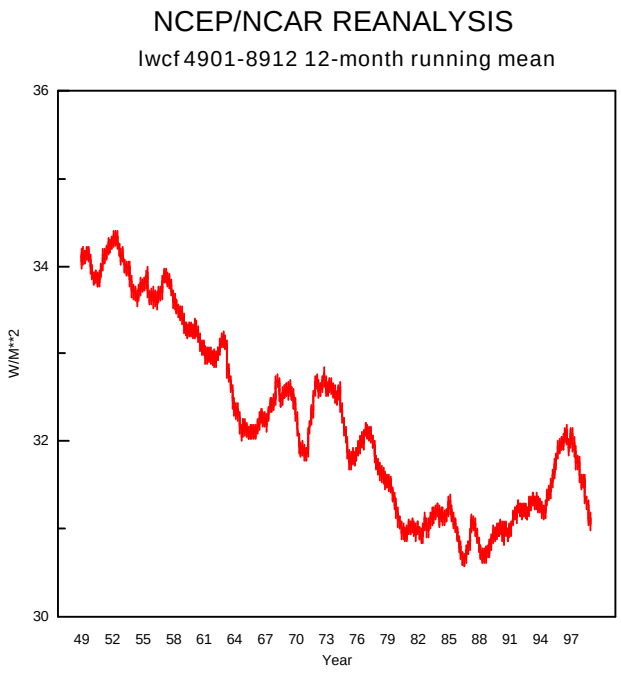
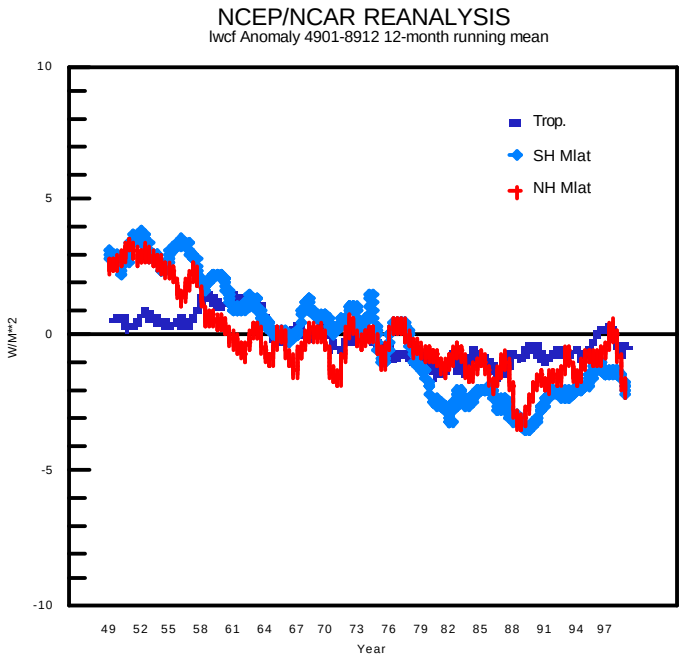
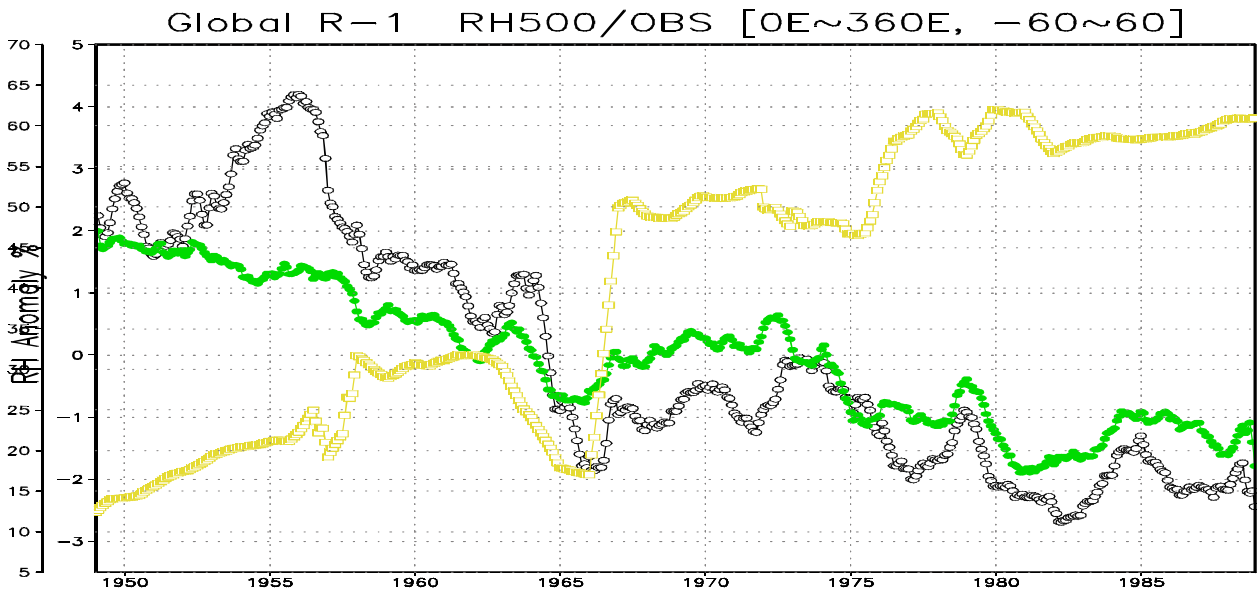
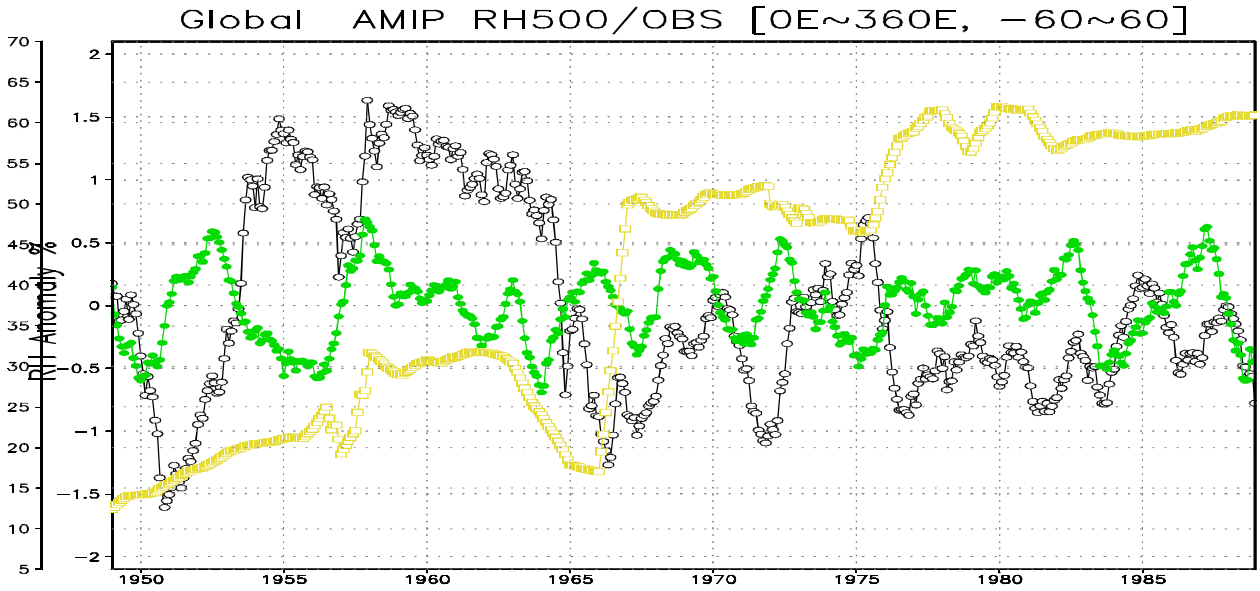
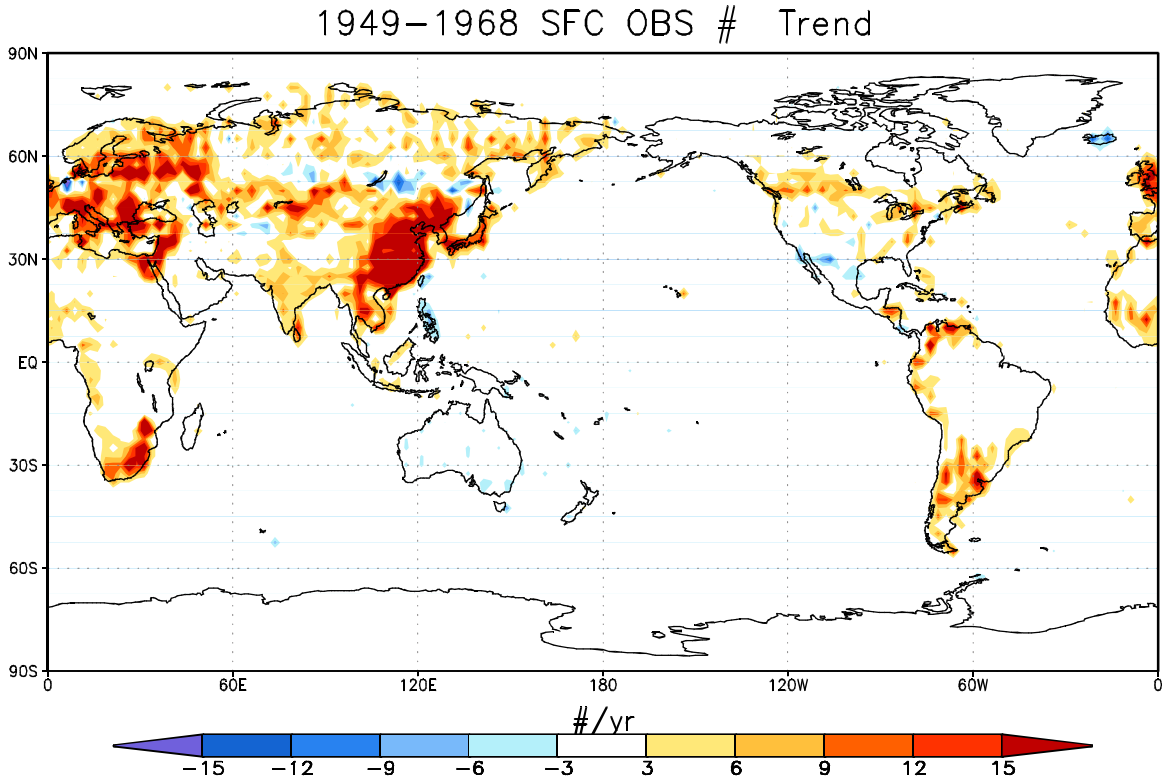
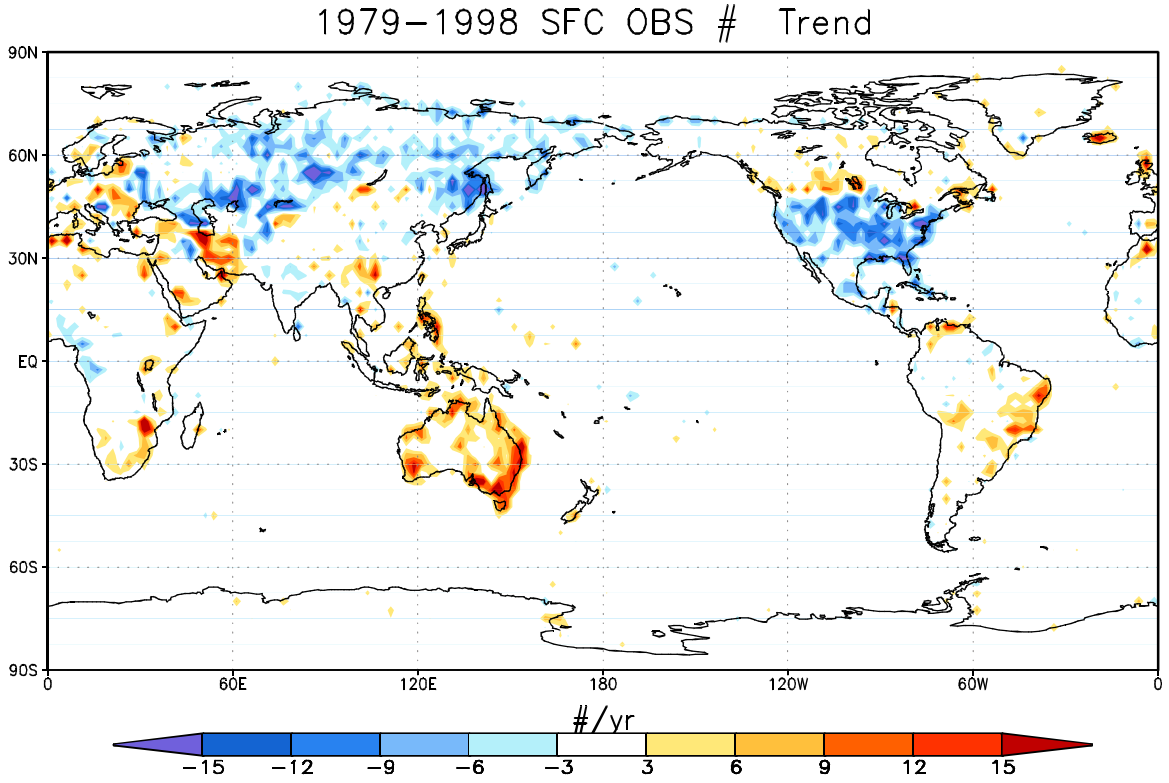

NCEP/NCAR REANALYSIS
lwcf 4901-8912 12-month running mean
36
34
32
30
W/M**2
49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97
Year

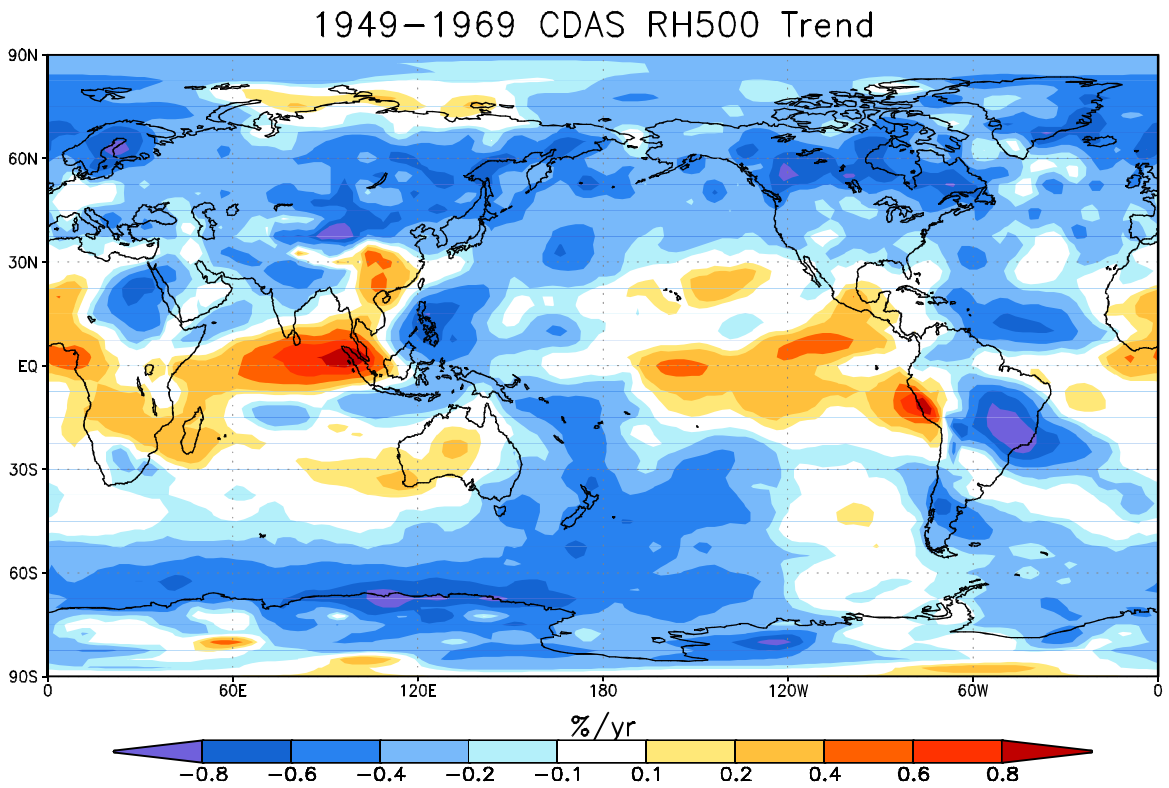

NCEP/NCAR REANALYSIS
lwcf Anomaly 4901-8912 12-month running mean
10
5
0
-5
-10
W/M**2
Trop.
SH Mlat
NH Mlat
49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97
Year

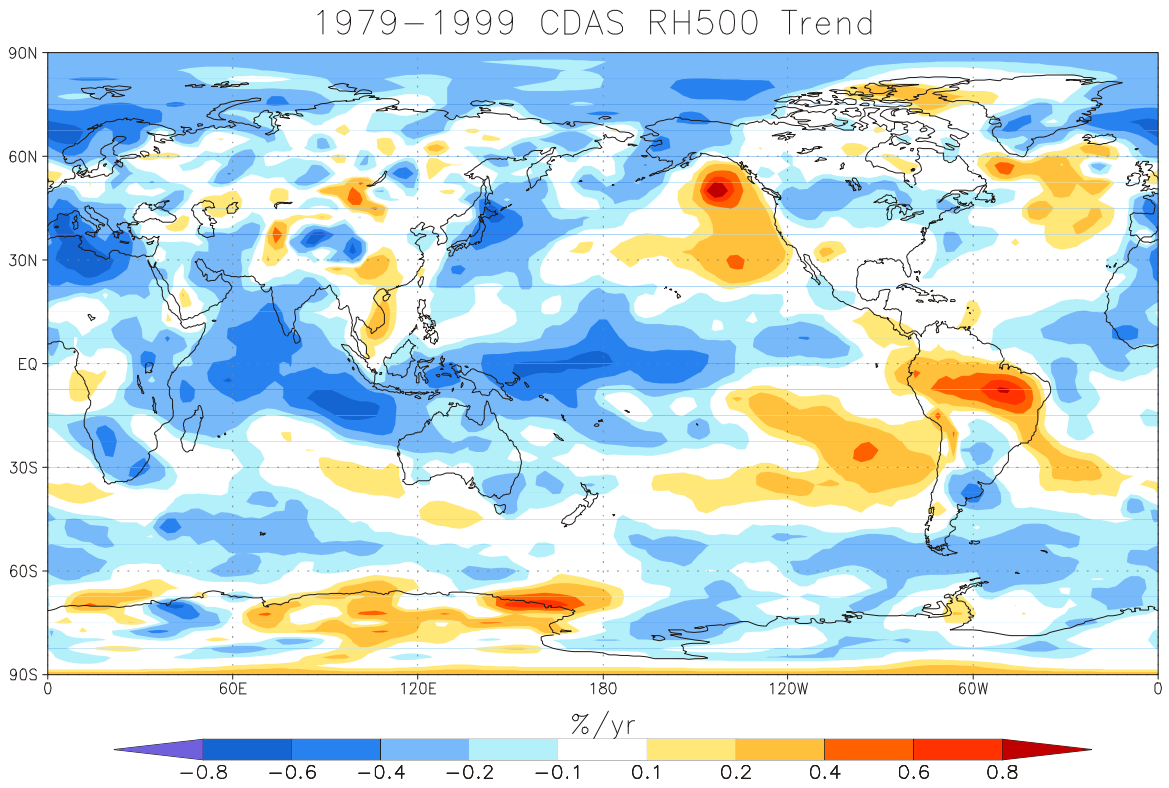

Global R−1 RH500/OBS [0E~360E, −60~60]
RH Anomaly %
70
65
60
55
50
45
40
35
30
25
20
15
10
5
5
4
3
2
1
0
−1
−2
−3
1950
1955
1960
1965
1970
1975
1980
1985

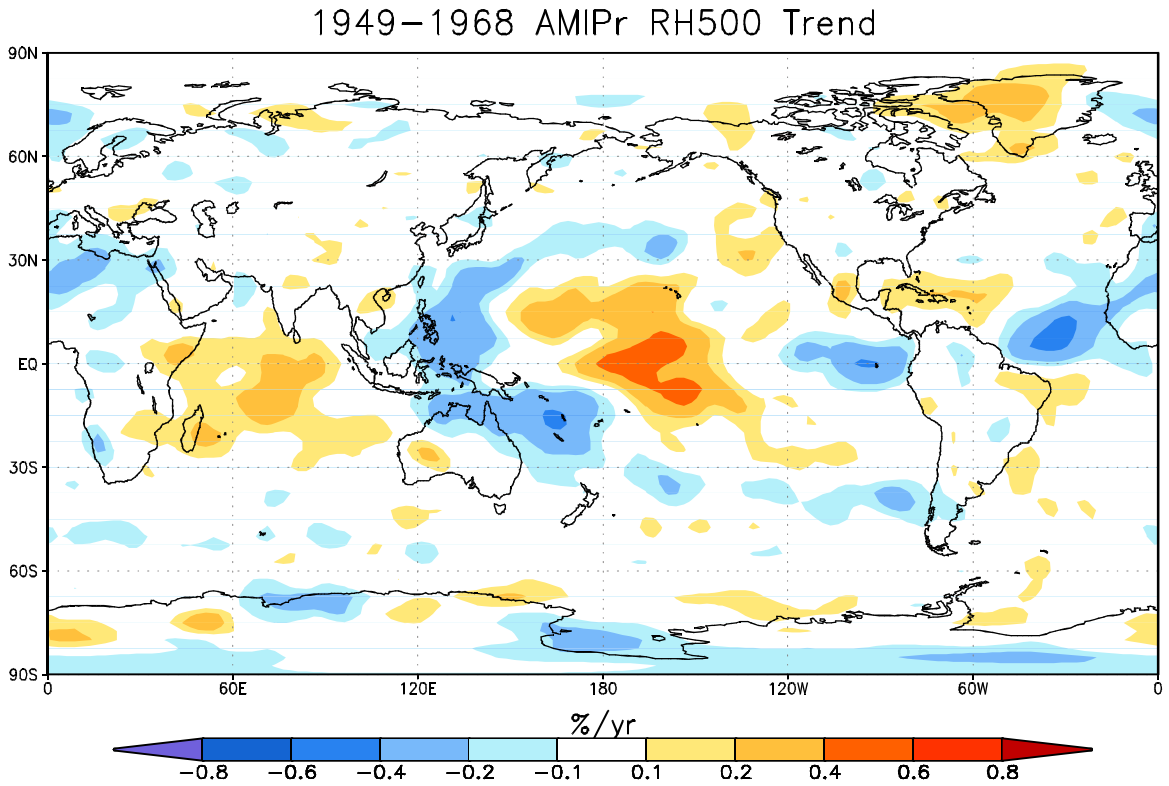

Global AMIP RH500/OBS [0E~360E, −60~60]
RH Anomaly %
70
65
60
55
50
45
40
35
30
25
20
15
10
5
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
1950
1955
1960
1965
1970
1975
1980
1985

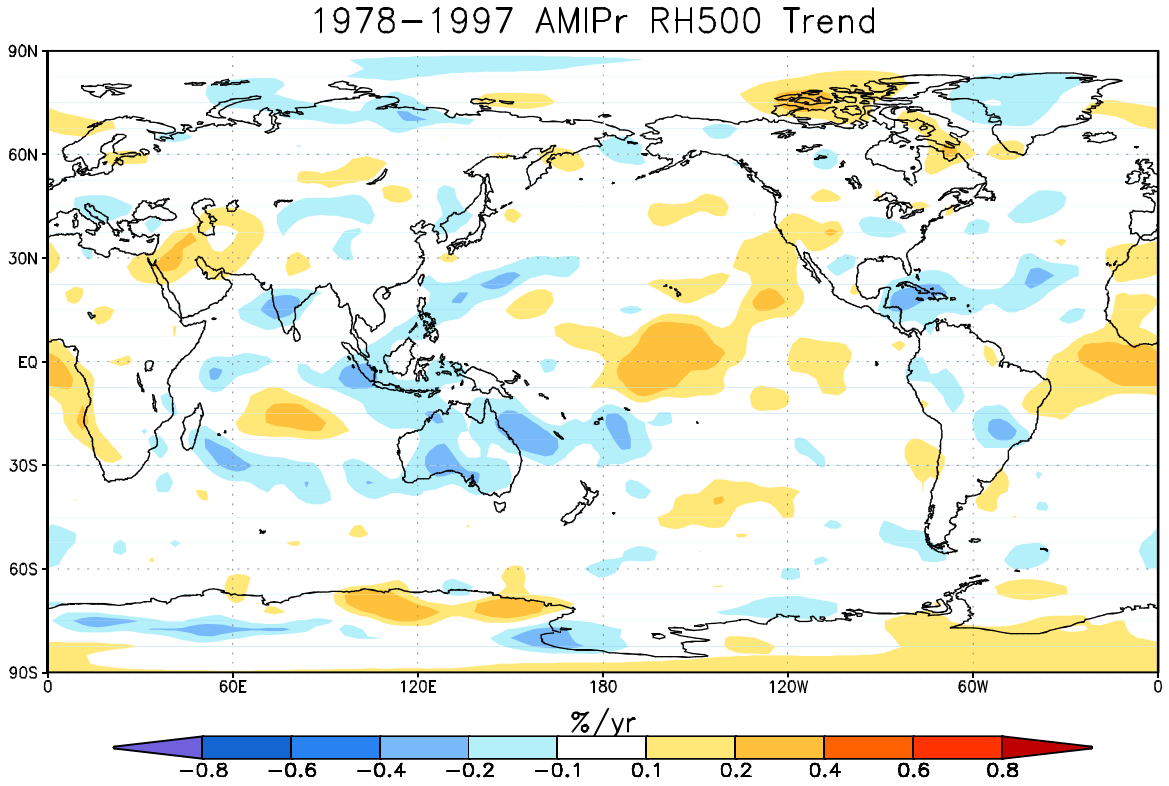

1949–1968 SFC OBS # Trend
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
#/yr
−15
−12
−9
−6
−3
3
6
9
12
15

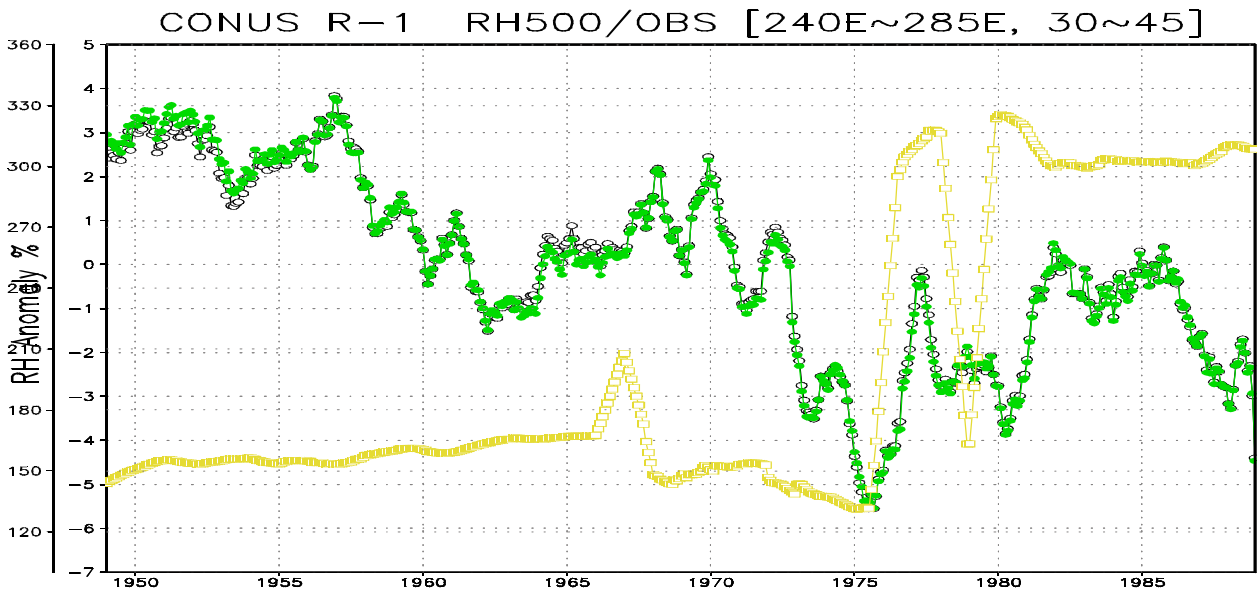

1979–1998 SFC OBS # Trend
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
#/yr
−15
−12
−9
−6
−3
3
6
9
12
15

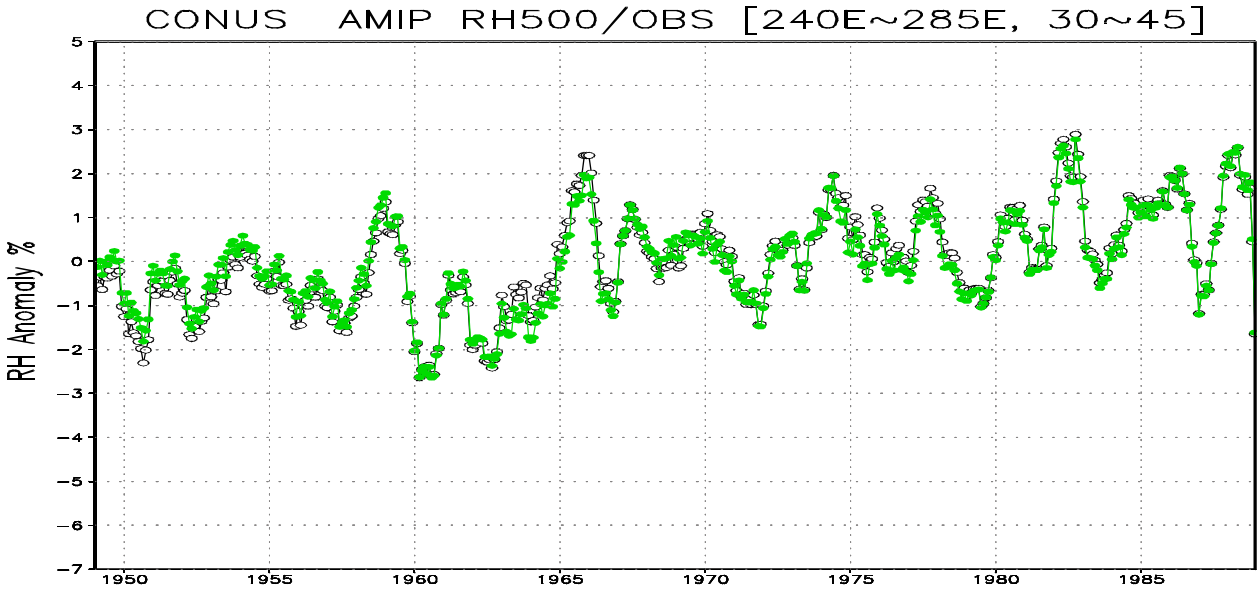

1949–1969 CDAS RH500 Trend
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
%/yr
−0.8
−0.6
−0.4
−0.2
−0.1
0.1
0.2
0.4
0.6
0.8

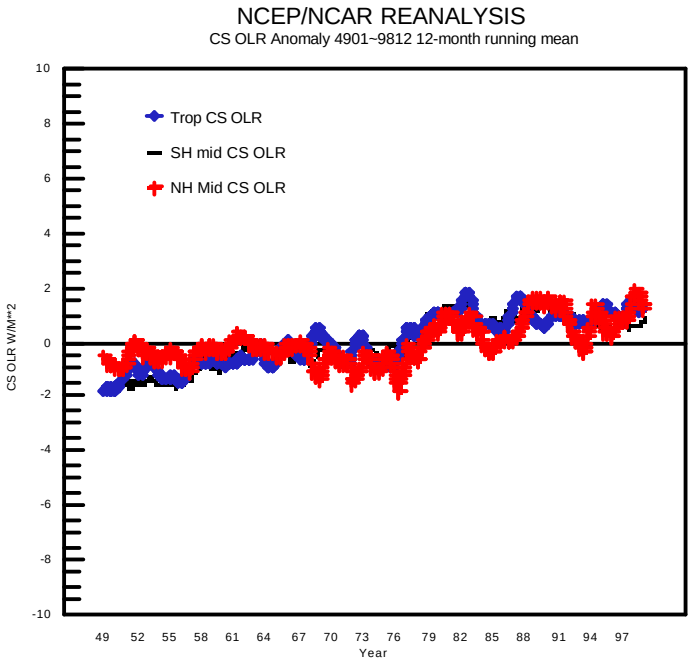

1979–1999 CDAS RH500 Trend
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
%/yr
−0.8
−0.6
−0.4
−0.2
−0.1
0.1
0.2
0.4
0.6
0.8

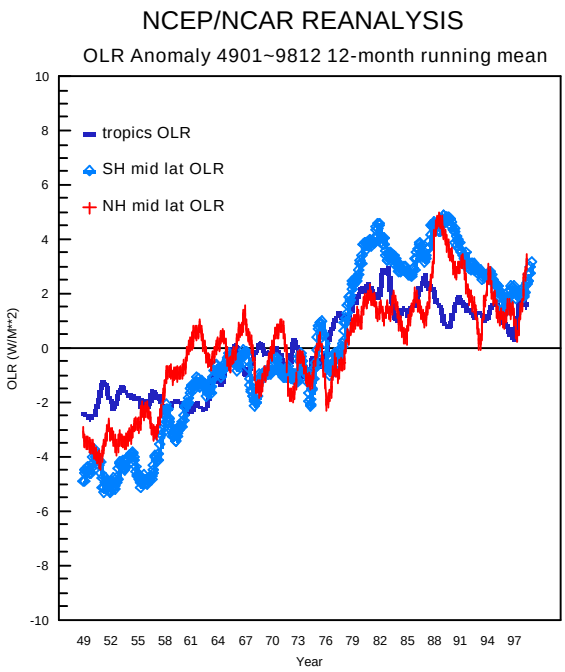

1949–1968 AMIPr RH500 Trend
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
%/yr
−0.8
−0.6
−0.4
−0.2
−0.1
0.1
0.2
0.4
0.6
0.8

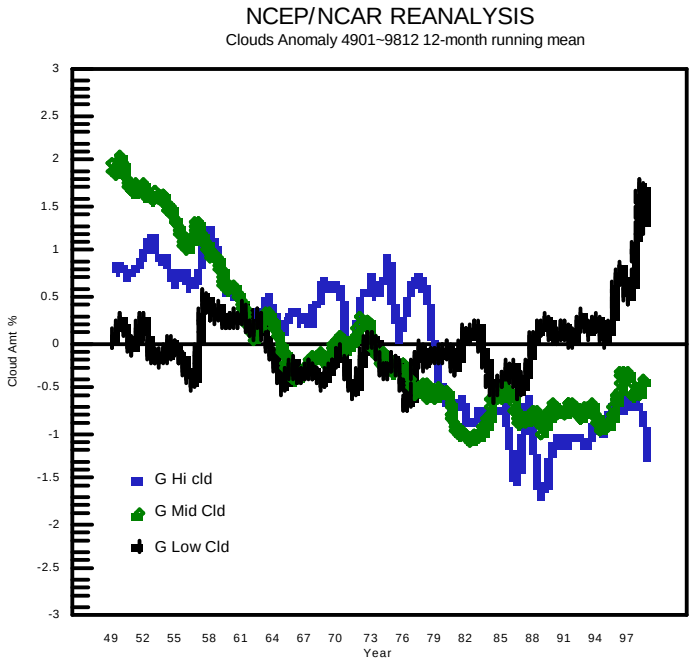

1978–1997 AMIPr RH500 Trend
90N
60N
30N
EQ
30S
60S
90S
0
60E
120E
180
120W
60W
0
%/yr
−0.8
−0.6
−0.4
−0.2
−0.1
0.1
0.2
0.4
0.6
0.8

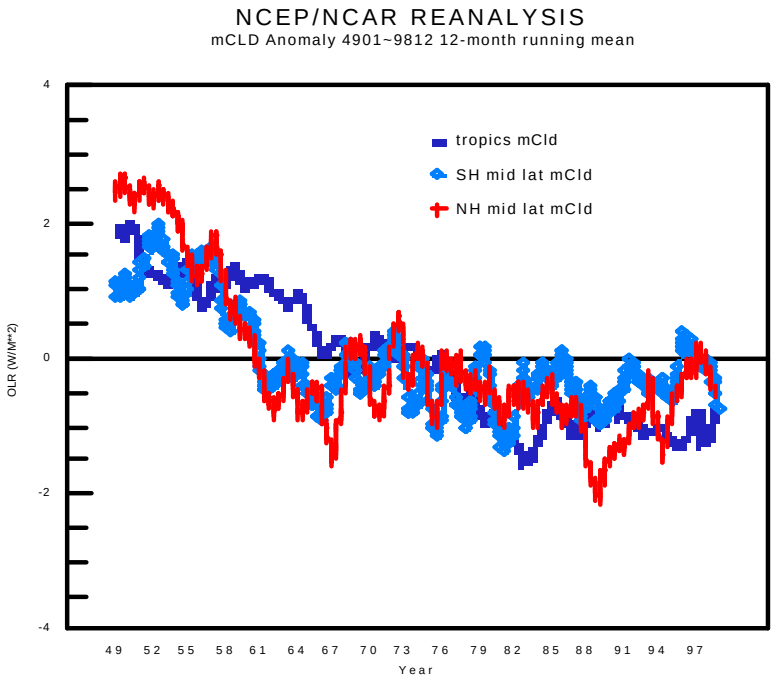

CONUS R-1 RH500/OBS [240E~285E, 30~45]
RH Anomaly %
360
330
300
270
240
210
180
150
120
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
1950
1955
1960
1965
1970
1975
1980
1985

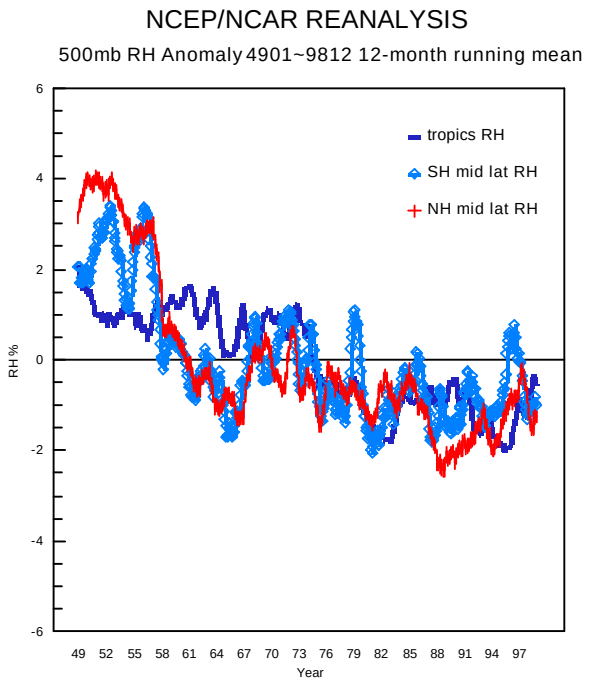

CONUS AMIP RH500/OBS [240E~285E, 30~45]
RH Anomaly %
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
1950
1955
1960
1965
1970
1975
1980
1985


NCEP/NCAR REANALYSIS
CS OLR Anomaly 4901~9812 12-month running mean
Trop CS OLR
SH mid CS OLR
NH Mid CS OLR
CS OLR W/M**2
10
8
6
4
2
0
-2
-4
-6
-8
-10
49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97
Year


NCEP/NCAR REANALYSIS
OLR Anomaly 4901~9812 12-month running mean
tropics OLR
SH mid lat OLR
NH mid lat OLR
OLR (W/M**2)
10
8
6
4
2
0
-2
-4
-6
-8
-10
49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97
Year


NCEP/NCAR REANALYSIS
Clouds Anomaly 4901~9812 12-month running mean
Cloud Amt %
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
G Hi cld
G Mid Cld
G Low Cld
49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97
Year


NCEP/NCAR REANALYSIS
mCLD Anomaly 4901~9812 12-month running mean
OLR (W/M**2)
4
2
0
-2
-4
tropics mCld
SH mid lat mCld
NH mid lat mCld
49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97
Year


NCEP/NCAR REANALYSIS
500mb RH Anomaly 4901~9812 12-month running mean
tropics RH
SH mid lat RH
NH mid lat RH
RH %
6
4
2
0
-2
-4
-6
49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97
Year

	R-1	R-2	AMIP-ensemble10
Convection	SAS	SASmod	RAS
SW Radiat'n	L & H	Chou	Chou
Boundary layer	Local diff	Non-Local	Non-Local
Orography	Mean	Smoothed	Smoothed Enhanced
Resolution	T62L28	T62L28	T42L24
Soil Moisture	w. nudging	w/o nudging + obs. Precip	interactive
Snow	obs (fixed on '72)	obs.	Climatology
Radiat'n Reso.	124 3-hourly	196 hourly	128 3-hourly

Summary

- **LWCF trend of NCEP/NCAR Reanalysis, discovered by Potter et al (1999), is caused by mid - upper tropospheric Relative Humidity.**

- **No corresponding trend in surface temperature**

- **The trend is not ENSO related, but from observational data as suggested by AMIP simulation.**

- **Unclear the cause is from natural variation, or is artificial.**