March 31, 2014

Thirty Years of Making Atlantic Seasonal Hurricane Forecasts - Lessons Learned, Certitudes Abandoned

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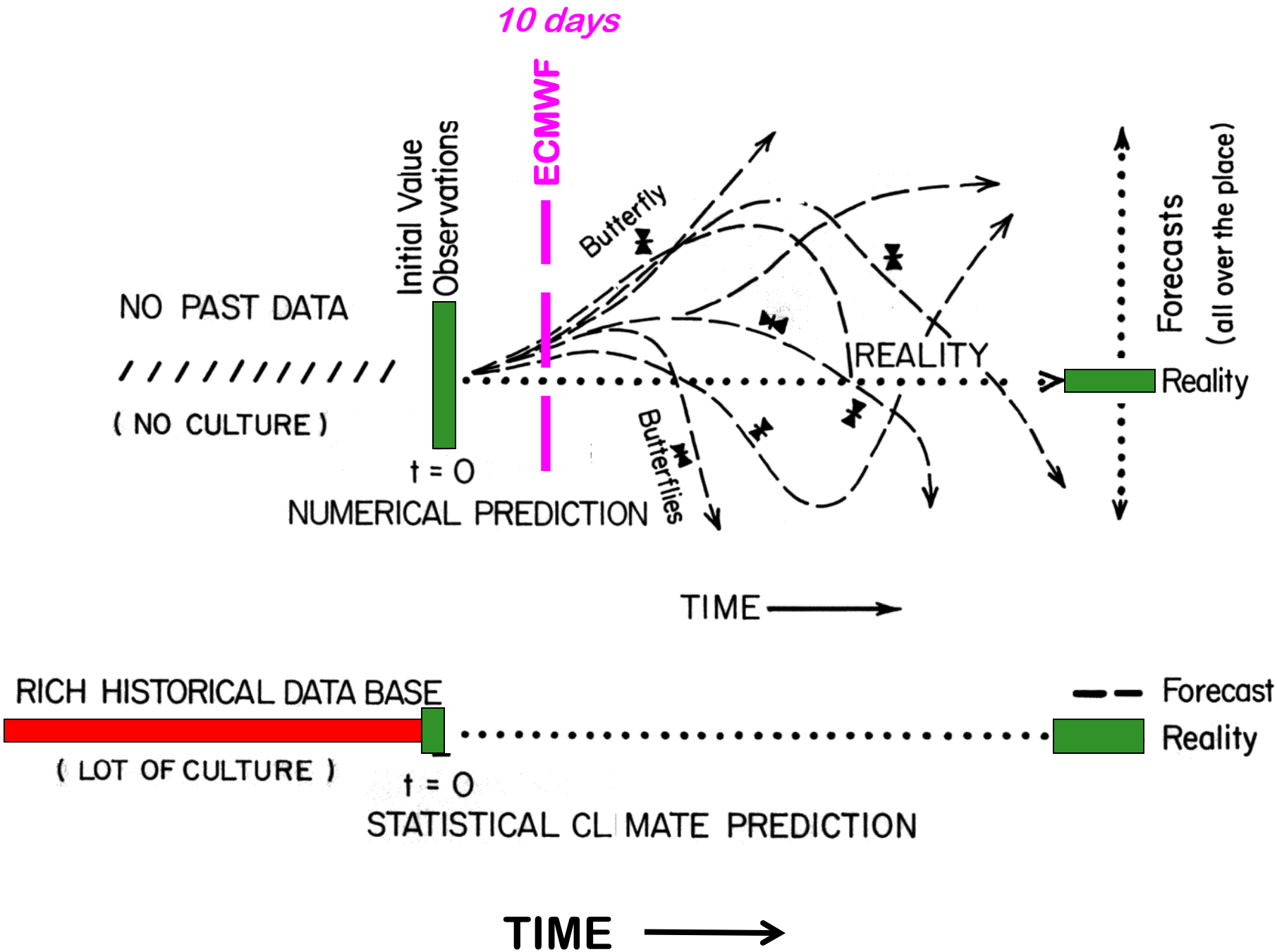
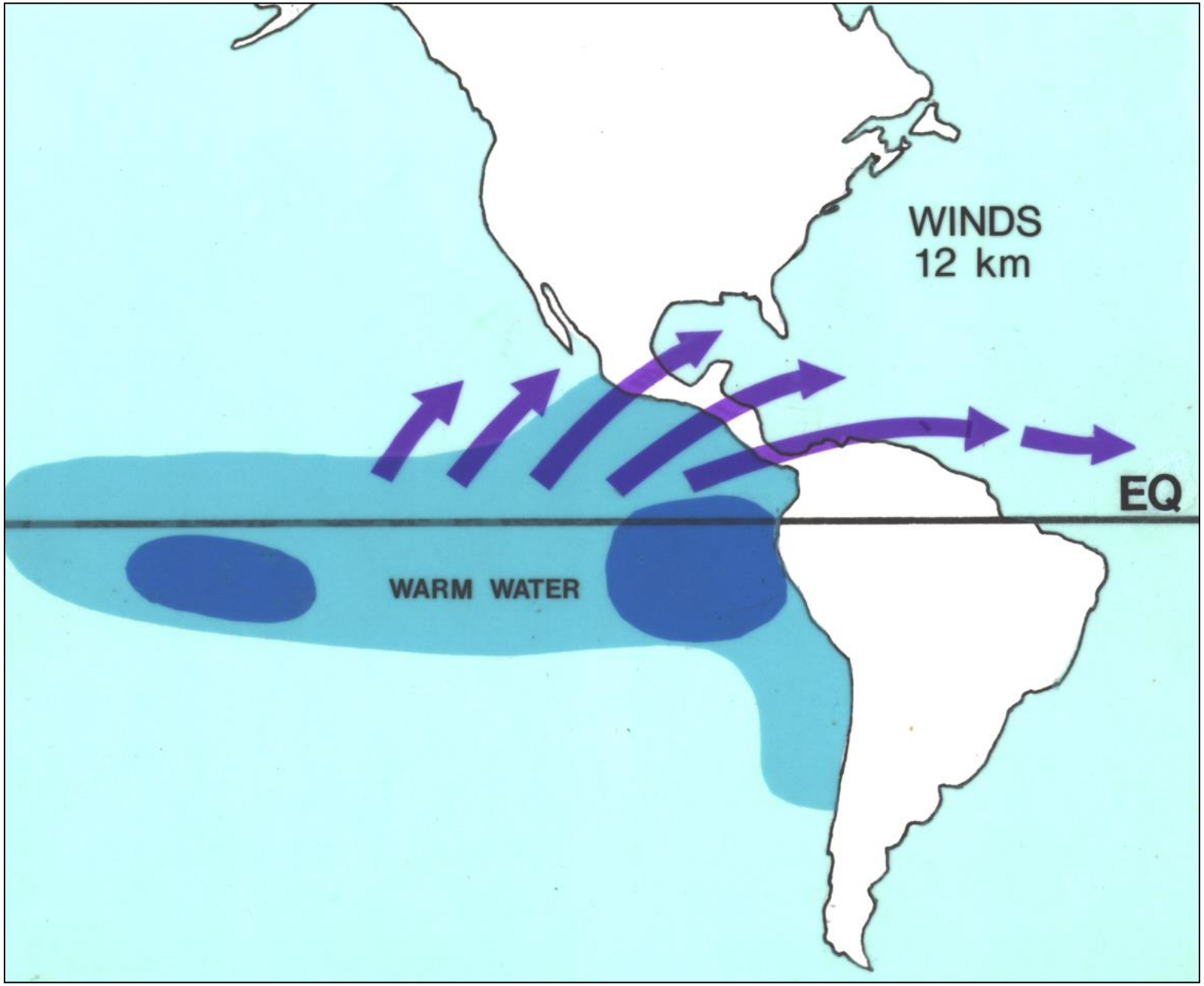
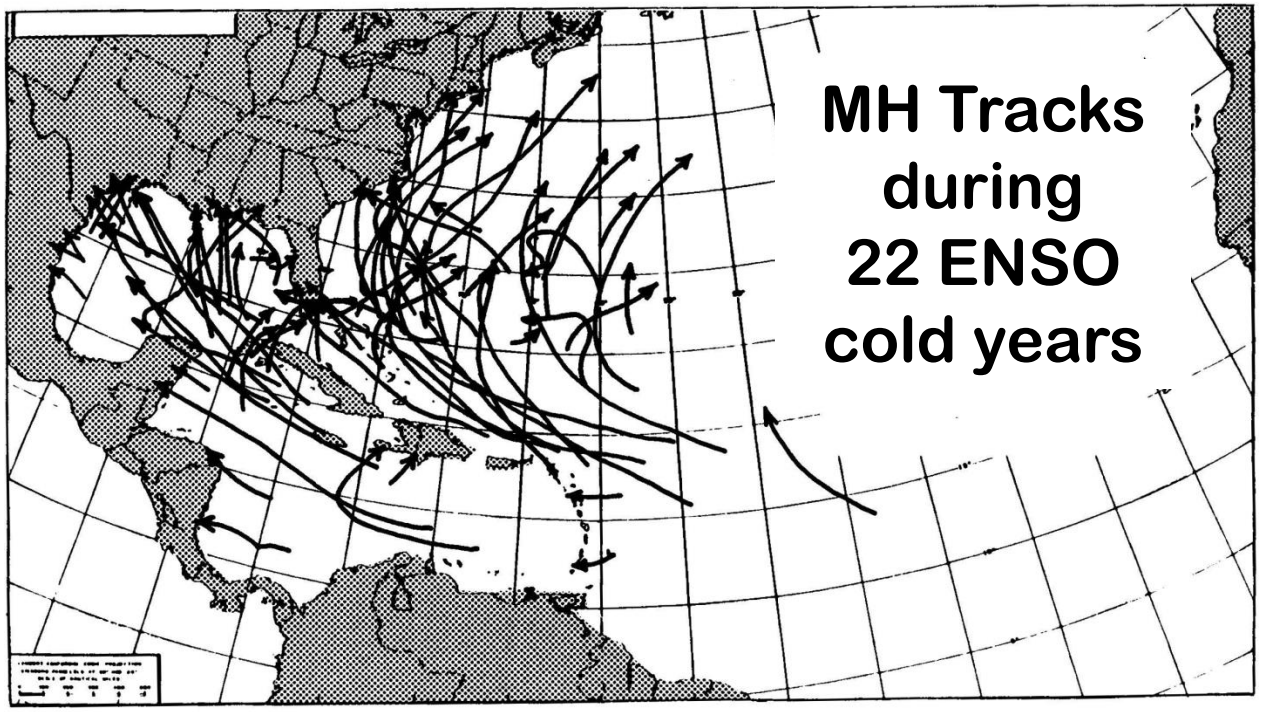
1 JUNE 1982

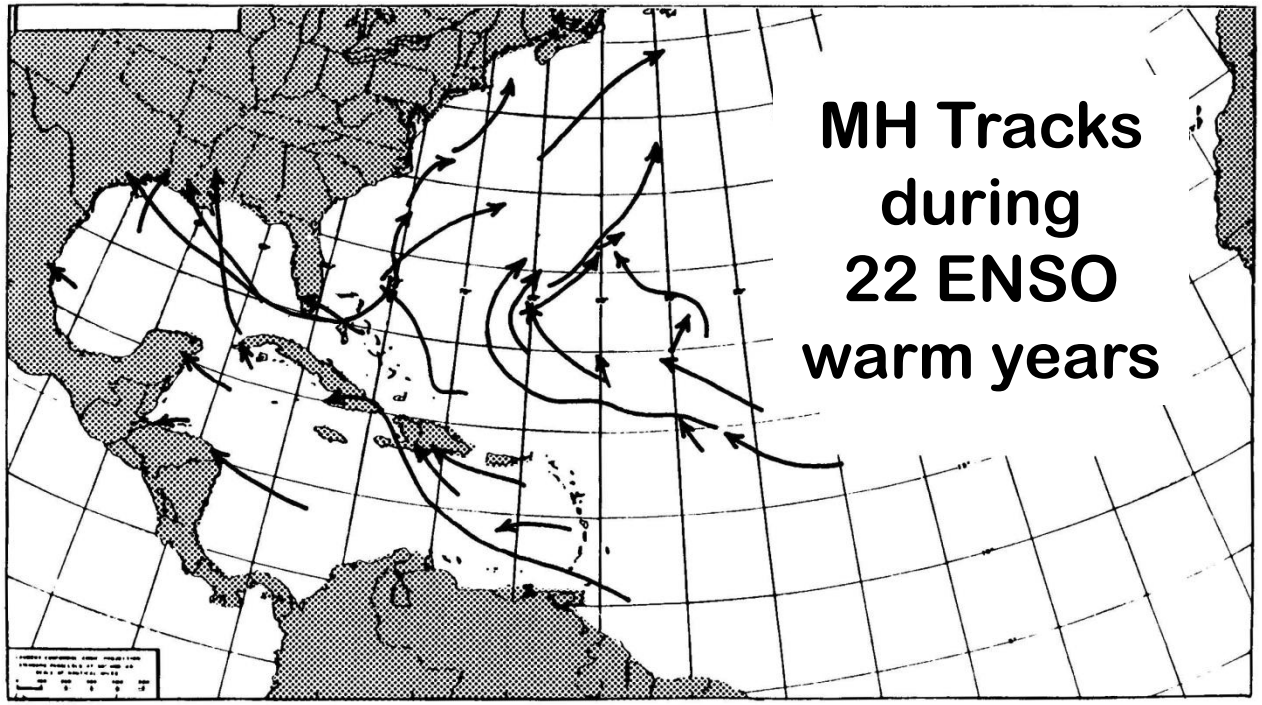
"There is no way to tell how active the coming Atlantic hurricane season is going to be."

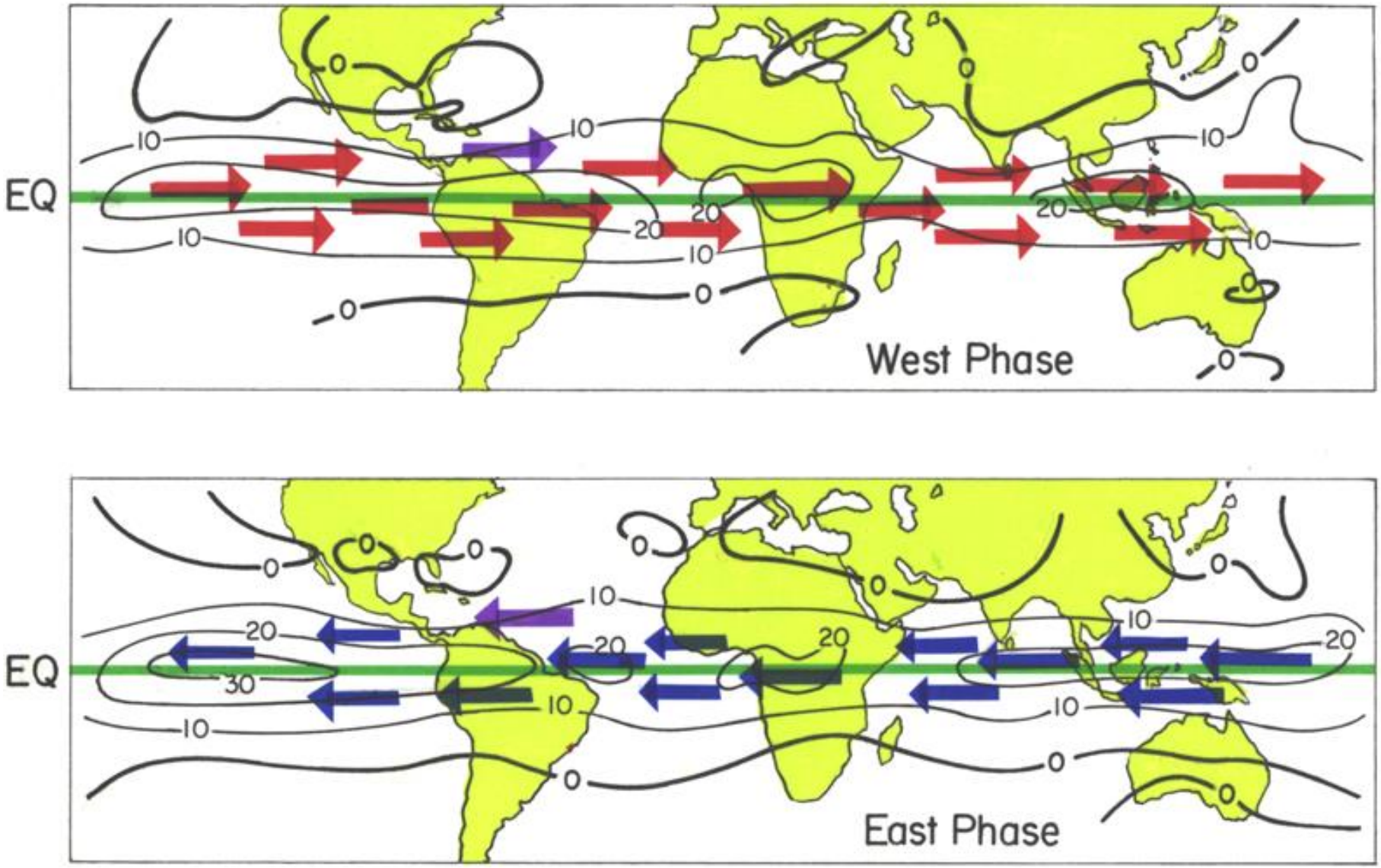
-Neil Frank, Director of NHC


10 days
ECMWF
Initial Value
Observations
Butterfly
NO PAST DATA
(NO CULTURE)
t = 0
NUMERICAL PREDICTION
Butterflies
REALITY
Forecasts
(all over the place)
Reality
TIME
RICH HISTORICAL DATA BASE
(LOT OF CULTURE)
t = 0
STATISTICAL CLIMATE PREDICTION
Forecast
Reality
TIME

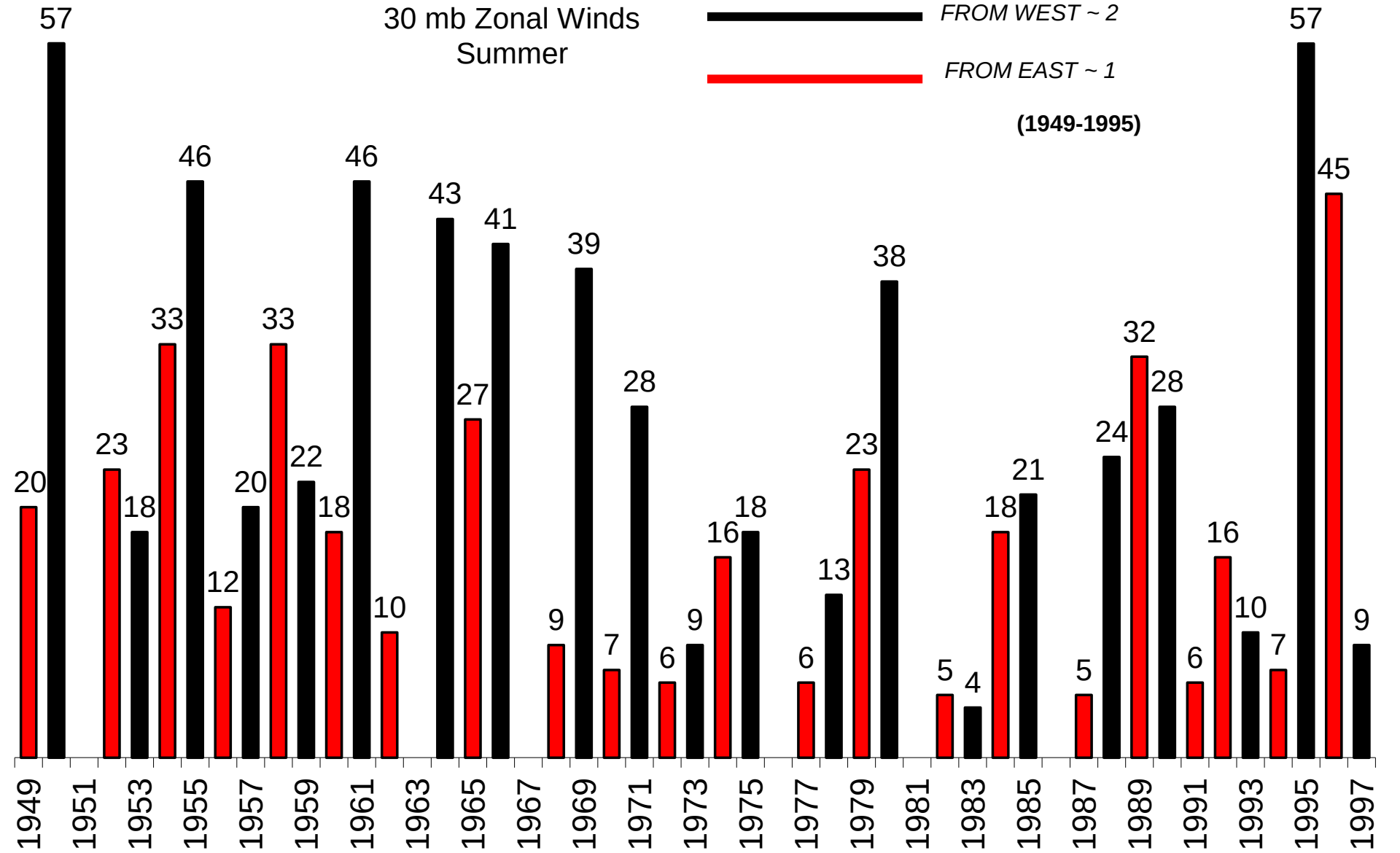

WINDS
12 km
EQ
WARM WATER

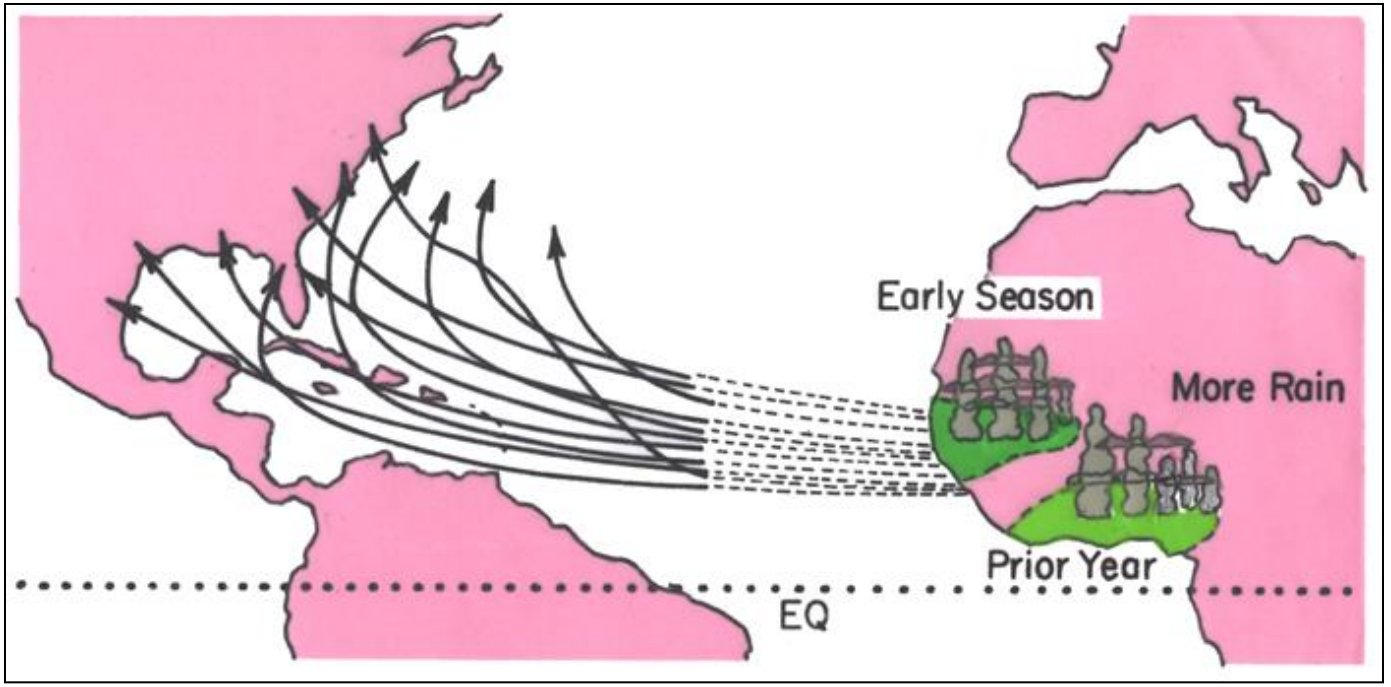

MH Tracks
during
22 ENSO
cold years

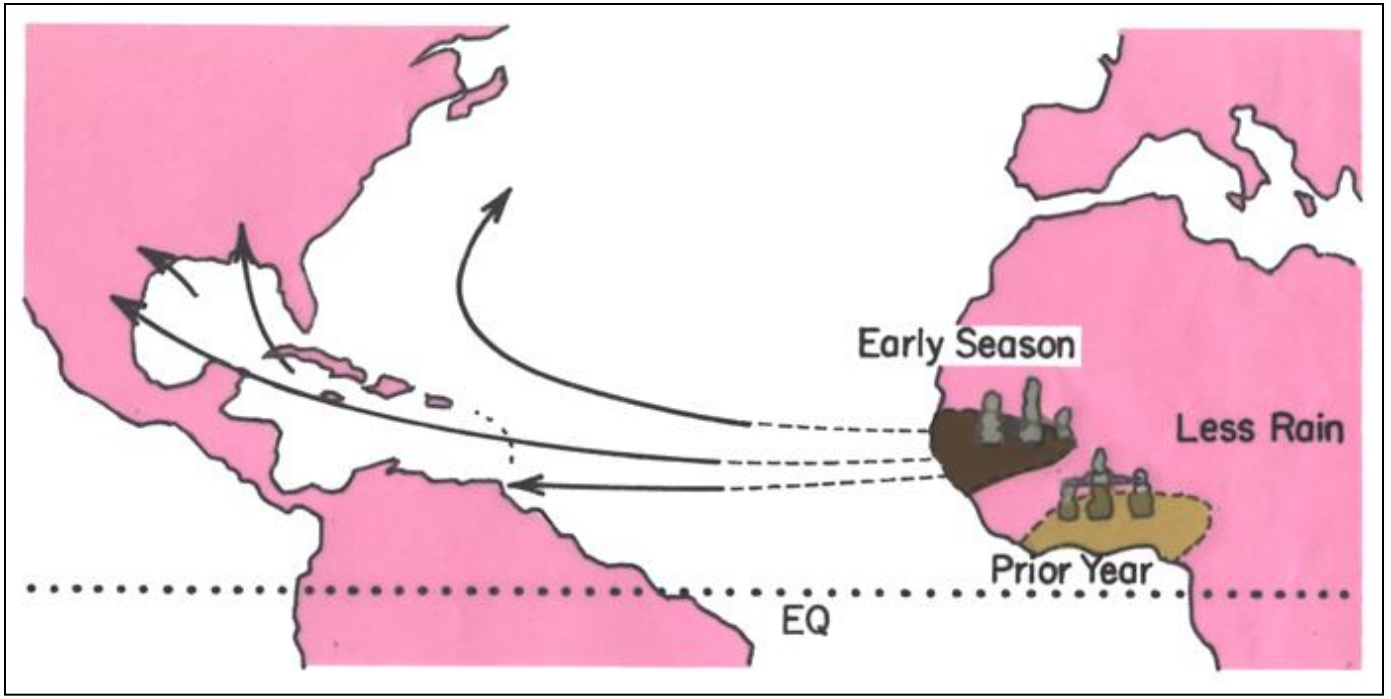

MH Tracks
during
22 ENSO
warm years

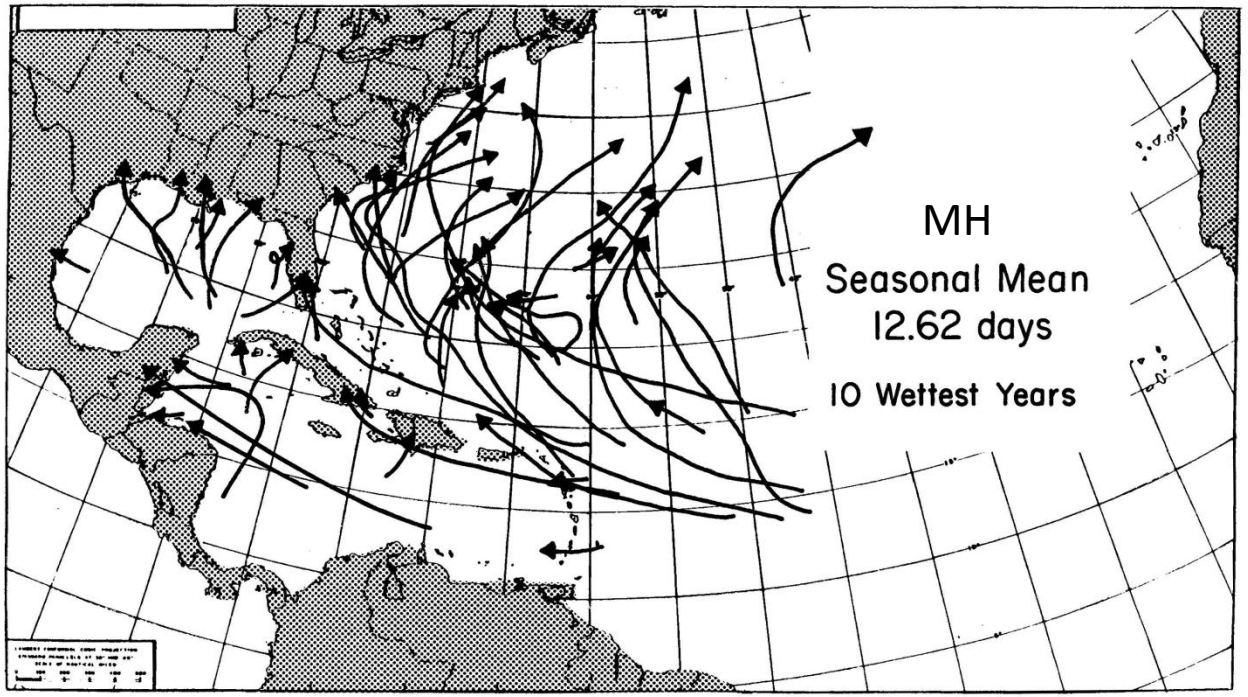

EQ
0
10
20
10
0
West Phase
EQ
0
10
20
30
10
0
East Phase

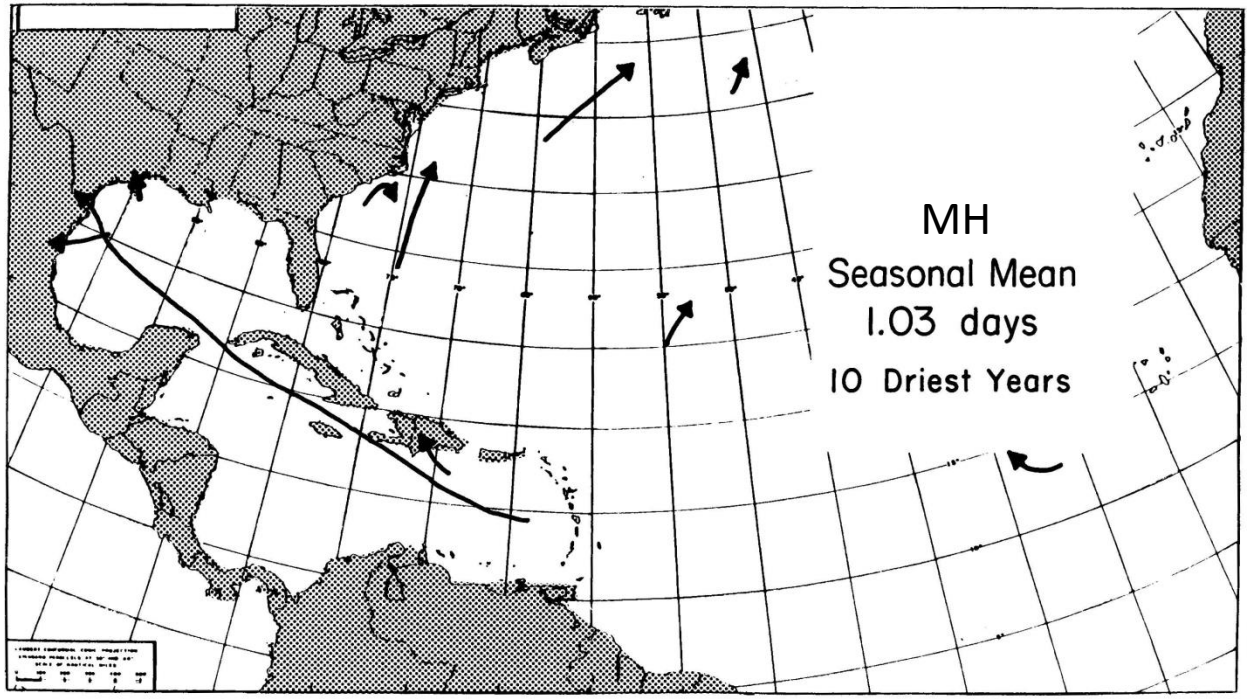
HURRICANE DAYS PER YEAR

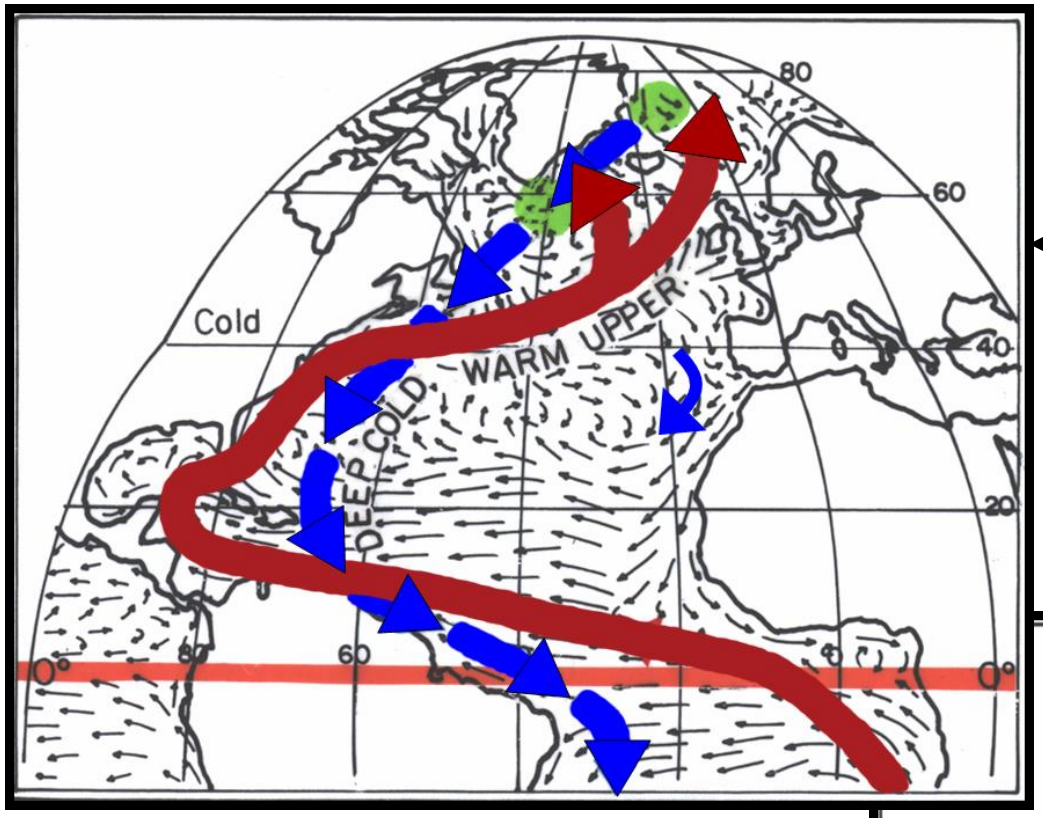



Early Season
More Rain
Prior Year
EQ


Early Season
Less Rain
Prior Year
EQ


MH
Seasonal Mean
12.62 days
10 Wettest Years


MH
Seasonal Mean
1.03 days
10 Driest Years



THC *(or AMO)*

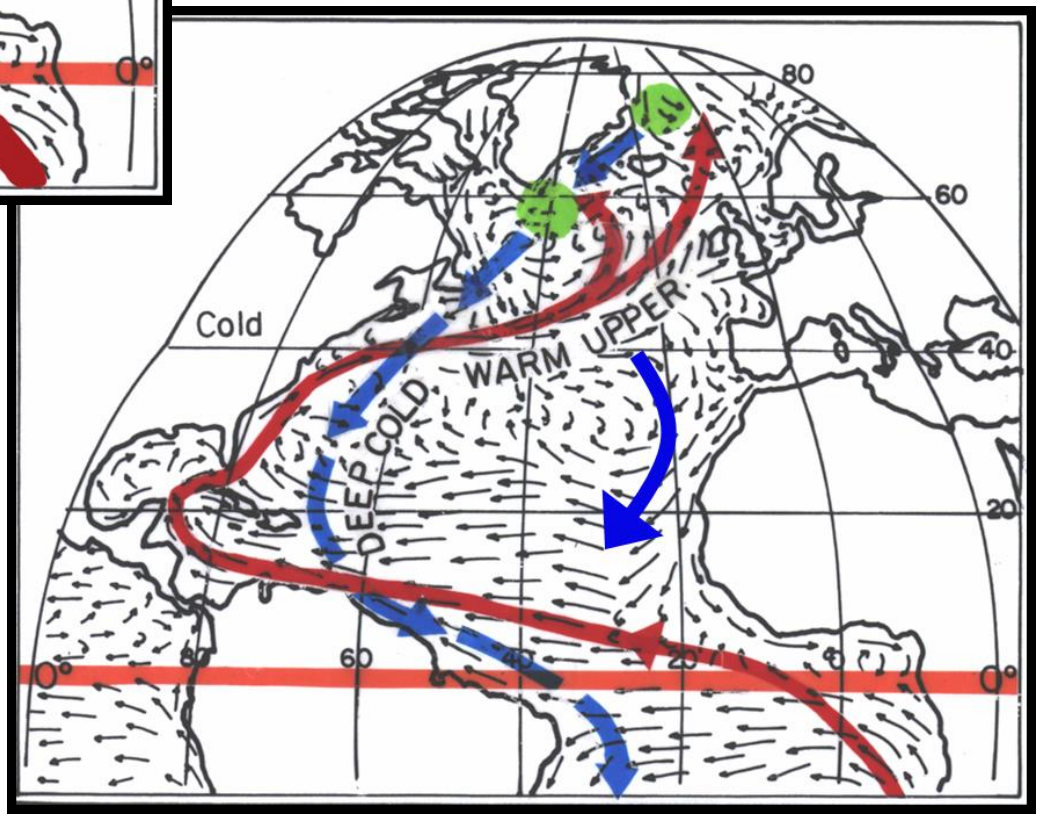
←

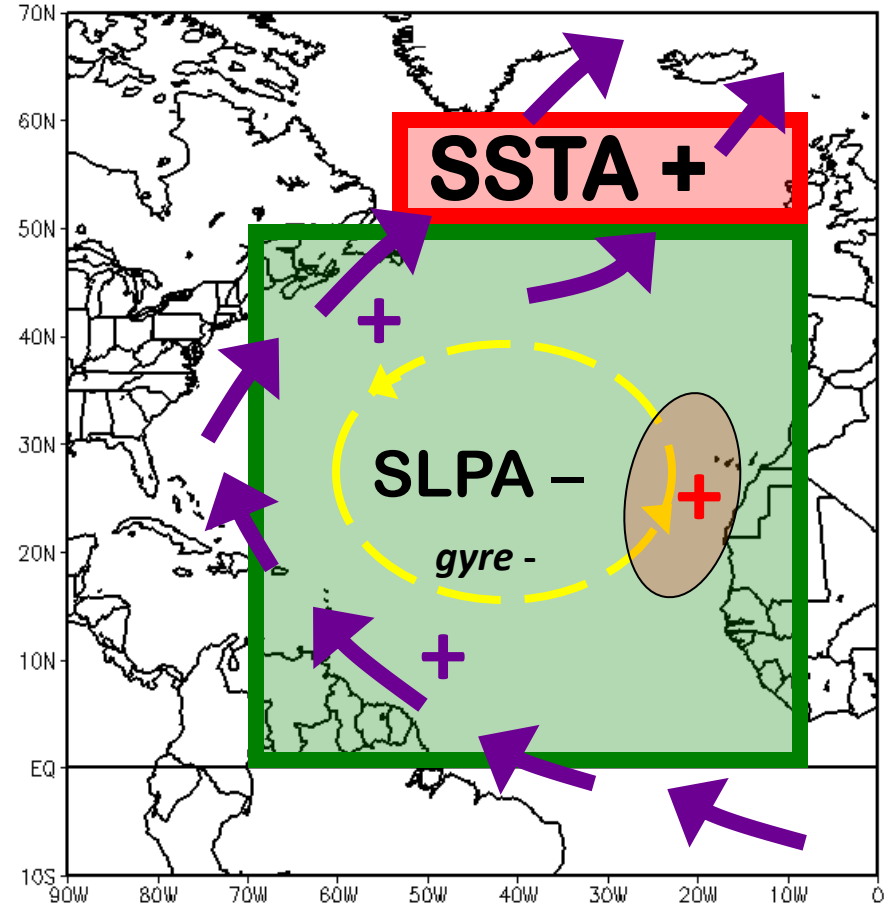
STRONG

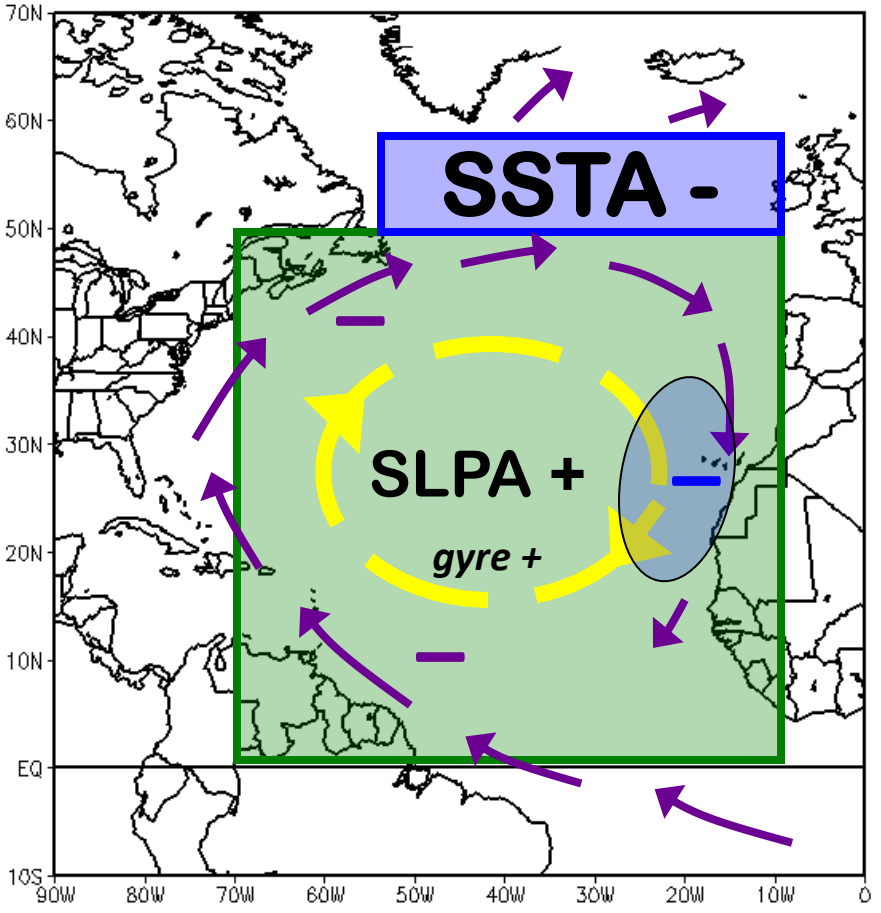
THC *(or AMO)*

→

WEAK



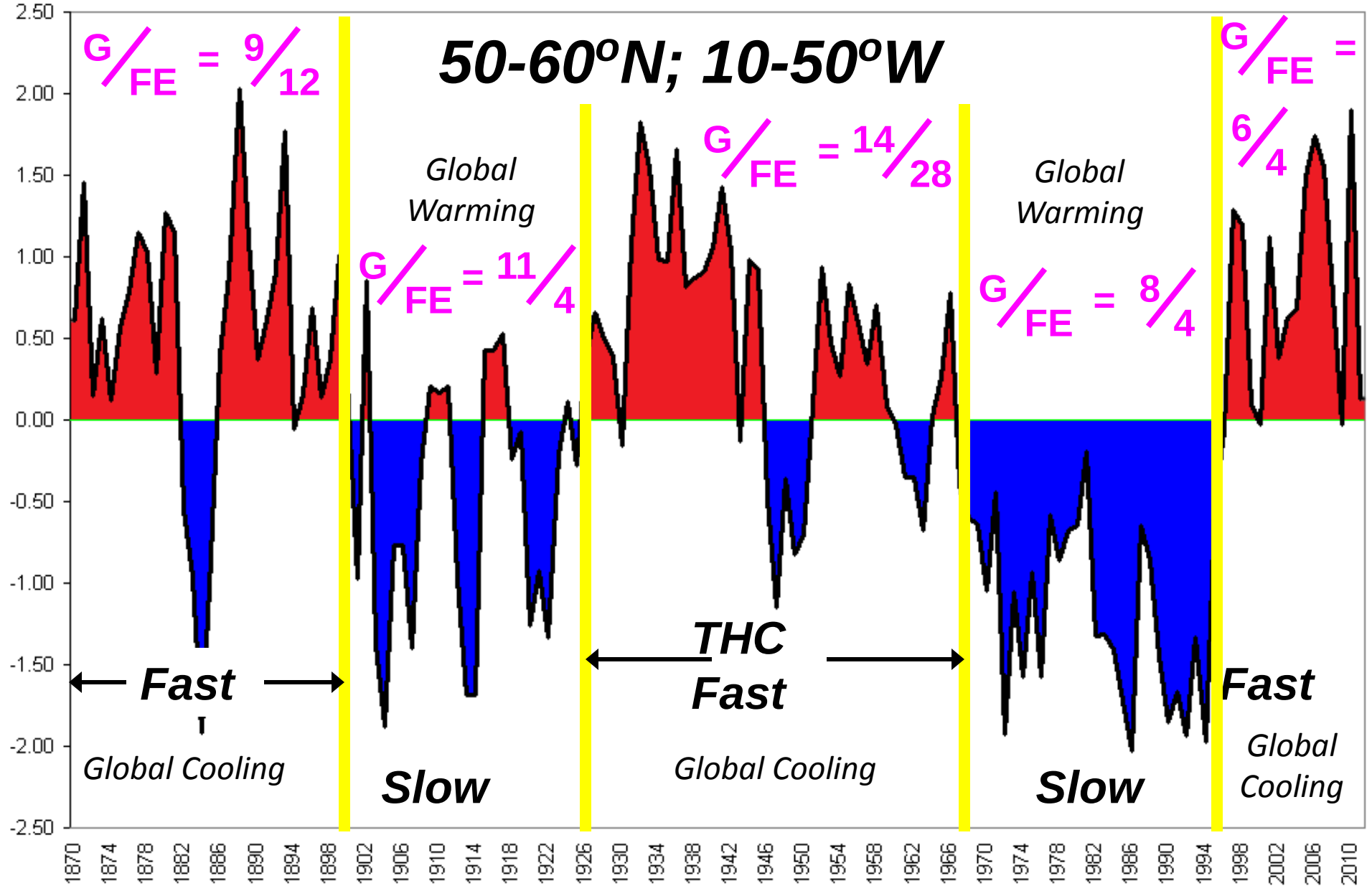


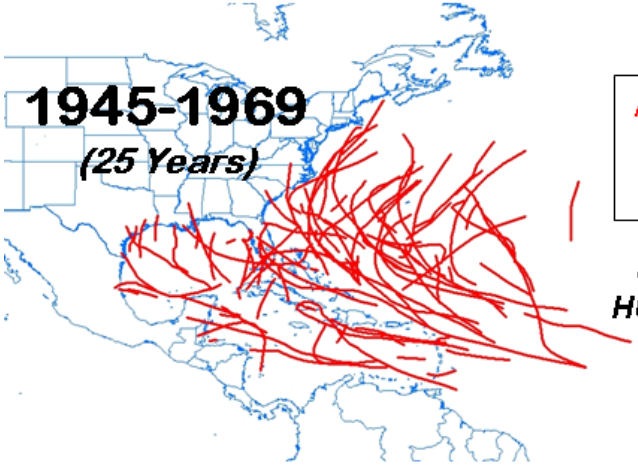


STRONG THC

WEAK THC

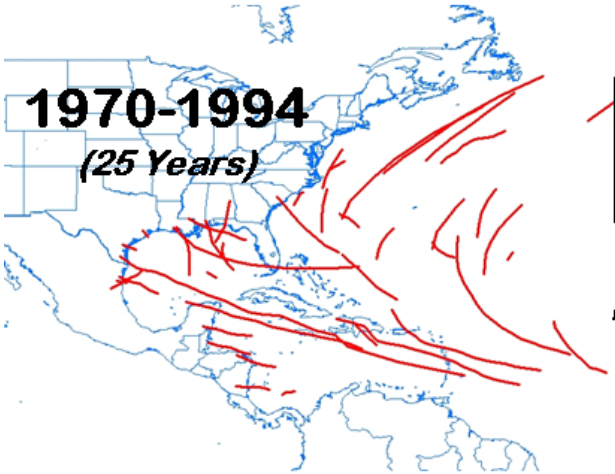
N. Atlantic SSTA





ATLANTIC THC STRONG

80 MAJOR HURRICANES



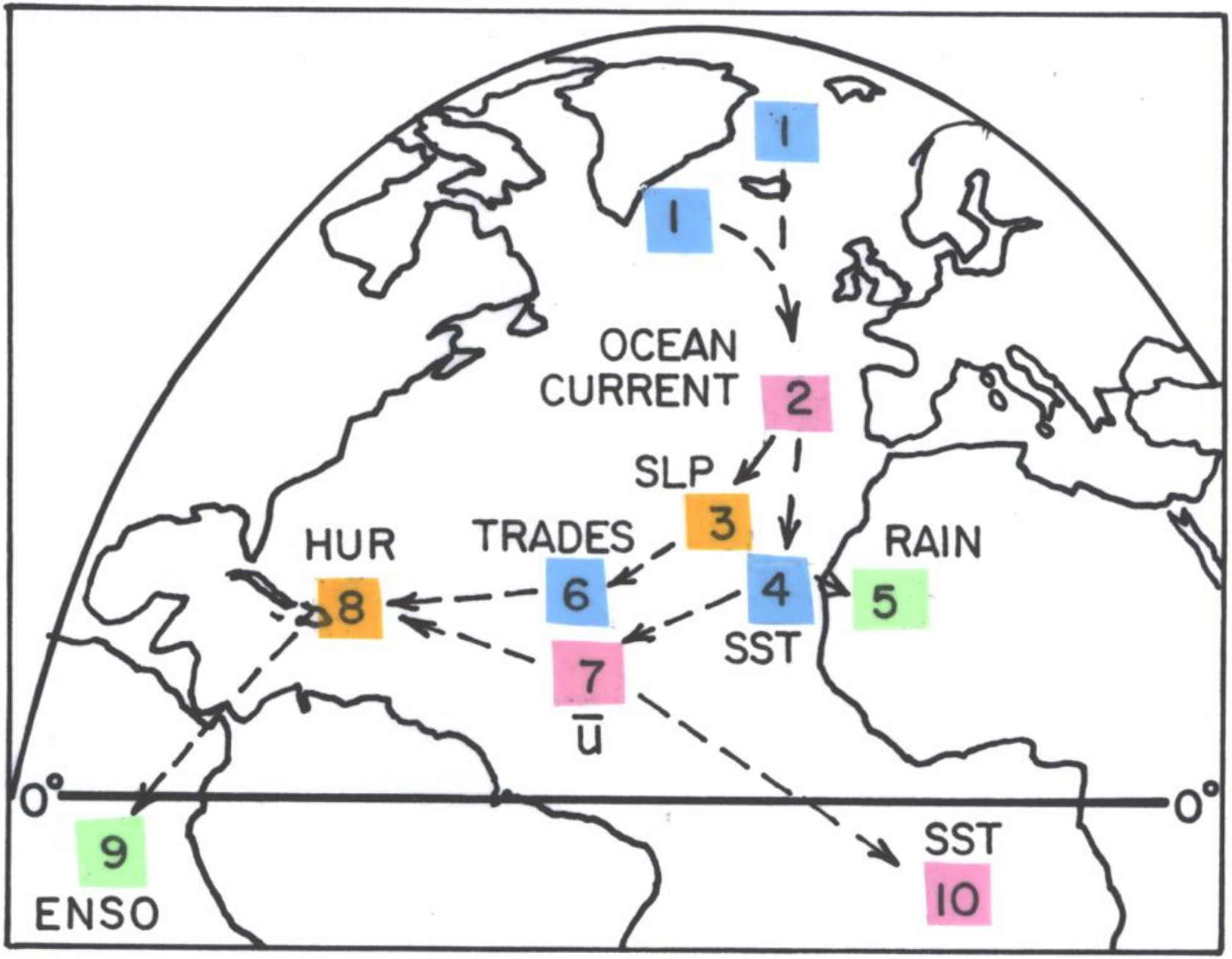
ATLANTIC THC WEAK

38 MAJOR HURRICANES

ATLANTIC THC STRONG

66 MAJOR HURRICANES or 92 Normalized to 25 Years

RATIO RELATIVE TO 1970-1994	
# MH	*# MHD*
2.1	*3.2*
1.0	*1.0*
2.4	*3.4*


1
1
OCEAN
CURRENT
2
SLP
3
HUR
TRADES
RAIN
8
6
4
5
SST
7
ū
0°
0°
9
ENSO
SST
10

VERIFICATION OF PREVIOUS FORECASTS (After 1 August Forecast)

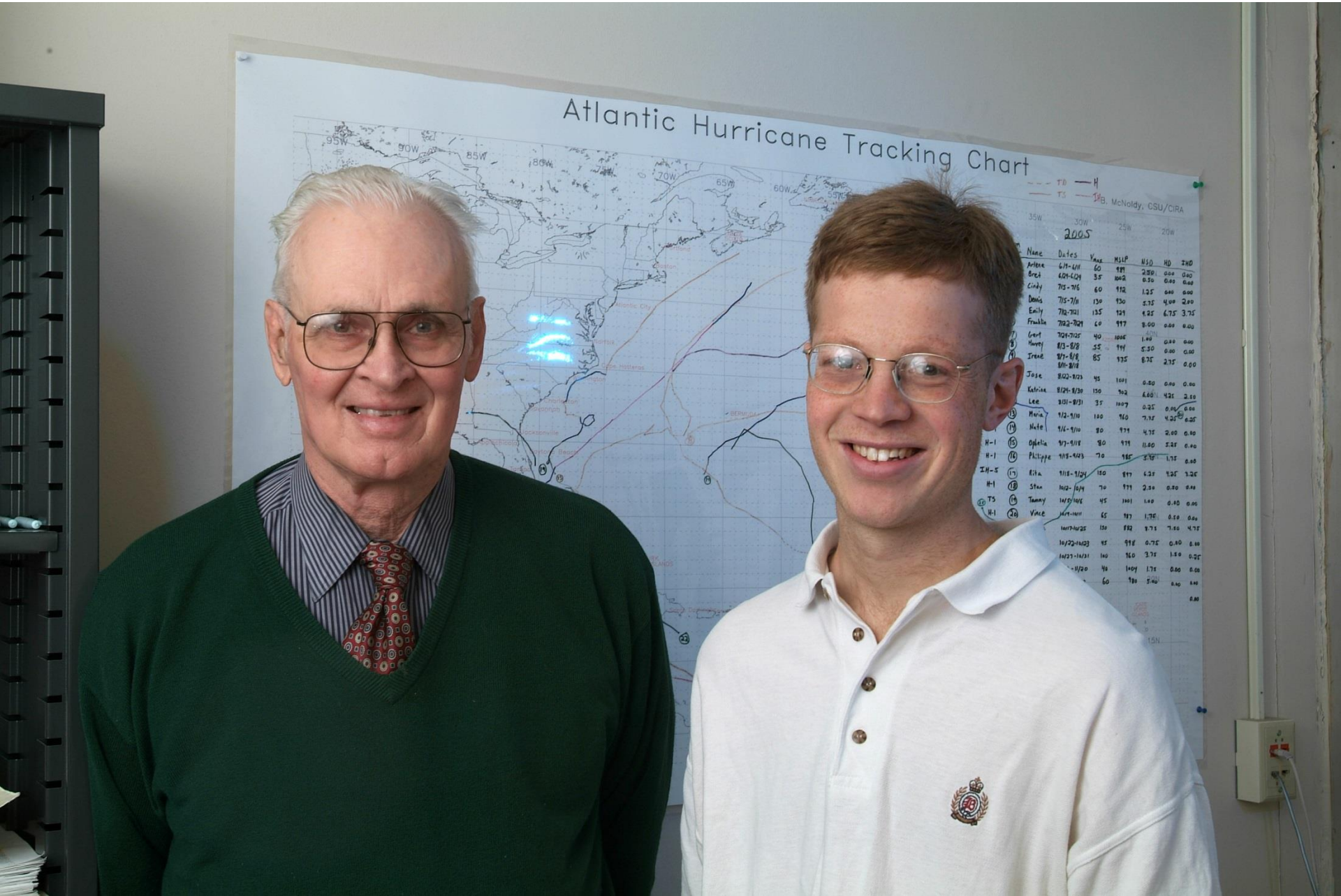
Year	Predicted NS	Observed NS	Predicted H		Observed H	1 H	2 H
1984	10	12	7		5		●
1985	10	9	7		6	●	
1986	7	4	4		3	●	
1987	7	7	4		3	●	
1988	11	12	7		5		●
1989	9	8	4	3	7		
1990	11	12	6		7	●	
1991	7	7	3		4	●	
1992	8	6	4		4	C	
1993	10	7	6		4		●
1994	7	6	4		3	●	
1995	16	14	9		10	●	
1996	11	10	7		7	C	
1997	11	3	6	5	1	BUST	
1998	10	13	6	4	10		
1999	14	11	9		8	●	
2000	11	14	7		8	●	
2001	12	14	7		9		●
2002	9	11	4		4		
2003	14	12	8	3	5		
2004	13	14	7		9		●
2005	13	20	8	4	12		
2006	13	7	7		5		●
2007	13	12	8		6		●
2008	13	12	7		6	●	
2009	10	9	4		3	●	
2010	16	17	9		11		●
2011	12	15	9		7		●
2012	10	15	5	4	9		
2013	14	9	8	6	2	BUST	
Average	*11.1*	*10.7*	*6.4*		*6.1*		
1984-2013 Correlation		*0.60*			*0.52*		
Correlation w/o 1997 & 2013		*0.69*			*0.63*		

± 1

9/13

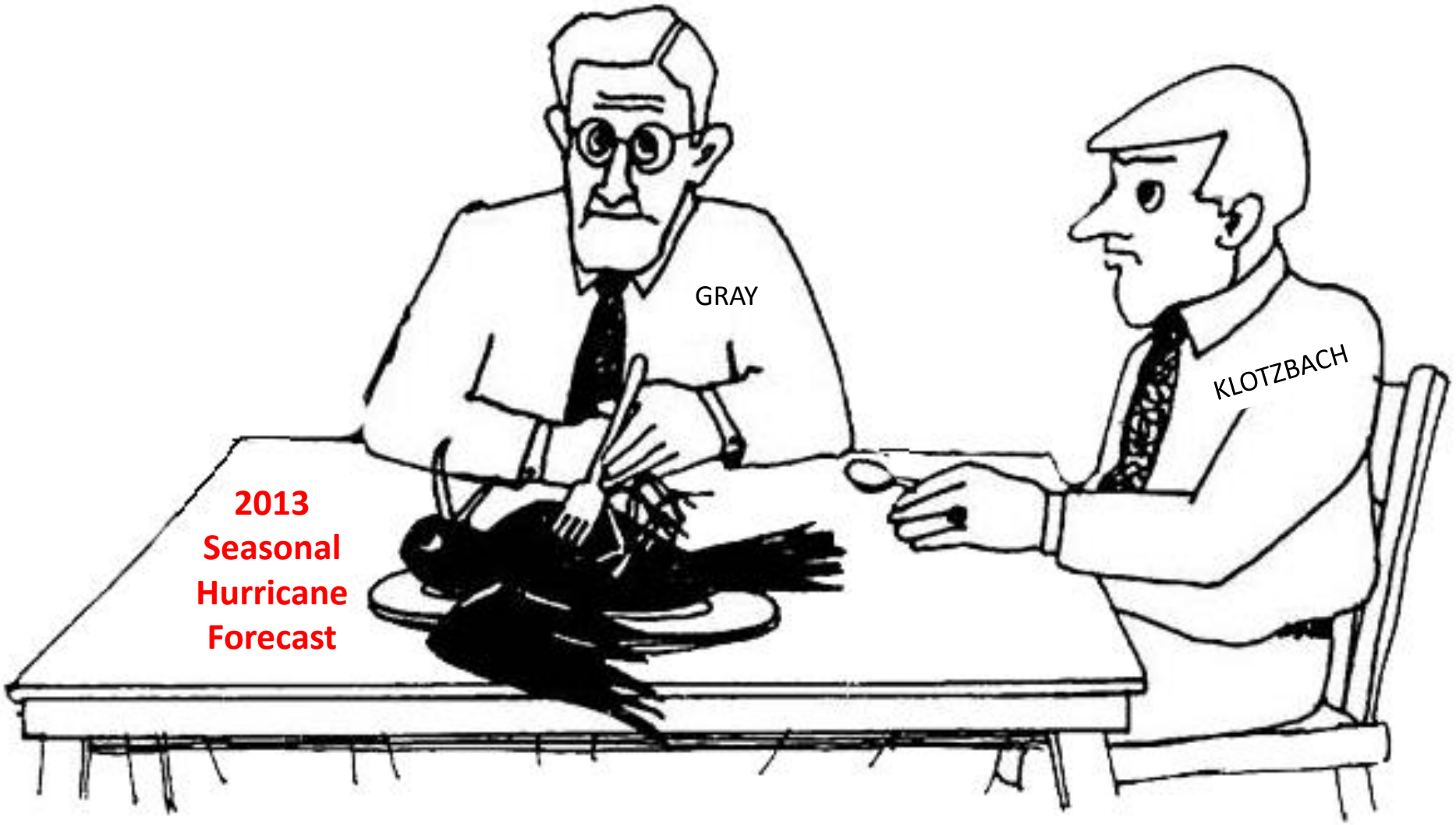
2002

Bill Gray and Phil Klotzbach



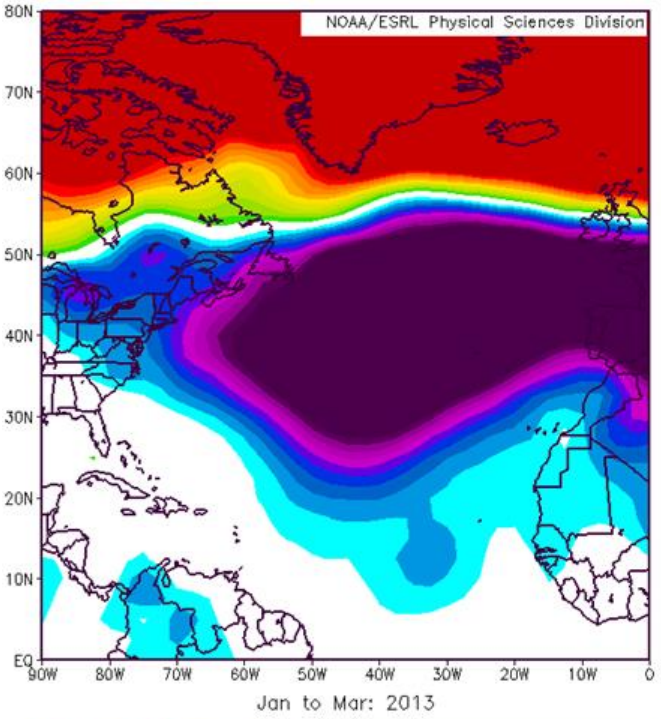
2008	7 Dec. 2007	Update 9 April	Update 3 June	Update 5 August	Obs.
Hurricanes	7	8	8	9	8
Named Storms	13	15	15	17	16
Hurricane Days	30	40	40	45	29.50
Named Storm Days	60	80	80	90	84.75
Major Hurricanes	3	4	4	5	5
Major Hurricane Days	6	9	9	11	8.50
Accumulated Cyclone Energy	115	150	150	175	146
Net Tropical Cyclone Activity	125	160	160	190	164

2010	9 Dec. 2009	Update 7 April	Update 2 June	Update 4 August	Obs.
Hurricanes	6-8	8	10	10	12
Named Storms	11-16	15	18	18	19
Hurricane Days	24-39	35	40	40	37.50
Named Storm Days	51-75	75	90	90	88.25
Major Hurricanes	3-5	4	5	5	5
Major Hurricane Days	6-12	10	13	13	11
Accumulated Cyclone Energy	100-162	150	185	185	163
Net Tropical Cyclone Activity	108-172	160	195	195	195

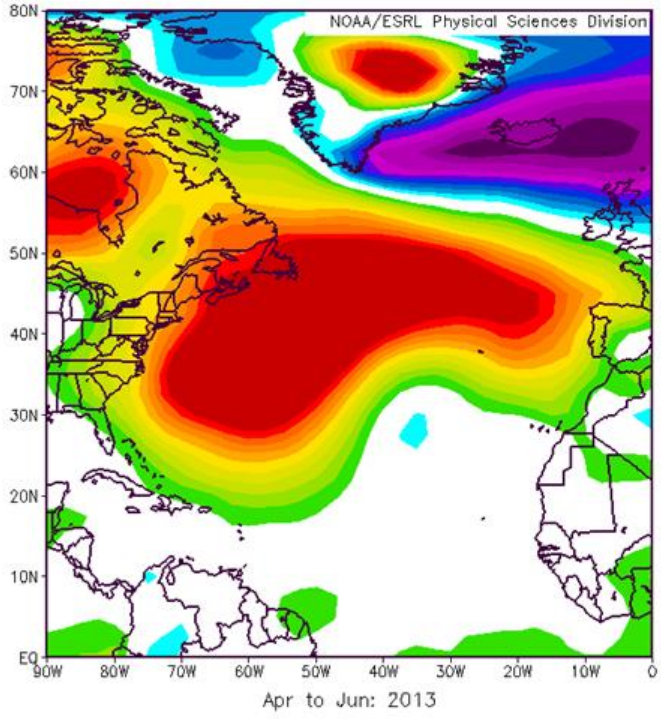


"The best laid schemes of mice and men sometimes go awry"

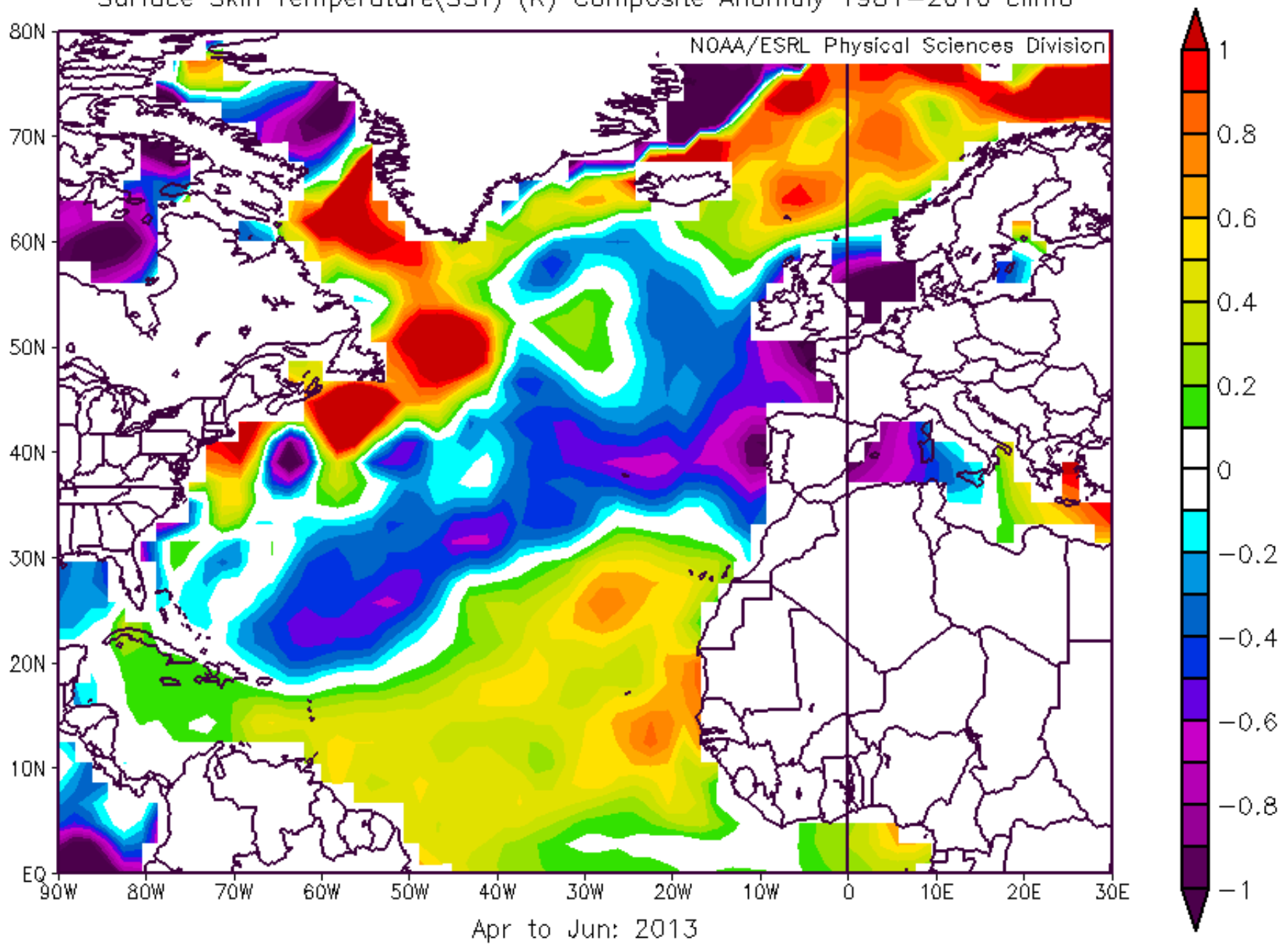
-- R. Burns

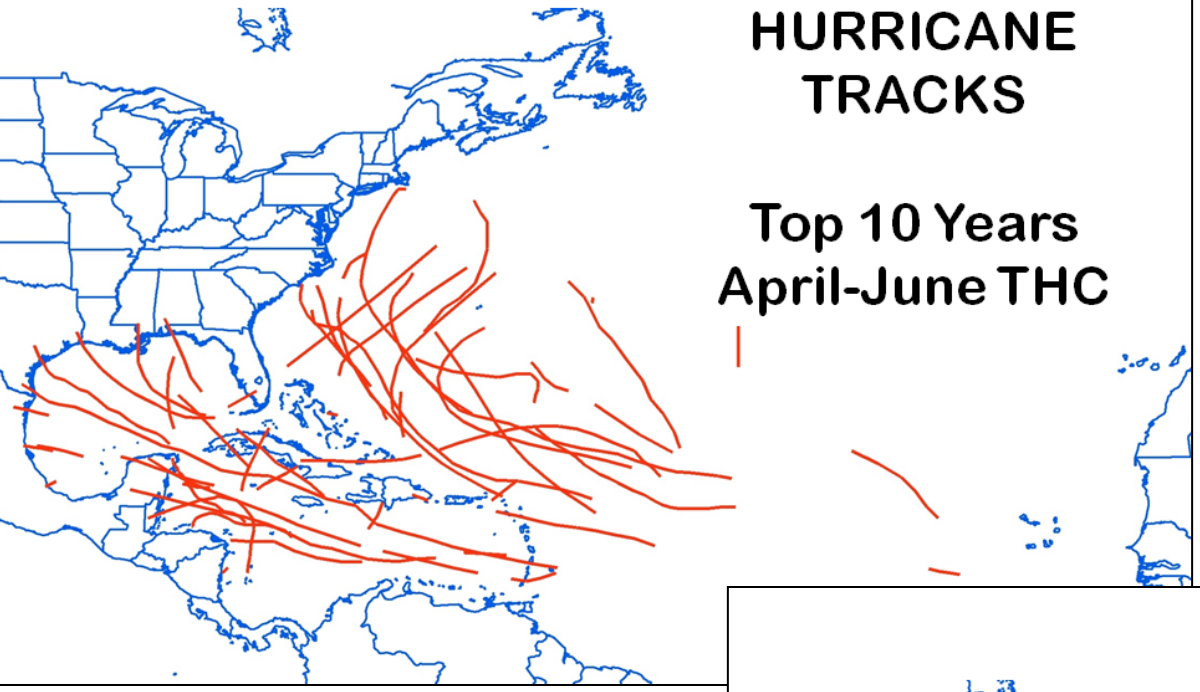


SLPA
Jan-Mar
2013



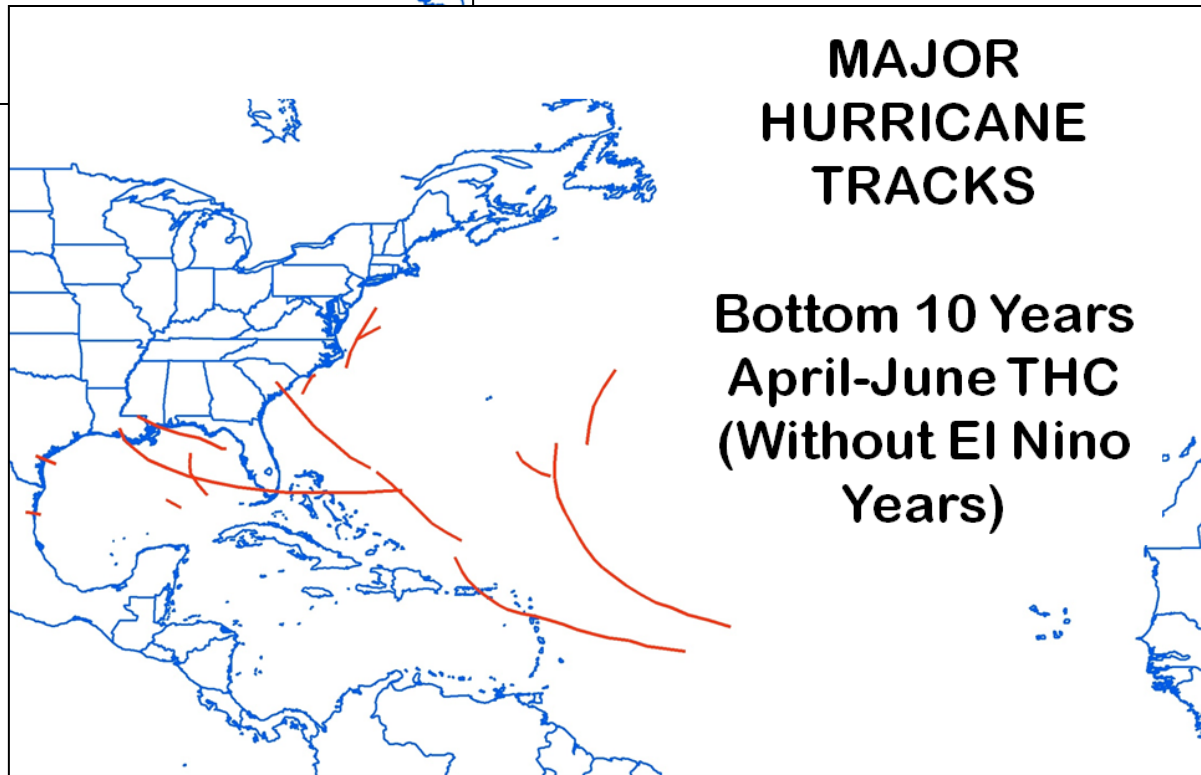
SLPA
Apr-Jun
2013


NCEP/NCAR Reanalysis
Surface Skin Temperature(SST) (K) Composite Anomaly 1981–2010 climo
NOAA/ESRL Physical Sciences Division
80N
70N
60N
50N
40N
30N
20N
10N
EQ
90W
80W
70W
60W
50W
40W
30W
20W
10W
0
10E
20E
30E
1
0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
Apr to Jun: 2013



MAJOR HURRICANE TRACKS

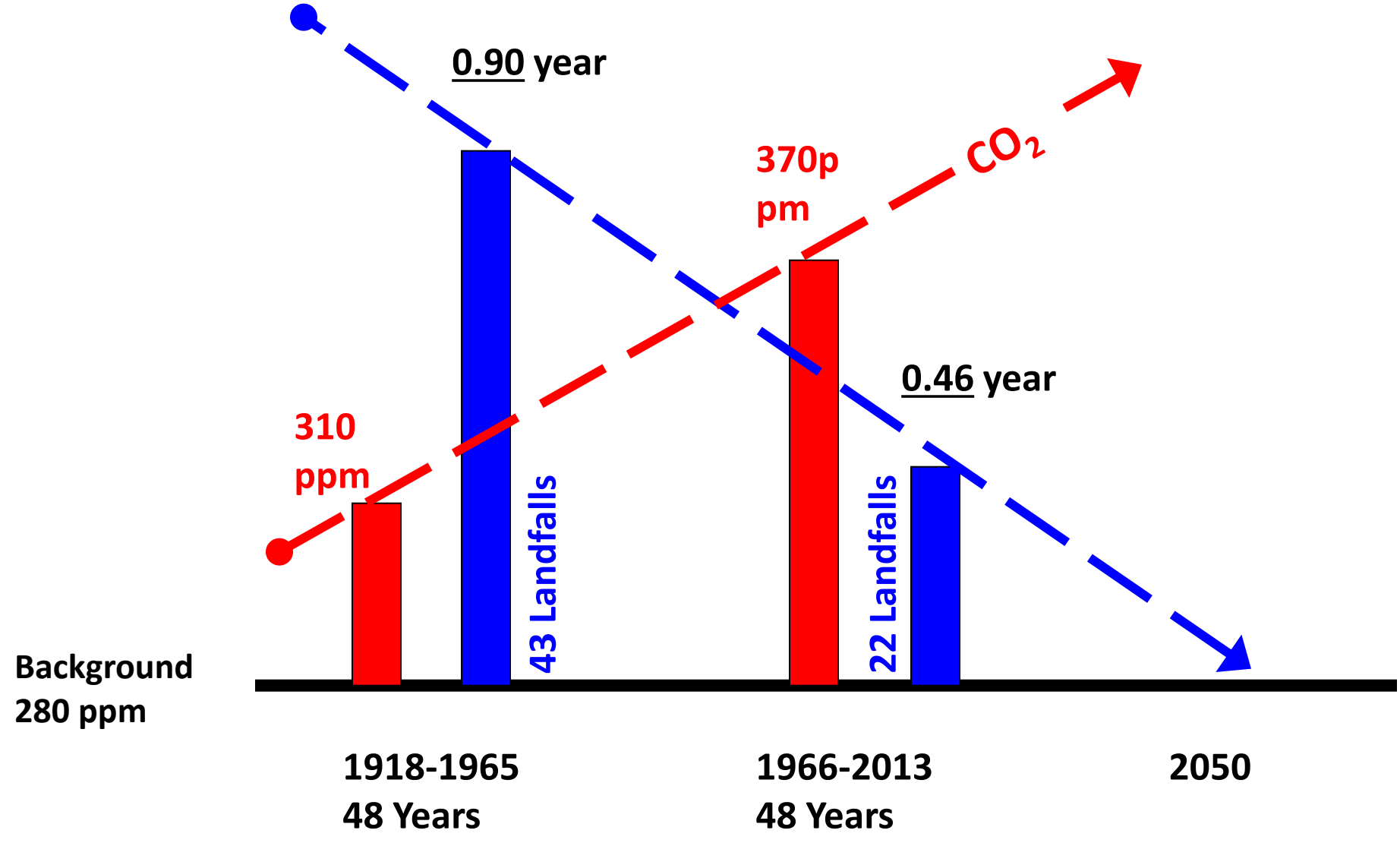
Top 10 Years April-June THC



MAJOR HURRICANE TRACKS

Bottom 10 Years April-June THC (Without El Nino Years)

US Landfalling Major Hurricanes



21st NOAA Climate Workshop, Huntsville, AL (1996)

FORECAST OF GLOBAL CIRCULATION CHARACTERISTICS IN THE NEXT 25-30 YEARS

William M. Gray
(written in 1996)

We expect that these changing THC (or MOC) patterns will lead to enhanced intense (or major) hurricane activity in coming years and to a small global surface temperature cooling. It is likely that the mean global surface temperature change in the next 20-30 years will be more driven by nature than by anthropogenic influences and be one of weak cooling, not warming.