



# **TROPOPAUSE AND EXTREME EVENTS SITUATIONS AS AN INDICATOR OF CLIMATE VARIABILITY AND CLIMATE CHANGE**

**Adrián E. Yuchechechen(\*)**

**Pablo O. Canziani(\*)**

**Susana A. Bischoff(\*\*)**

**(\*)Programa de Estudio de Procesos Atmosféricos en el Cambio Global  
(PEPACG), Pontificia Universidad Católica Argentina (UCA)/Consejo  
Nacional de Investigaciones Científicas y Técnicas (CONICET)**

**(\*\*)Departamento de Ciencias de la Atmósfera y los Océanos, Facultad de  
Ciencias Exactas y Naturales, Universidad de Buenos Aires**

# LOCATION OF STATIONS

## Extreme Events Analysis

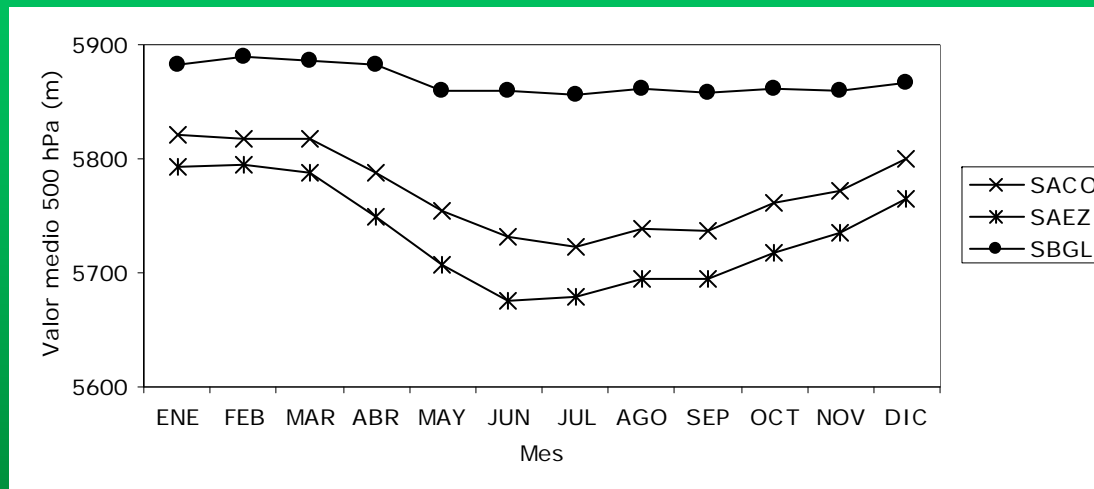


## Tropopause Analysis





# Part I – 500 hPa ANOMALIES

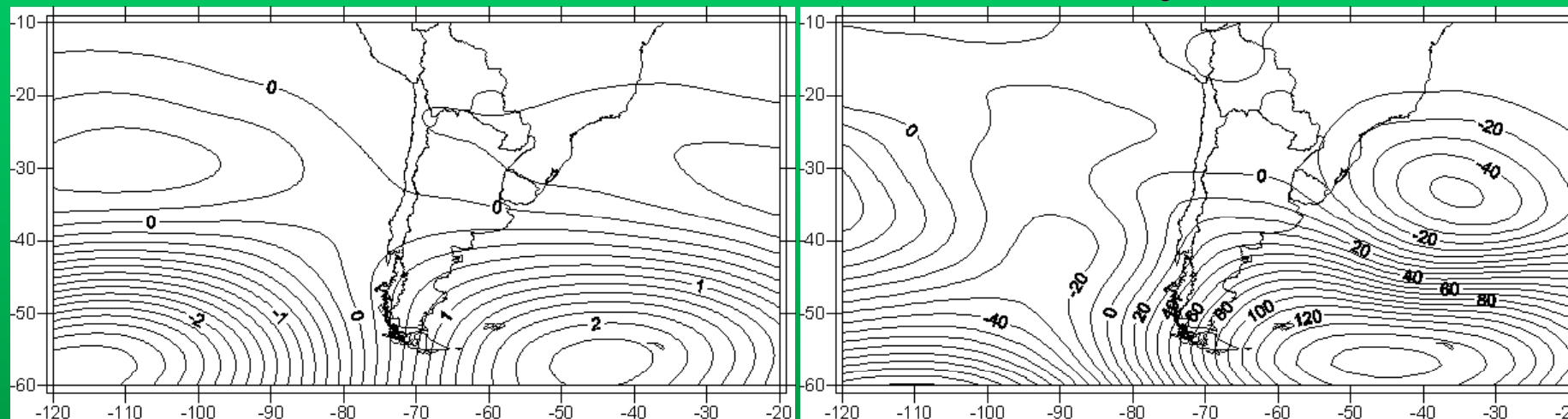


**Monthly 500 hPa geopotential  
height mean at SACO, SAEZ  
and SBGL**

# PC1 – SACO

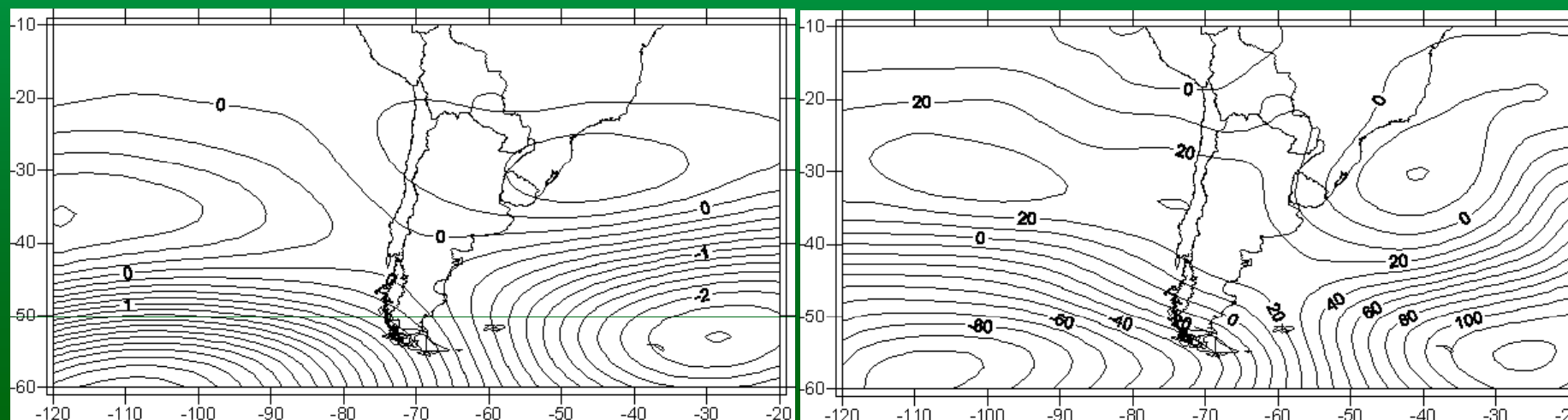
**Q1**

**July 1989**



**Q5**

**April 2006**



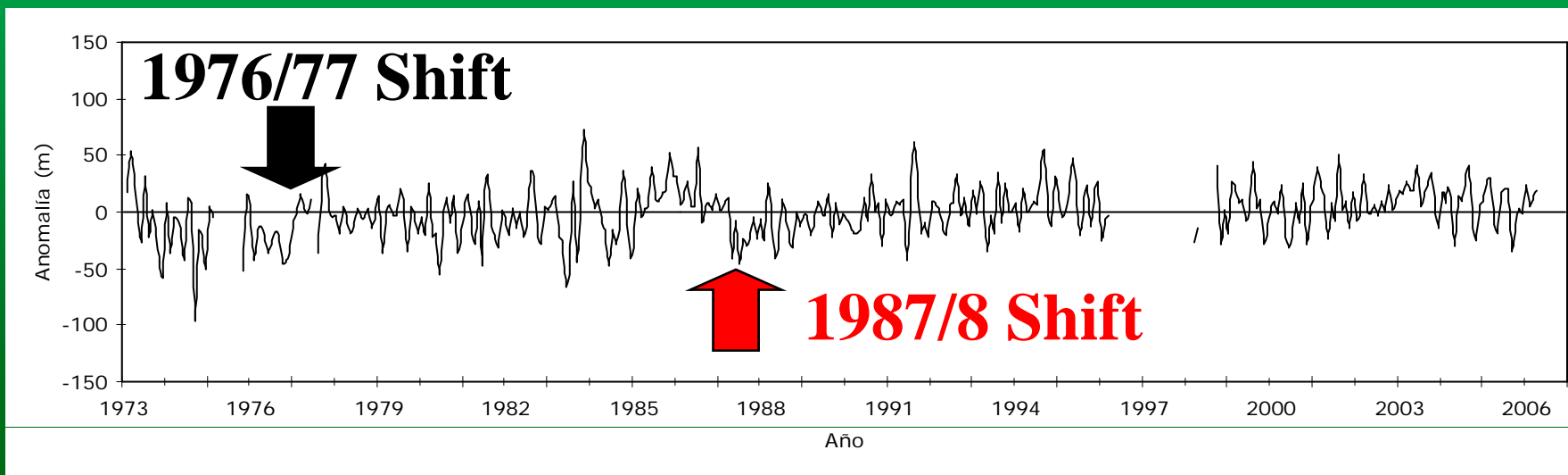
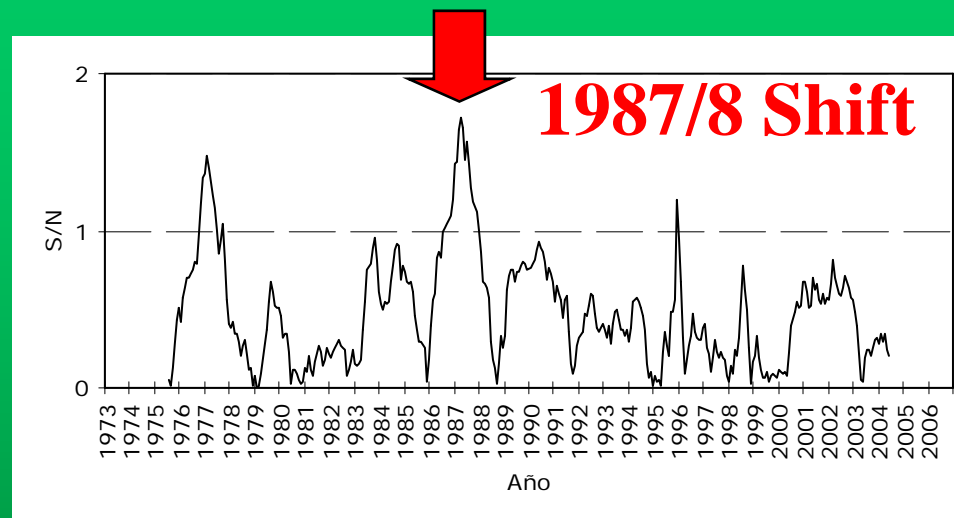
## Q1 PC time distribution – SACO

[illegible]

# Q5 PC time distribution – SACO

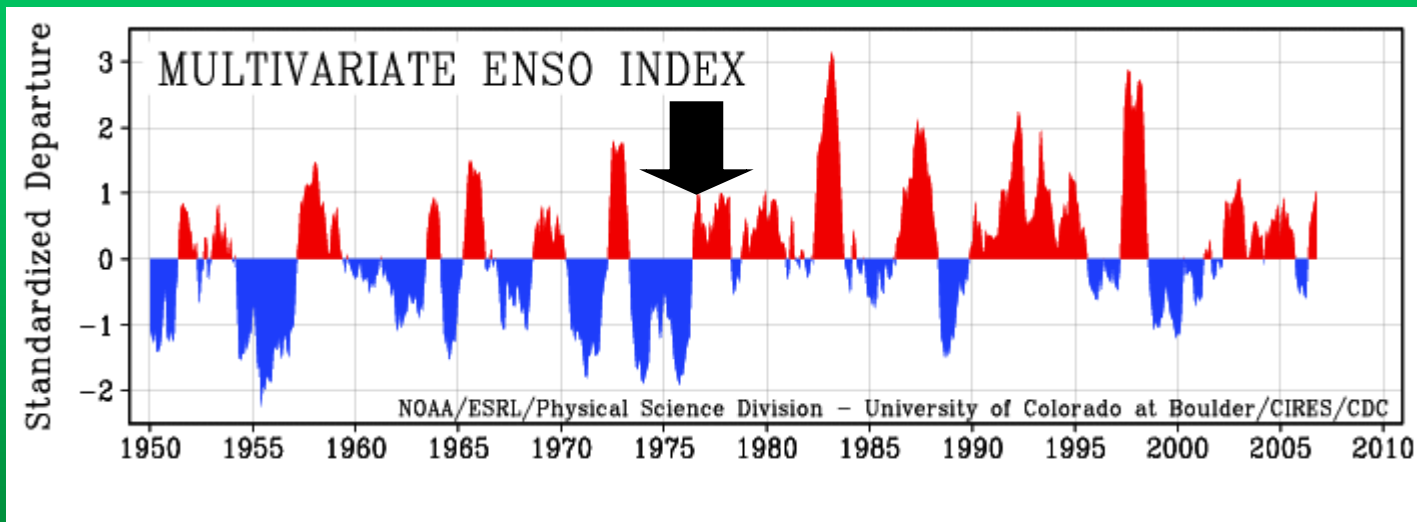
	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC
1973			X	1(+)			X					
1974												
1975												
1976												
1977									X	X		
1978												
1979							X					
1980			X									
1981								X				
1982								1(+)	X			
1983								X			1(-)	4(+)
1984	X									X		
1985		4(+)				2(-)				2(-)	X	X
1986	2(+)			X			X					
1987												
1988			X									
1989												
1990								X				
1991								X	X			
1992								X				
1993	X		3(-)					X		X		
1994			X					1(-)	X			X
1995				1(-)	4(+)	X			X		3(+)	4(+)
1996												
1997												
1998										X		
1999		2(+)	X					X				
2000				X						X		
2001		2(+)	2(+)					5(+)				1(-)
2002			1(+)							X		
2003	2(+)		X	X	3(+)	3(-)			X	X		
2004			X					X	2(+)			
2005		2(-)	X			X	2(-)	X				
2006	1(-)			1(-)								

# Intermonthly variability – SACO

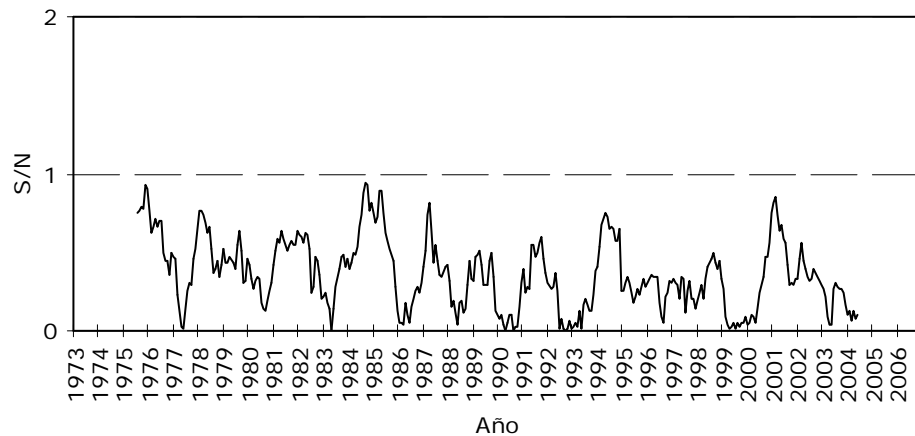




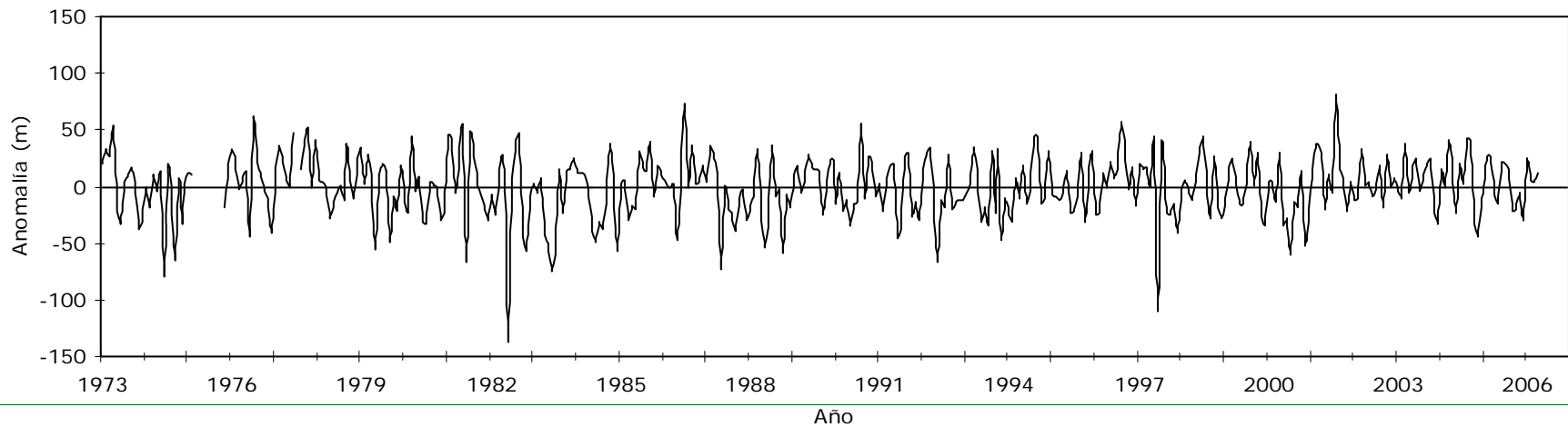
# Multivariate ENSO Index (MEI)



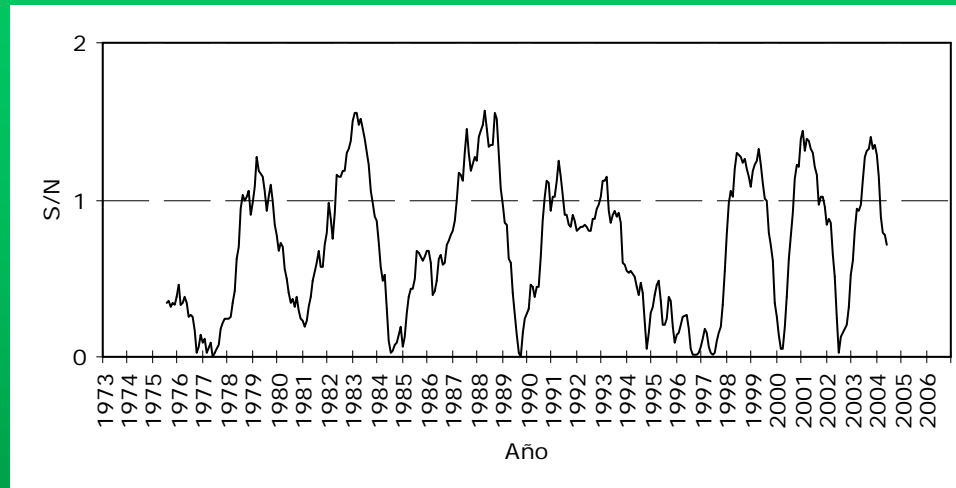
# Intermonthly variability – SAEZ



**Even the  
1976/77 shift  
is not  
detected!**



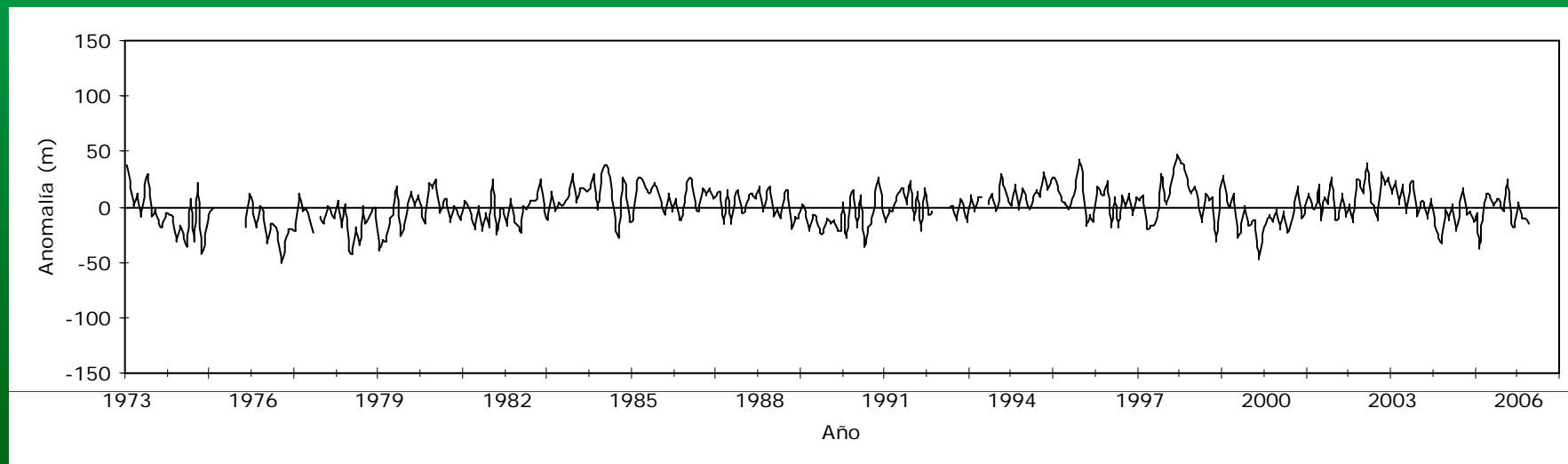
# Intermonthly variability – SBGL



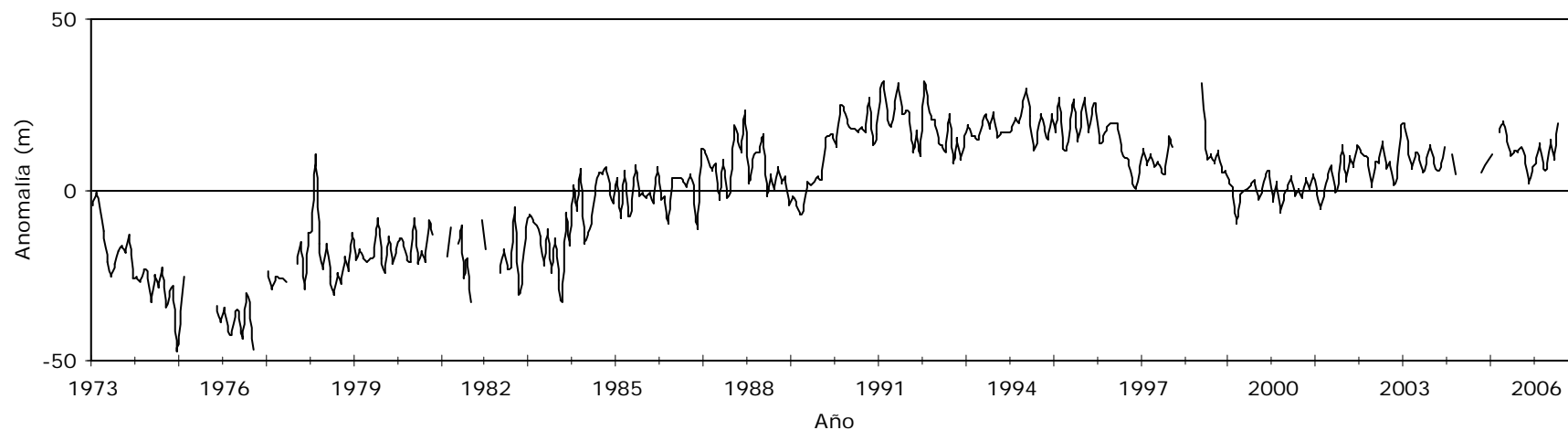
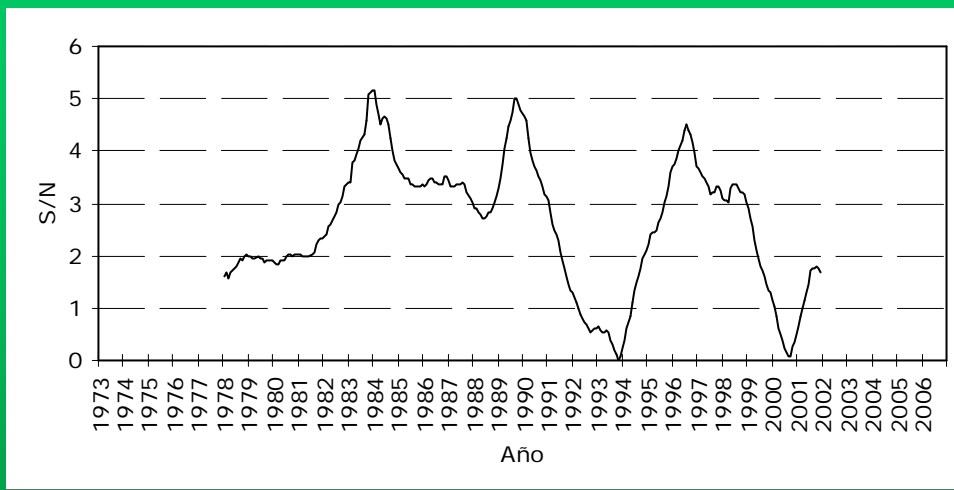
**Too many  
jumps  
detected!!!**



**Gaffen (1994)**

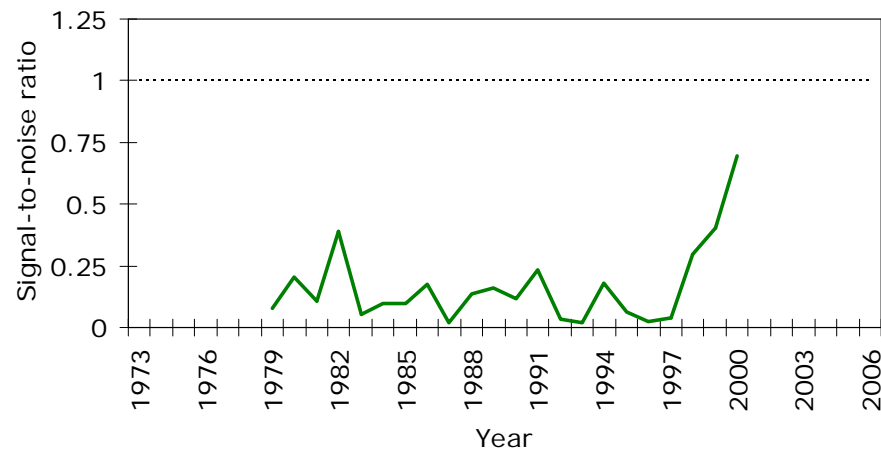


# Intermonthly variability – SKBO

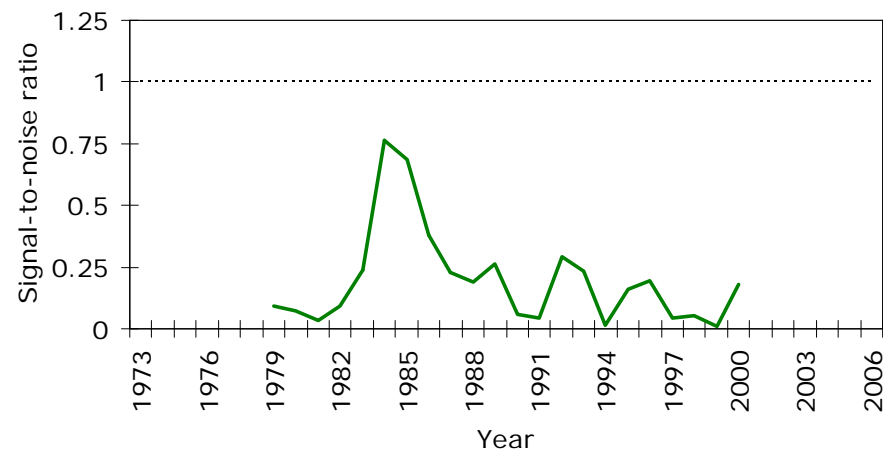


# Interannual variability – SACO

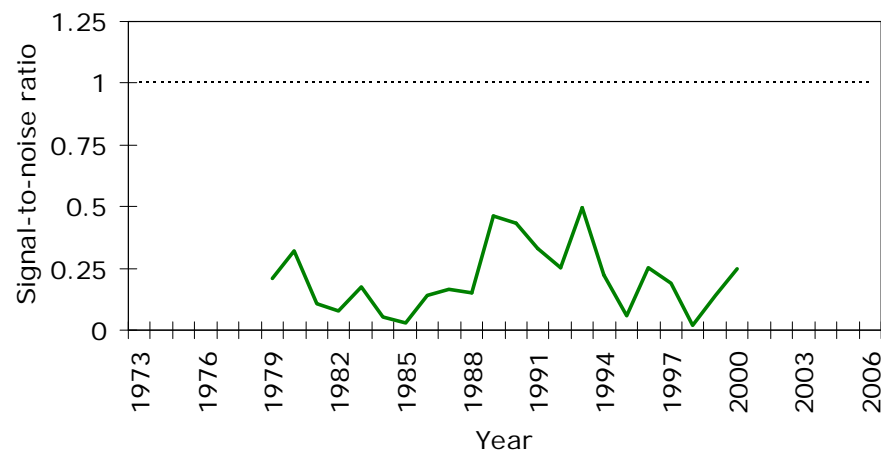
SACO - March



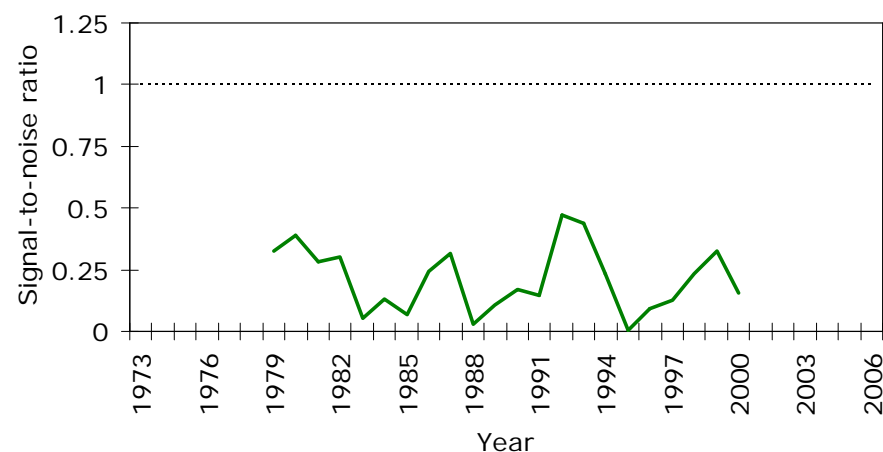
SACO - June



SACO - September

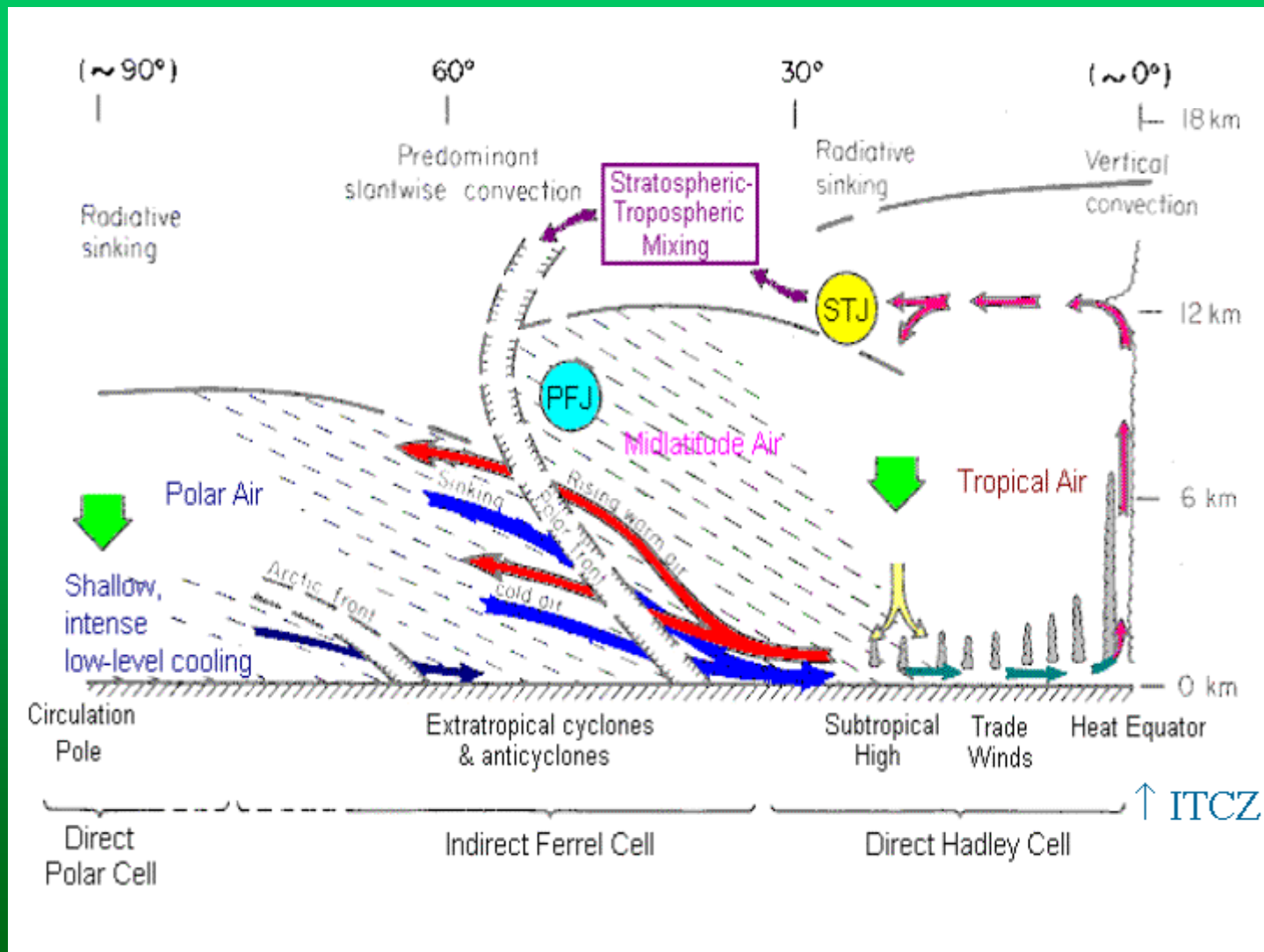


SACO - December

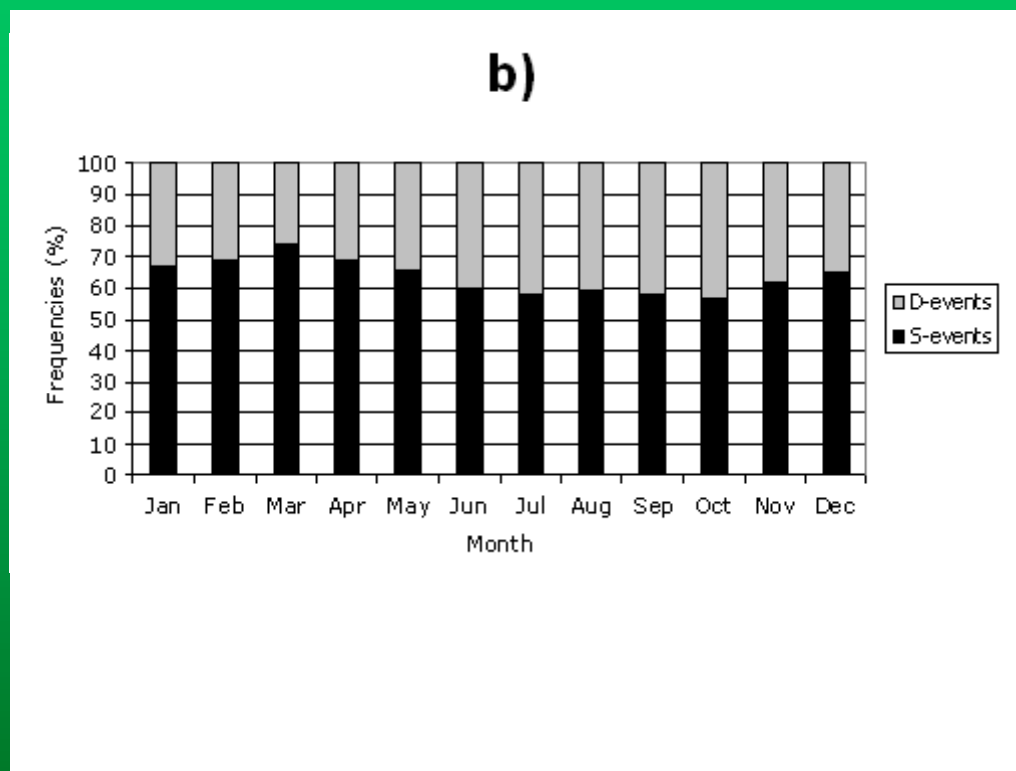




## Part II – TROPOPAUSE

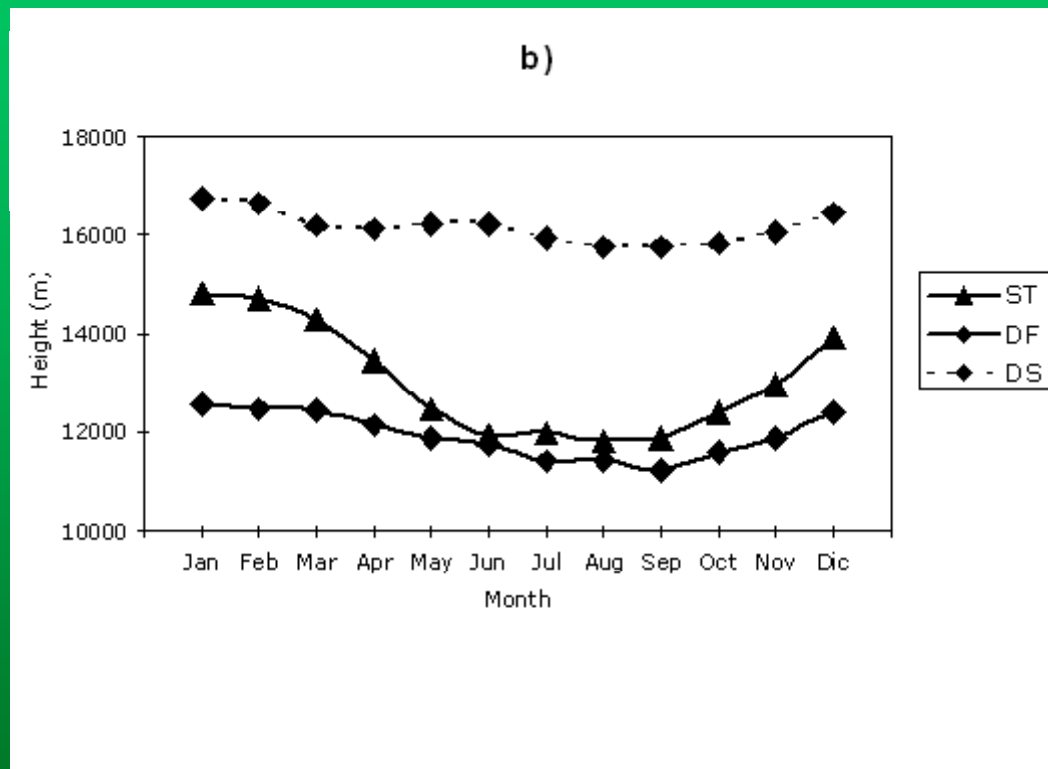


## Part II – TROPOPAUSE



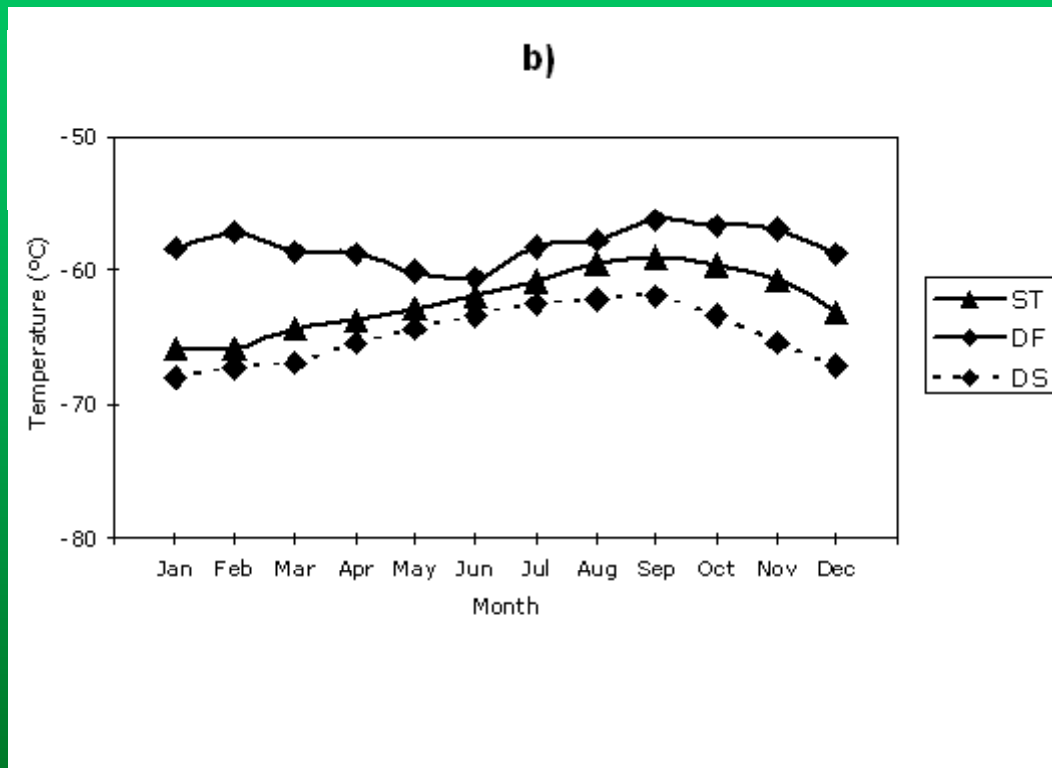
*S-* and *D-events* frequency  
distribution at SAEZ

## Part II – TROPOPAUSE



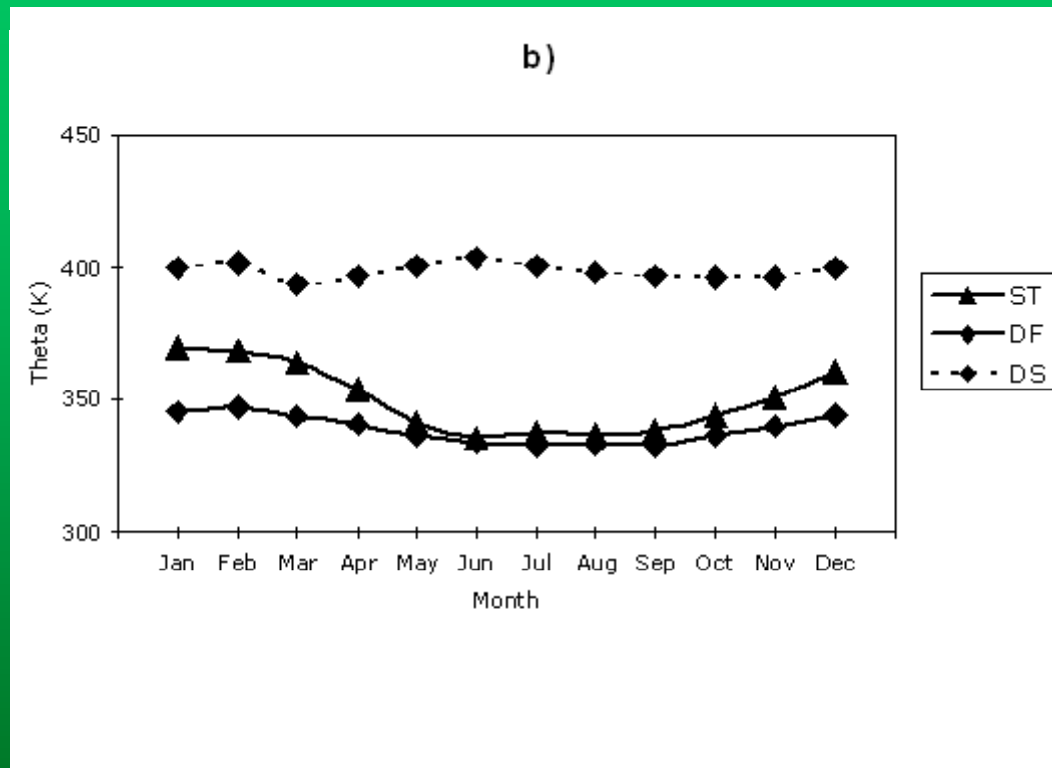
**Monthly mean tropopause  
height at SAEZ**

## Part II – TROPOPAUSE



**Monthly mean tropopause  
temperature at SAEZ**

## Part II – TROPOPAUSE



**Monthly mean potential  
temperature at SAEZ**



## CONCLUSIONS (SOME)

- The Yamamoto test is useful to detect climatic jumps; however, care must be taken
- Series (like the SKBO one) need further investigation
- Apart from the 1976/77 shift, other climatic jumps detected in SBGL and SACO for intermonthly series
- Jumps detected in intermonthly series are not necessarily present in interannual series (for instance, SACO)
- More conclusions available soon!