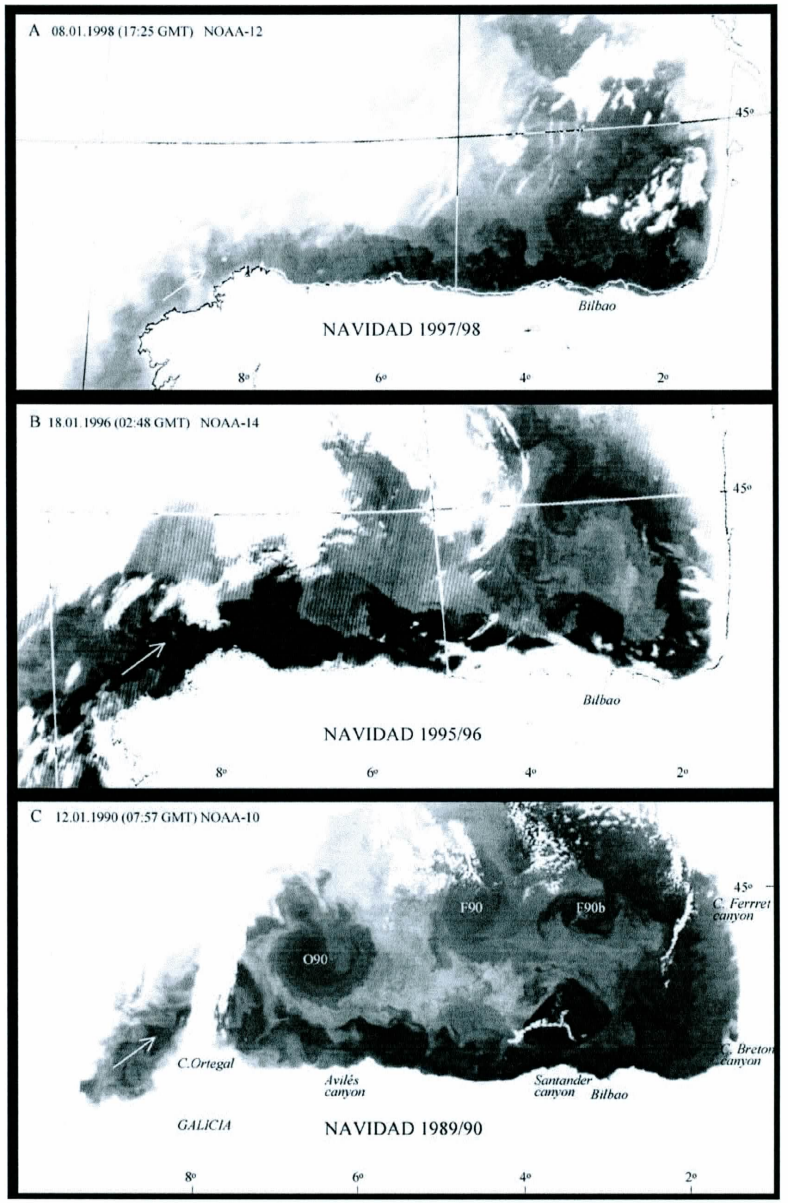
Variabilité à long terme de la Navidad
Evaluation de données SST

(B. Le Cann et A. Serpette)

Question:

Peut-on avoir une idée des occurrences d'événements de type « Navidad » à « long terme » (plusieurs décennies)?


A 08.01.1998 (17:25 GMT) NOAA-12
45º
Bilbao
NAVIDAD 1997/98
8º
6º
4º
2º
B 18.01.1996 (02:48 GMT) NOAA-14
45º
Bilbao
NAVIDAD 1995/96
8º
6º
4º
2º
C 12.01.1990 (07:57 GMT) NOAA-10
45º
F90
F90b
C. Ferrret canyon
O90
C. Breton canyon
C.Ortegal
Avilés canyon
Santander canyon
Bilbao
GALICIA
NAVIDAD 1989/90
8º
6º
4º
2º

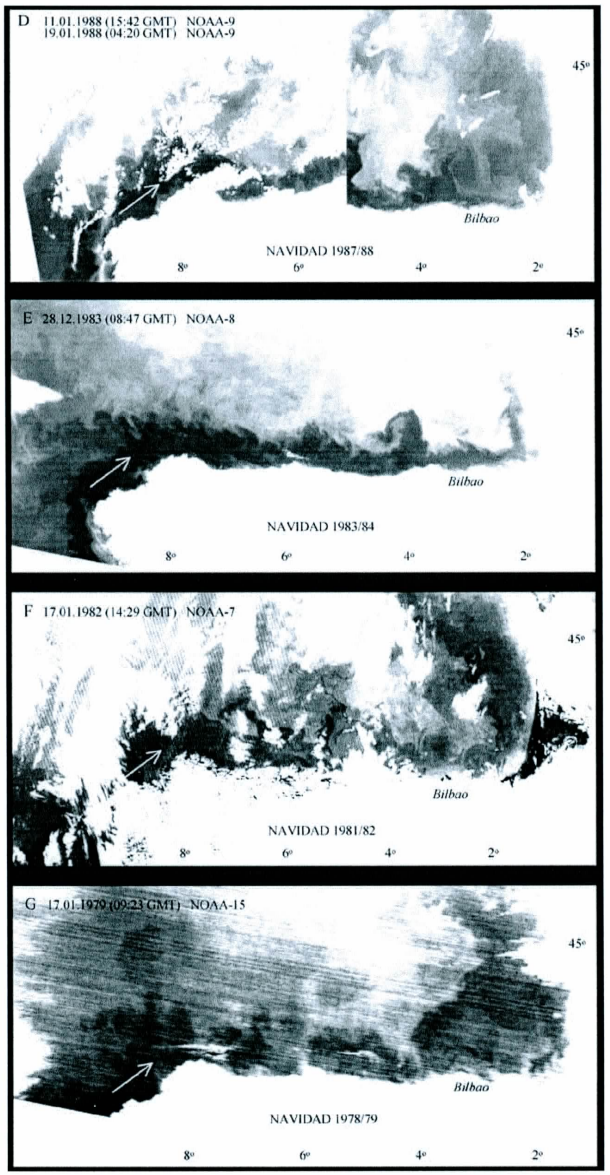
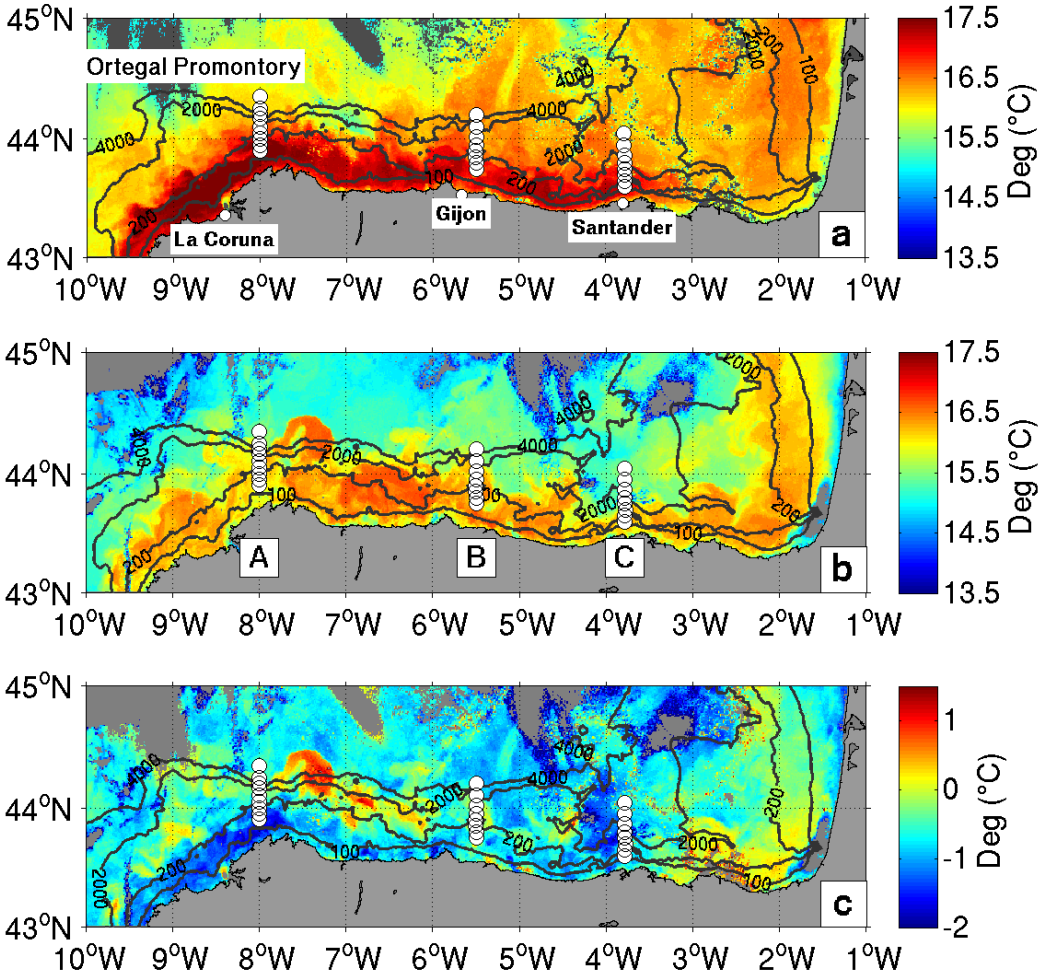


Figure 1. (continued)


45°N
44°N
43°N
10°W 9°W 8°W 7°W 6°W 5°W 4°W 3°W 2°W 1°W
Ortegal Promontory
La Coruna
Gijon
Santander
a
b
c
A
B
C
17.5
16.5
15.5
14.5
13.5
Deg (°C)
1
0
-1
-2
100
200
2000
4000

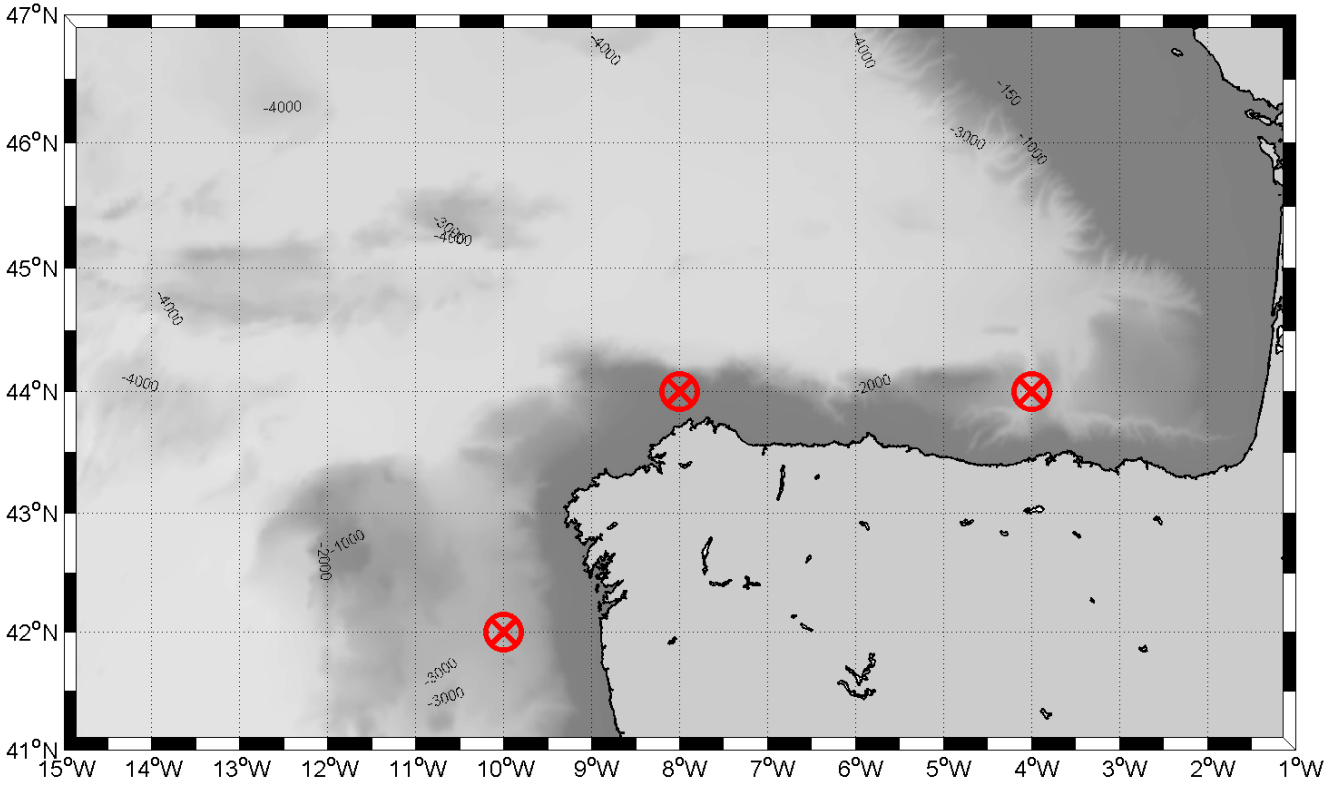
Evaluation (préliminaire et sommaire) de données de SST : ERSST.v3 (Smith et al, J. Clim. 2008)

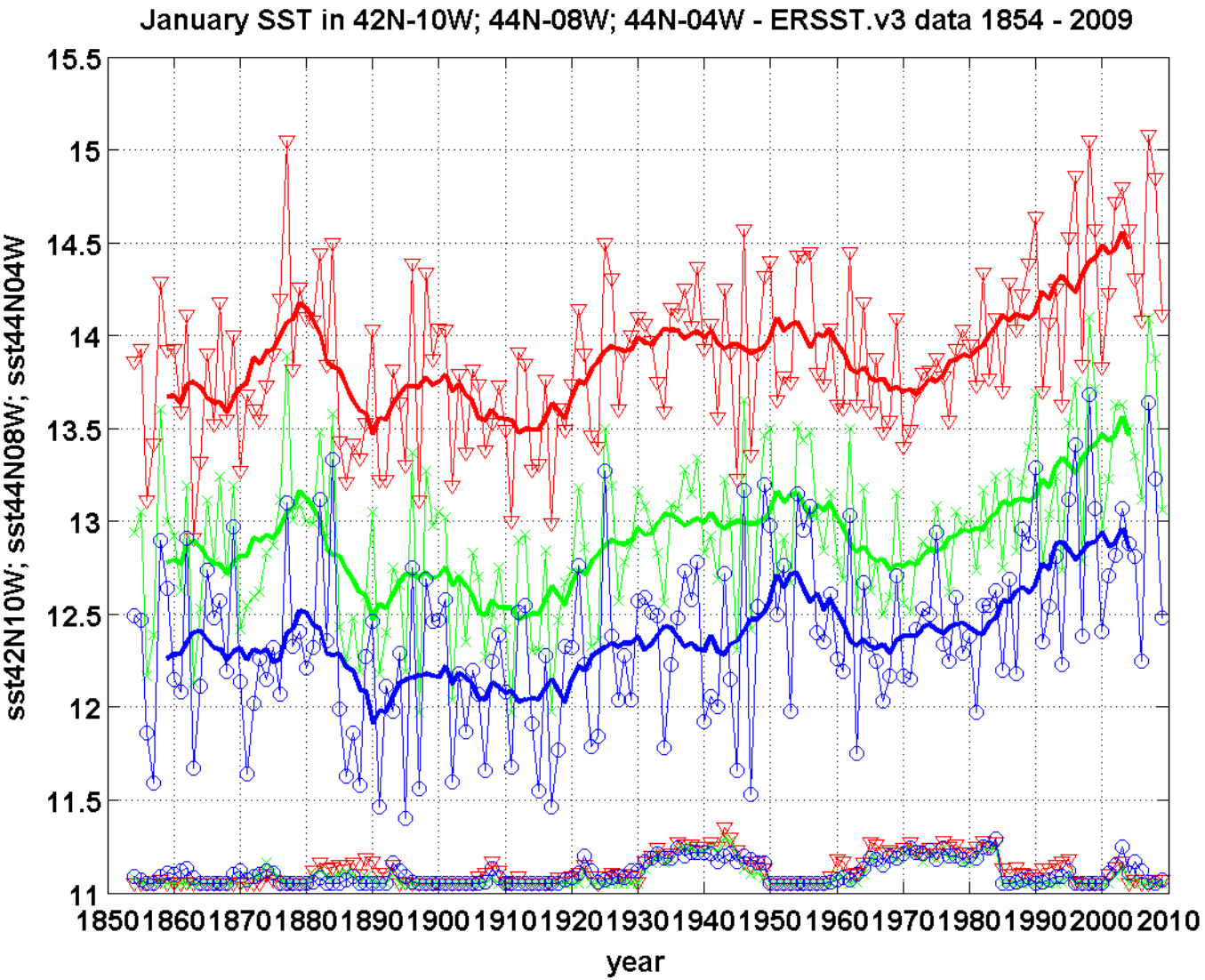
Basée sur ICOADS
1854 – 2009
Résolution 2° x 2°

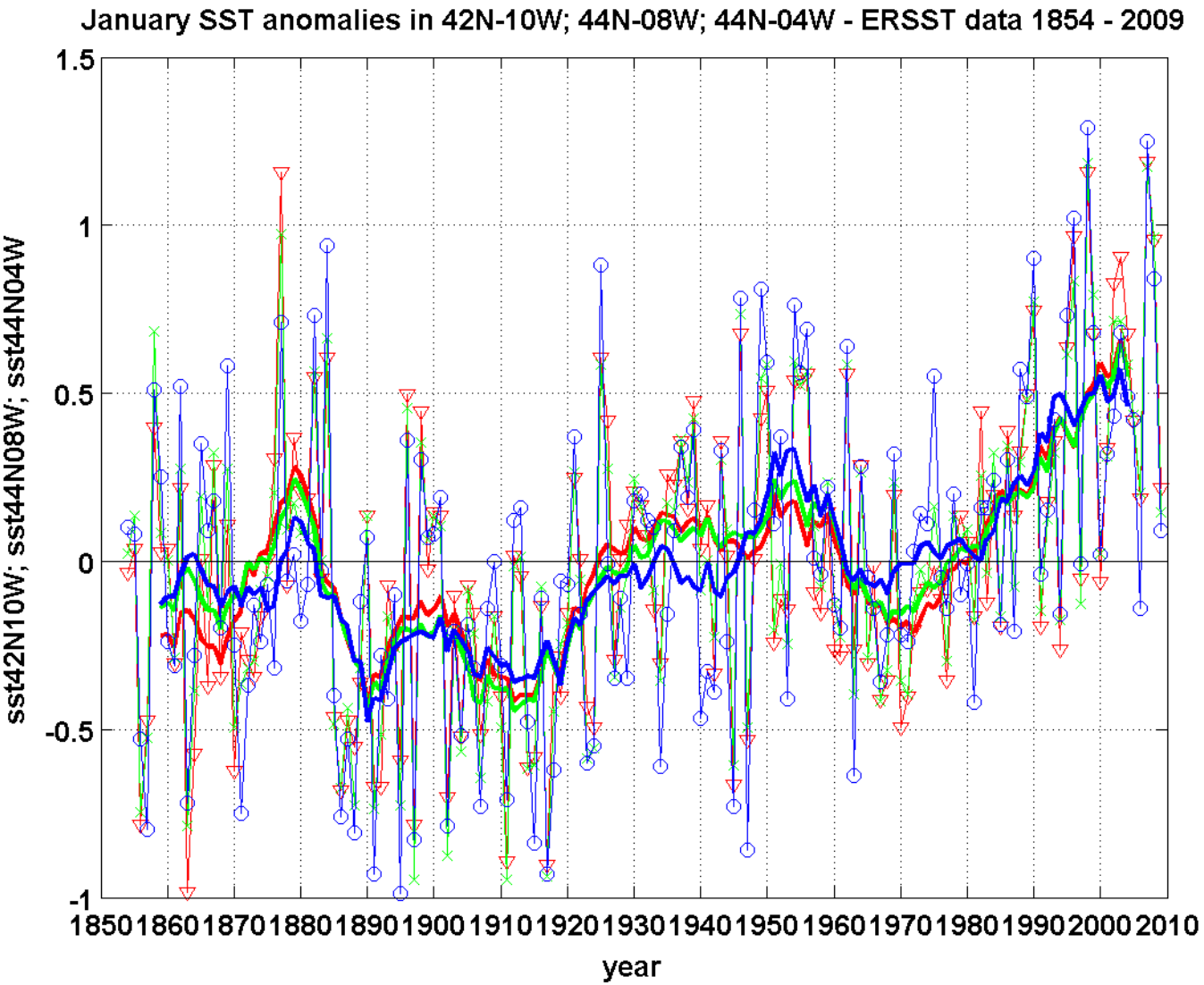
Comparaison avec éléments connus sur les dernières décennies (1980 -):

Pingree, Garcia-Soto, Llope, Le Cann and Serpette

Lien avec NAO


47°N
46°N
45°N
44°N
43°N
42°N
41°N
15°W
14°W
13°W
12°W
11°W
10°W
9°W
8°W
7°W
6°W
5°W
4°W
3°W
2°W
1°W
-4000
-3000
-2000
-1000
-150


January SST in 42N-10W; 44N-08W; 44N-04W - ERSST.v3 data 1854 - 2009
sst42N10W; sst44N08W; sst44N04W
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11
1850 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010
year


January SST anomalies in 42N-10W; 44N-08W; 44N-04W - ERSST data 1854 - 2009
sst42N10W; sst44N08W; sst44N04W
1.5
1
0.5
0
-0.5
-1
1850 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010
year

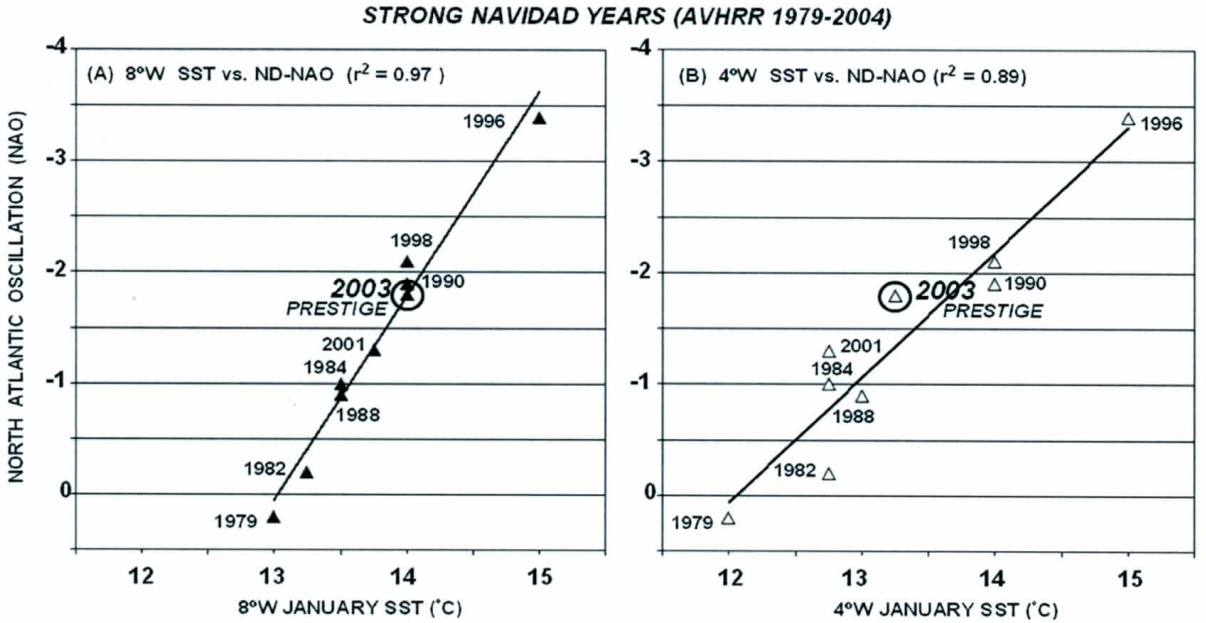
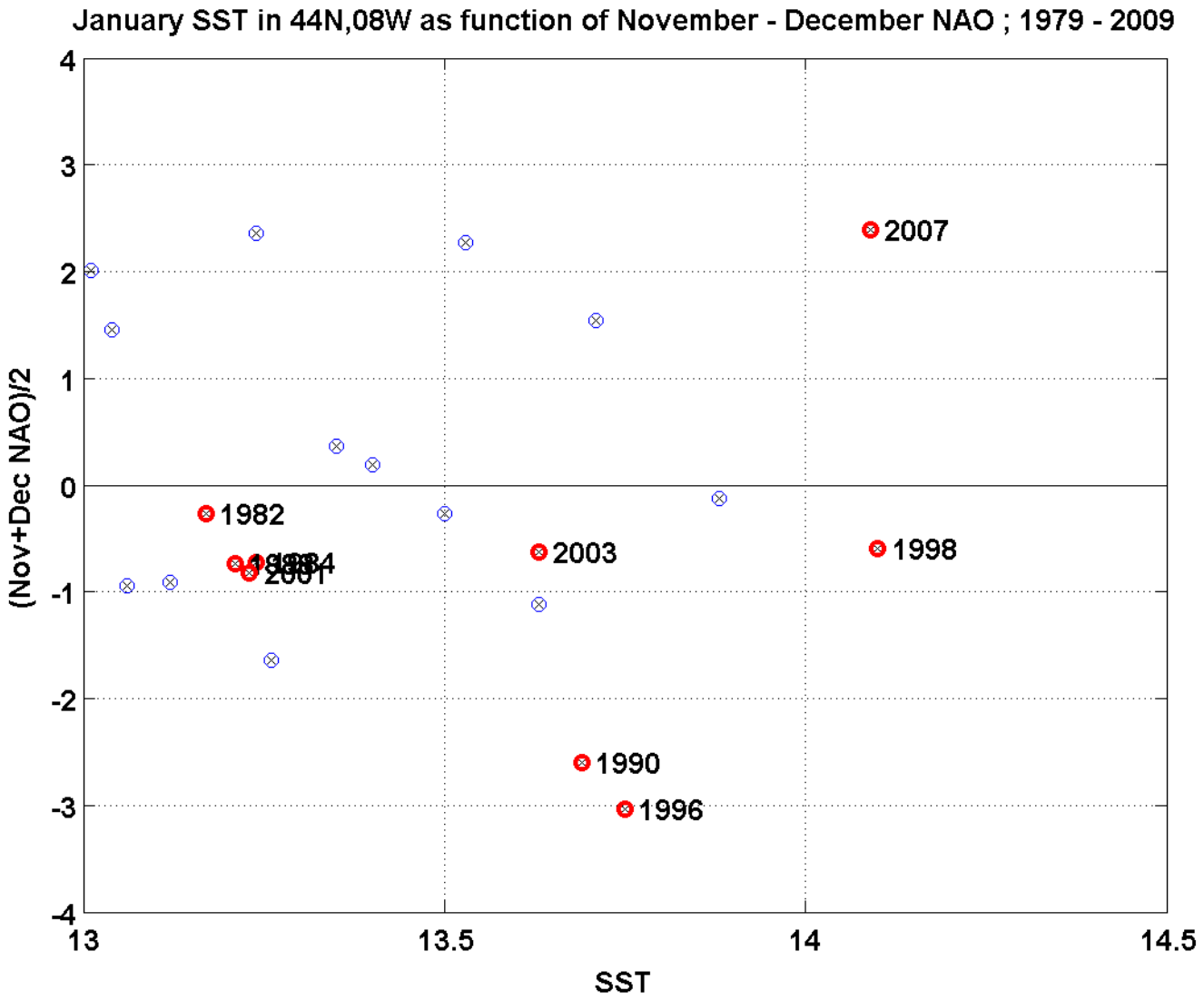
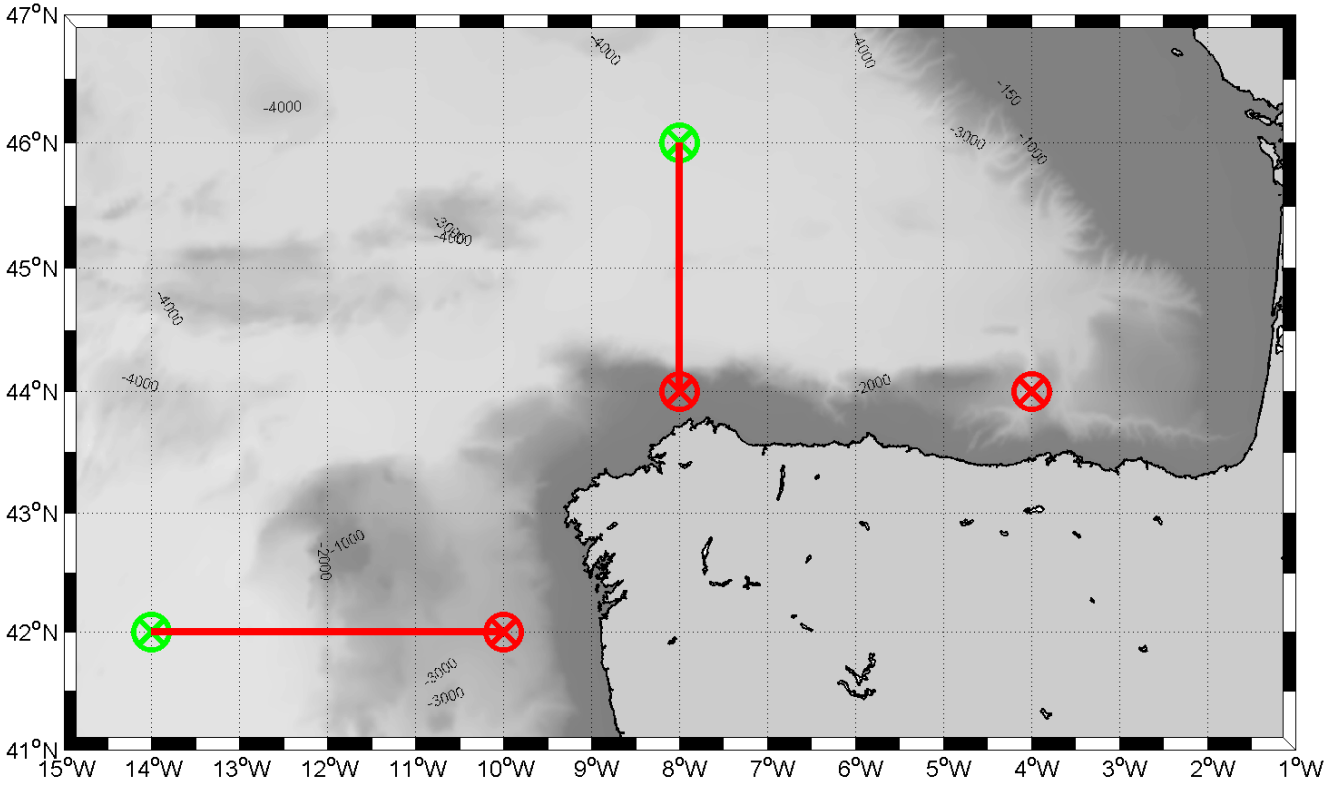
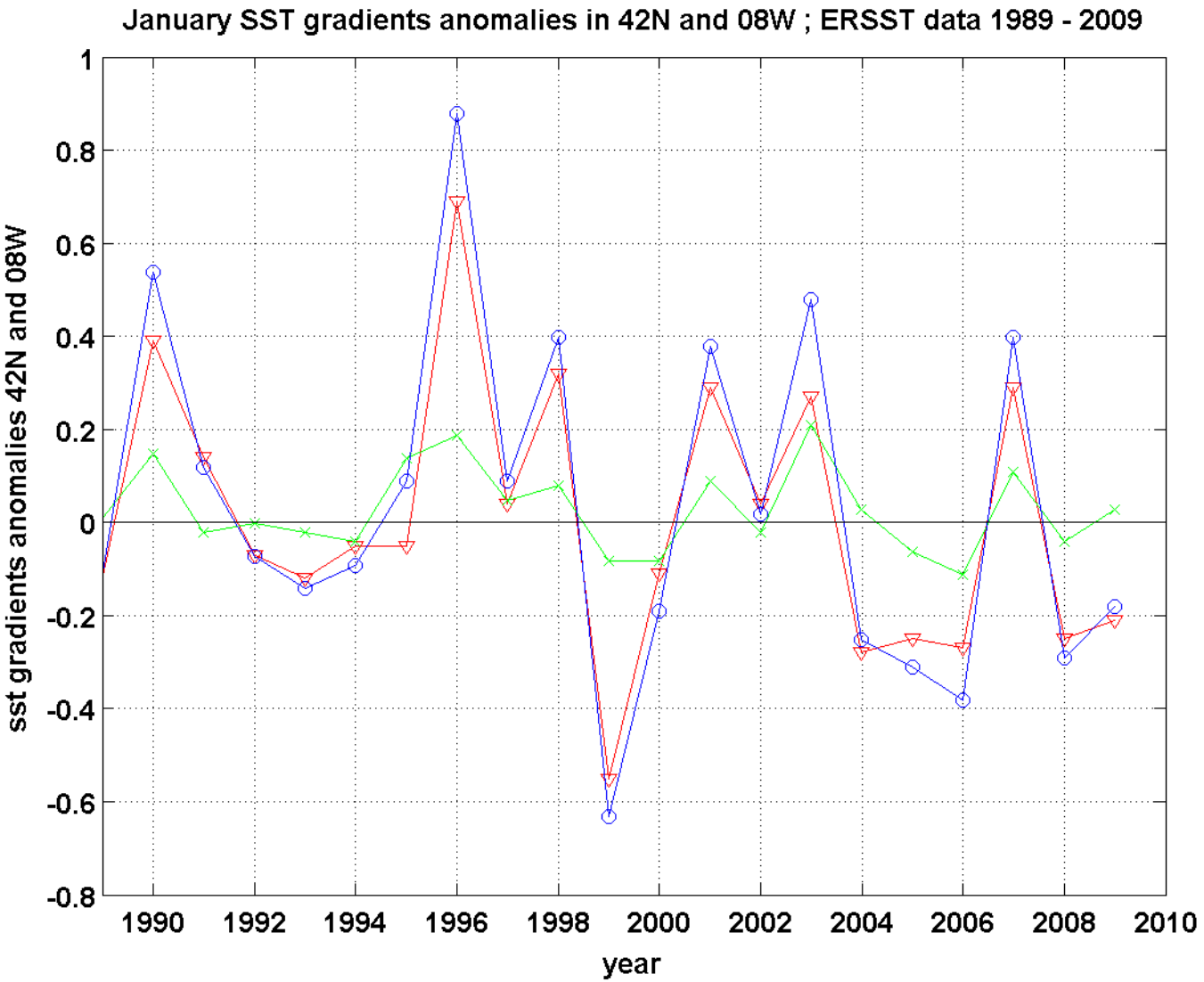
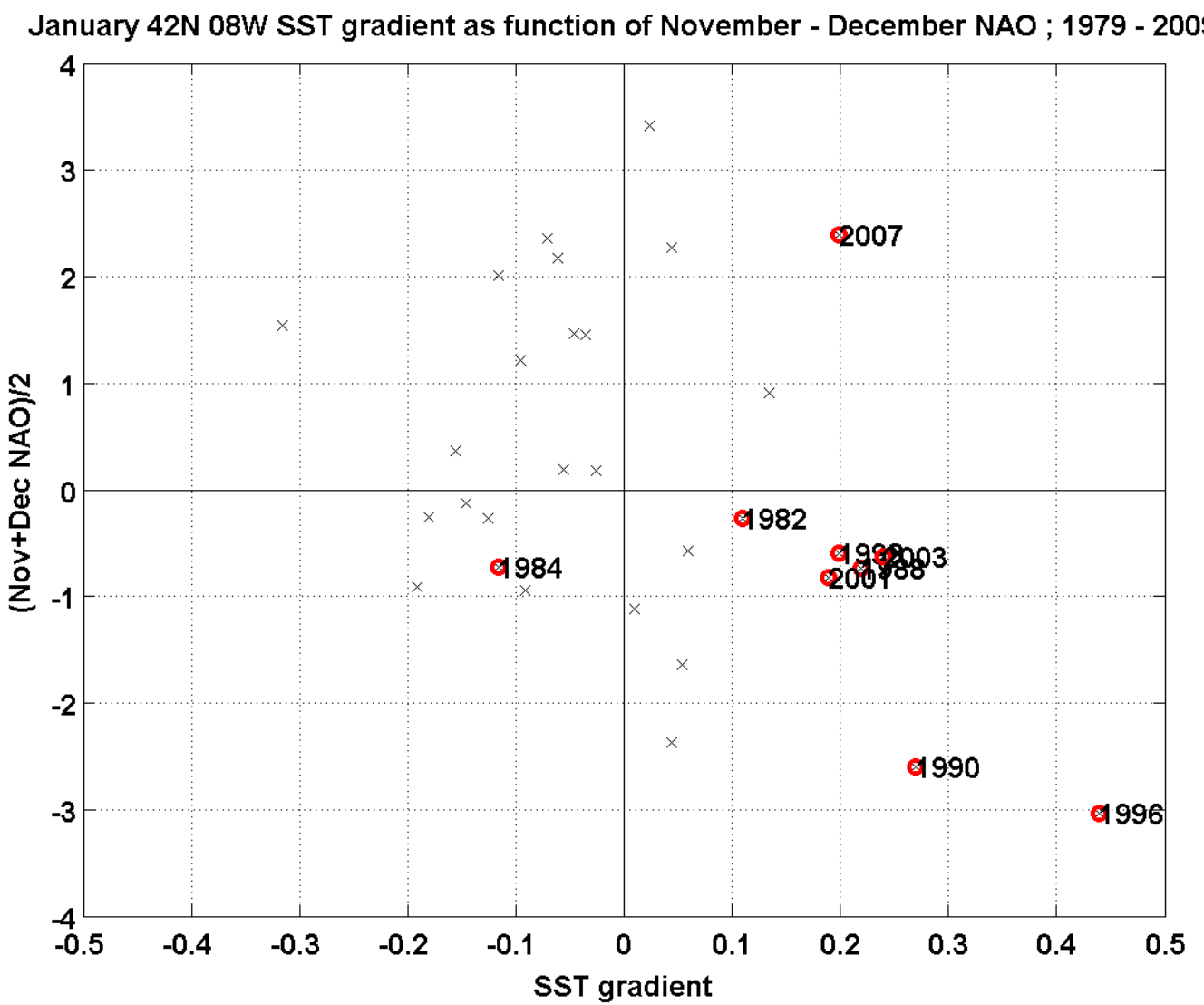


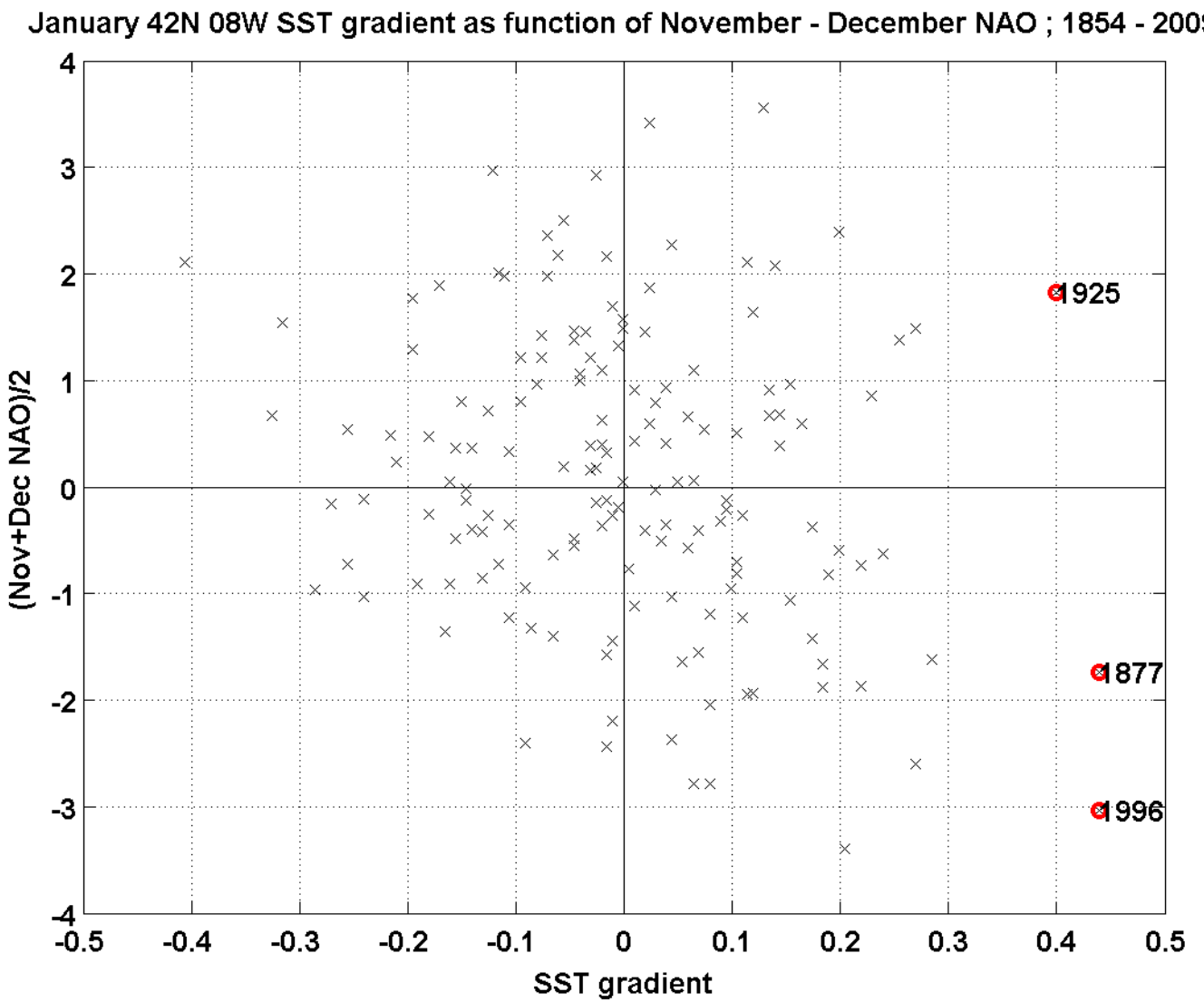
Figure 2. Relationships between North Atlantic Oscillation (NAO) index (November + December values) and Sea Surface Temperature (SST) off northern Spain (°C; January values to the nearest 0.25°C) at (A) 8°W and (B) 4°W during years of strong *Navidad*. Though the number of observations is low (N=9) the distributions are tight and significant (r^2=0.97 at 8°W and r^2=0.89 at 4°W). The figure extends to the winters of 2000/2001 and 2002/2003 ('Prestige' accident) the ND NAO–SST relationships described in Garcia-Soto et al. (2002). The SST data for the period 1979–1993 (CMS/CMM) were first published in Pingree (1994). During the last 25 years (1979–2004) the available AVHRR images have shown the *Navidad* warm water extending clearly from Galicia to France during nine winters: 1978/1979, 1981/1982, 1983/1984, 1987/1988, 1989/1990, 1995/1996, 1997/1998, 2000/2001 and 2002/2003. Among these nine events of strong *Navidad*, the winter of the 'Prestige' accident (2002/2003; highlighted in the Figure) shows the fourth most marked values of SST and ND NAO index (−1.8). NAO represents the first mode (32% of variance; Cayan, 1992) of low frequency variability over the North Atlantic and its regional extension and amplitude is most pronounced during the winter (December–February; Barston & Livezey, 1987), when the *Navidad* takes place.

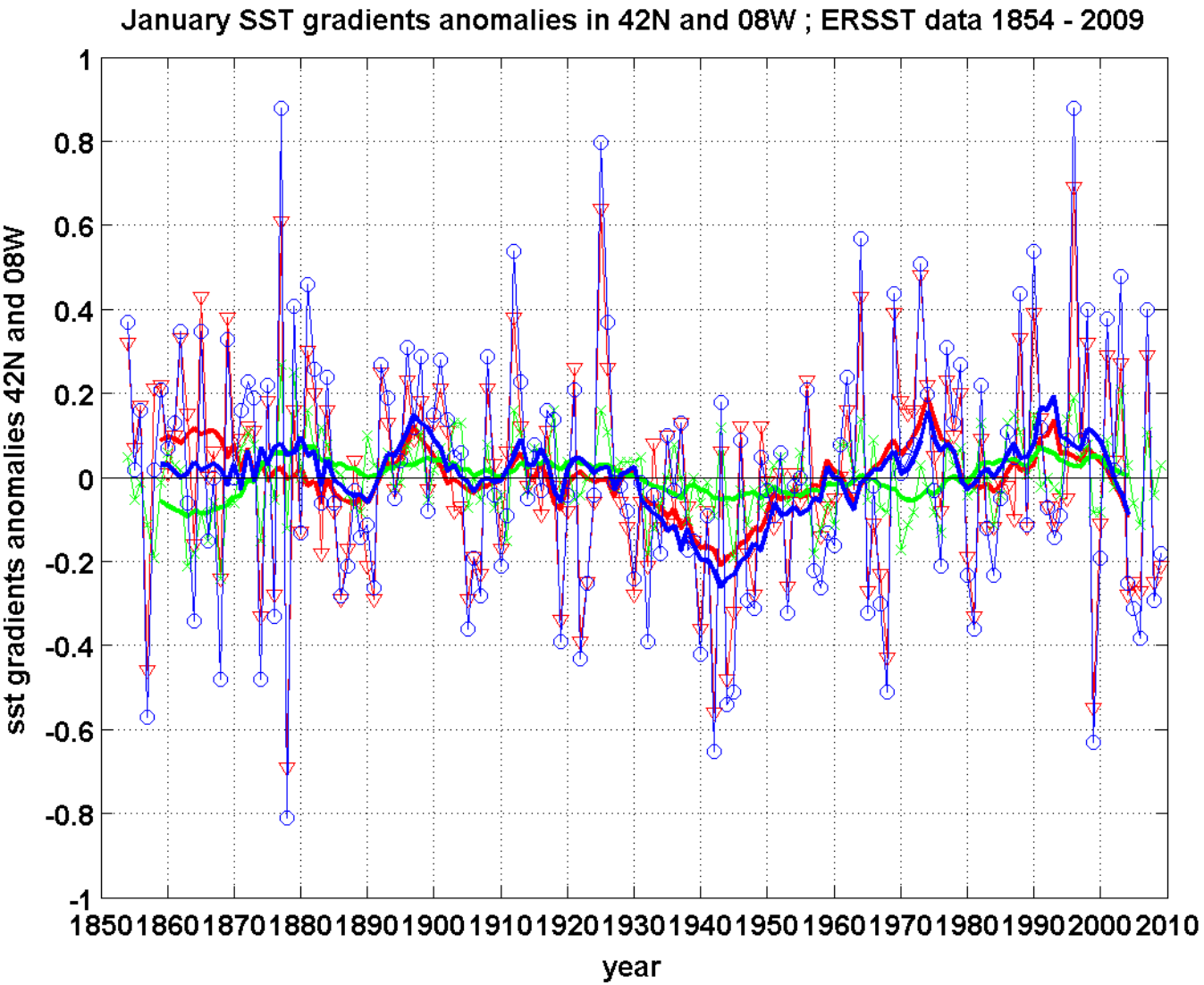

January SST in 44N,08W as function of November - December NAO ; 1979 - 2009
(Nov+Dec NAO)/2
SST
4
3
2
1
0
-1
-2
-3
-4
13
13.5
14
14.5
2007
1982
2003
1998
2001
1990
1996

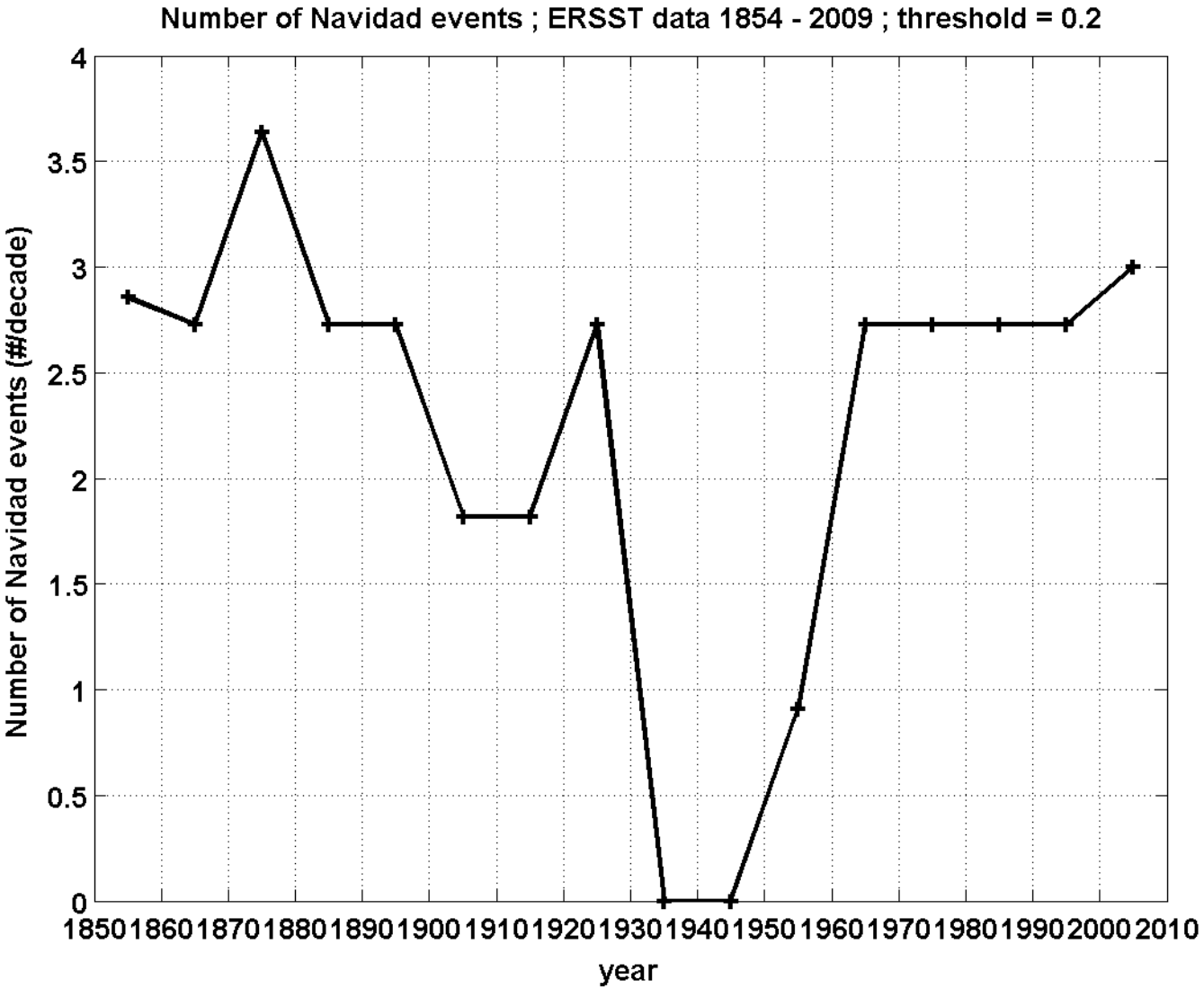

47°N
46°N
45°N
44°N
43°N
42°N
41°N
15°W
14°W
13°W
12°W
11°W
10°W
9°W
8°W
7°W
6°W
5°W
4°W
3°W
2°W
1°W
-4000
-3000
-2000
-1000
-150

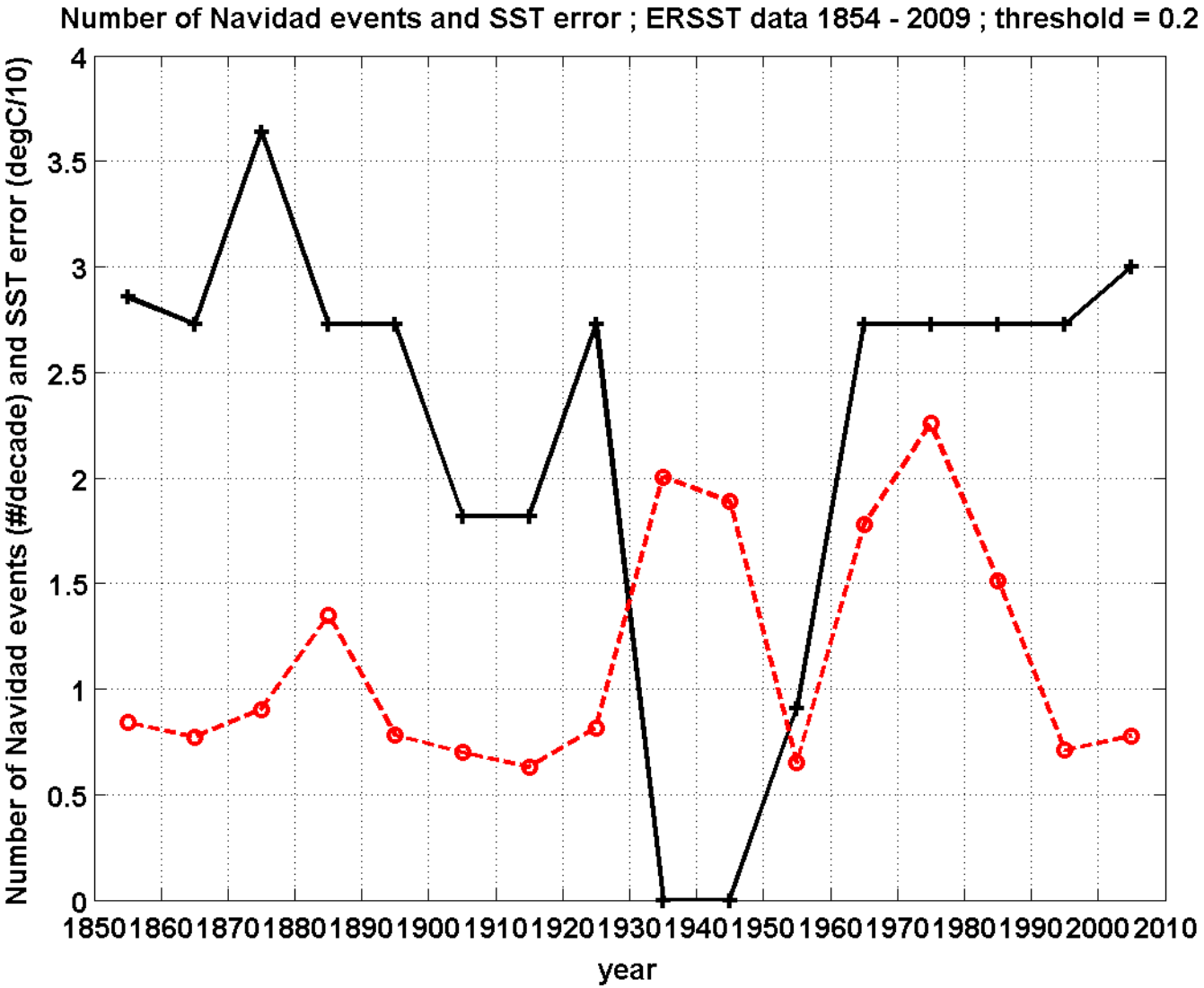

January SST gradients anomalies in 42N and 08W ; ERSST data 1989 - 2009
sst gradients anomalies 42N and 08W
year
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010


January 42N 08W SST gradient as function of November - December NAO ; 1979 - 2009
(Nov+Dec NAO)/2
SST gradient
4
3
2
1
0
-1
-2
-3
-4
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
2007
1982
1984
2003
1988
2001
1990
1996


January 42N 08W SST gradient as function of November - December NAO ; 1854 - 2009
(Nov+Dec NAO)/2
SST gradient
4
3
2
1
0
-1
-2
-3
-4
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
1925
1877
1996


January SST gradients anomalies in 42N and 08W ; ERSST data 1854 - 2009
sst gradients anomalies 42N and 08W
year
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
1850 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

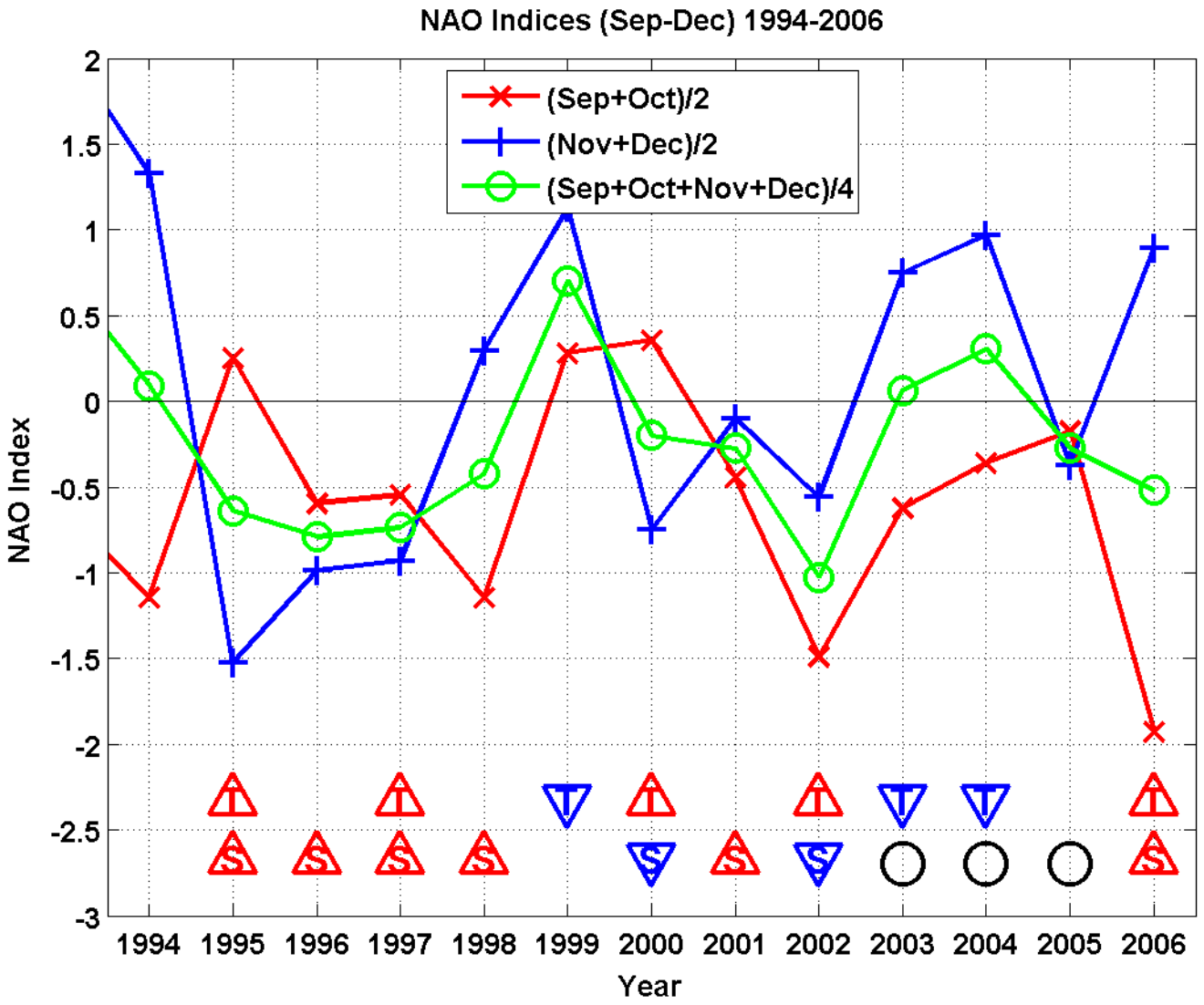

Number of Navidad events ; ERSST data 1854 - 2009 ; threshold = 0.2
Number of Navidad events (#/decade)
0
0.5
1
1.5
2
2.5
3
3.5
4
1850 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010
year

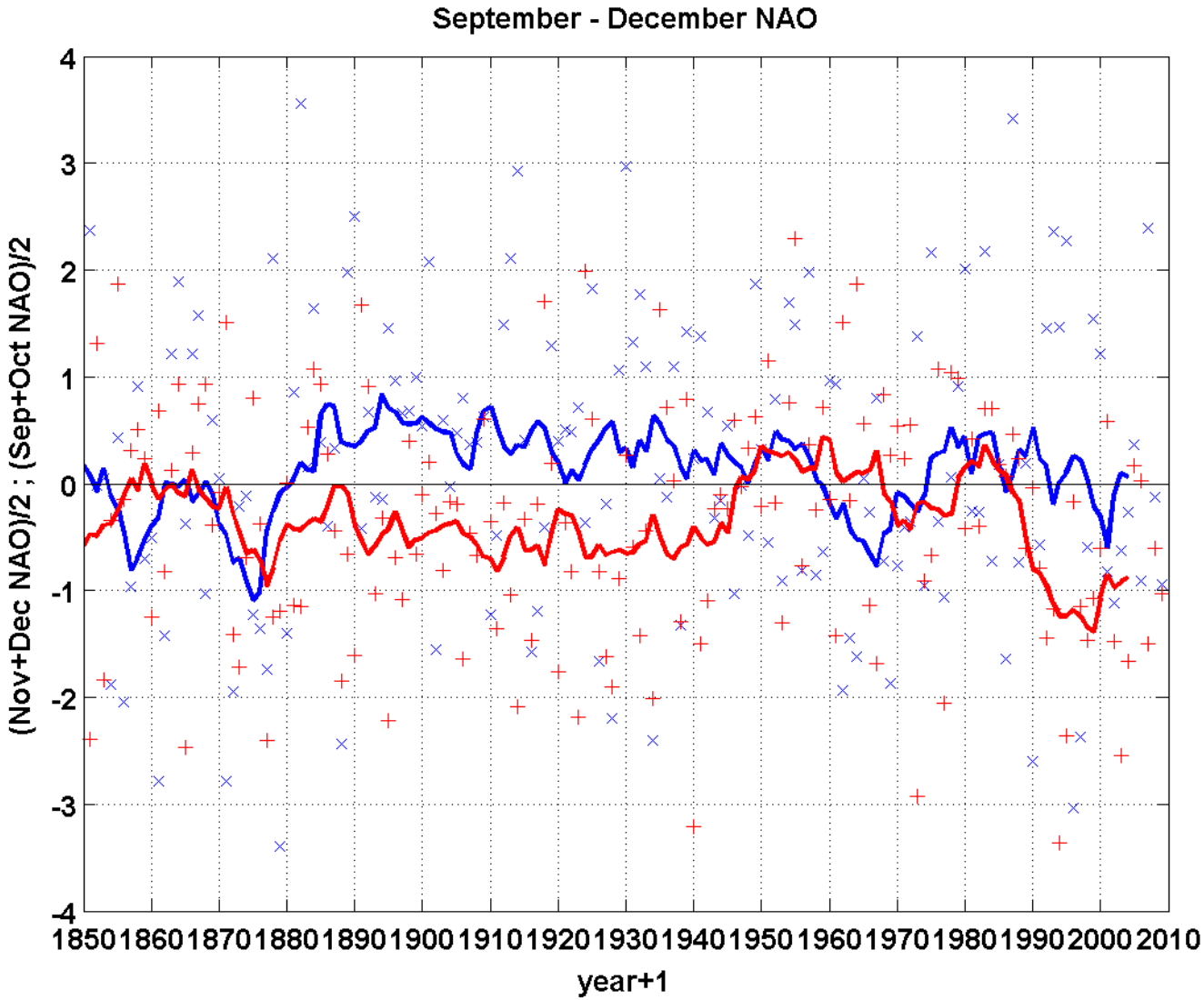

Number of Navidad events and SST error ; ERSST data 1854 - 2009 ; threshold = 0.2
Number of Navidad events (#decade) and SST error (degC/10)
0
0.5
1
1.5
2
2.5
3
3.5
4
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
year

Conclusions et développements éventuels

Autres jeux ERSST, SST

Autres jeux de données (niveaux? ...)


NAO Indices (Sep-Dec) 1994-2006
(Sep+Oct)/2
(Nov+Dec)/2
(Sep+Oct+Nov+Dec)/4
NAO Index
Year
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006


September - December NAO
(Nov+Dec NAO)/2 ; (Sep+Oct NAO)/2
year+1
4
3
2
1
0
-1
-2
-3
-4
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010