

Laissez le feu brûler... pour une gestion durable des forêts!

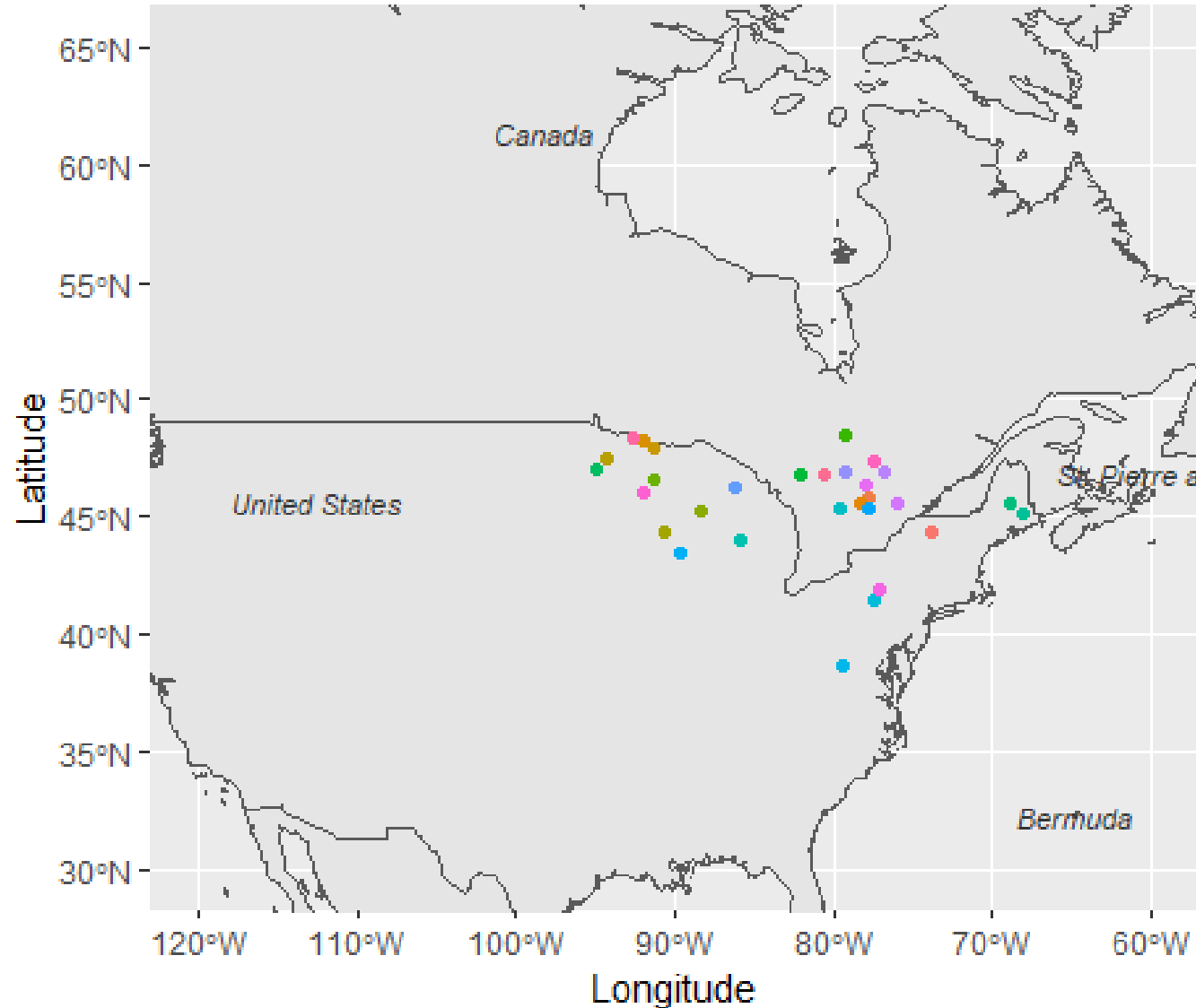
Synthèses des historiques de feux dans les
forêts mixtes de L'Amérique du Nord-Est.

Daniela Robles



Question: Comment le climat détermine le régime des feux dans les forêts mixtes de pins de l'est de l'Amérique du Nord?

Sites



Site

- | | |
|--------------|--------------|
| ● Adirondack | ● ParrySound |
| ● AlgonquinE | ● PCG |
| ● AlgonquinW | ● PikeKnob |
| ● BWCAW | ● PineBluff |
| ● Canoe | ● PPU |
| ● Chippewa | ● Seney |
| ● CMPF | ● TEM |
| ● CNNF | ● TEMEM |
| ● CNNFWF | ● TEMGAT23 |
| ● Duparquet | ● TEMP125 |
| ● Huron | ● Tioga |
| ● Itasca | ● Totogatic |
| ● JoMary | ● Verendrye |
| ● Machias | ● VNP |
| ● Manistee | ● WolfLake |

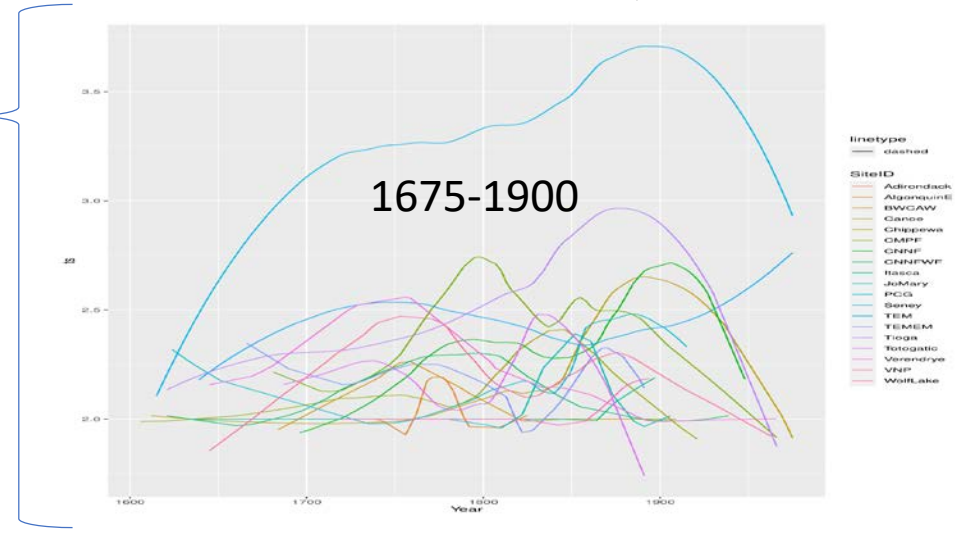
Méthodes

Création d'une base de données sur l'historique des incendies

Algorithme pour l'analyse des changements de régimes

Préparation des données

- Sites indépendants et déconnectés: objectivité statistique prônée
- Période d'étude sélectionnée: 1675-1900



ENSO, PDO, NAO, AMO

Associations entre les indices climatiques et l'activité historique des feux

Indices climatiques uniques

Combinaisons d'états climatiques

- Anomalie positive
- Neutre
- Anomalie négative

Fréquences annuelles

Tranches de 3, 5, et 10 années

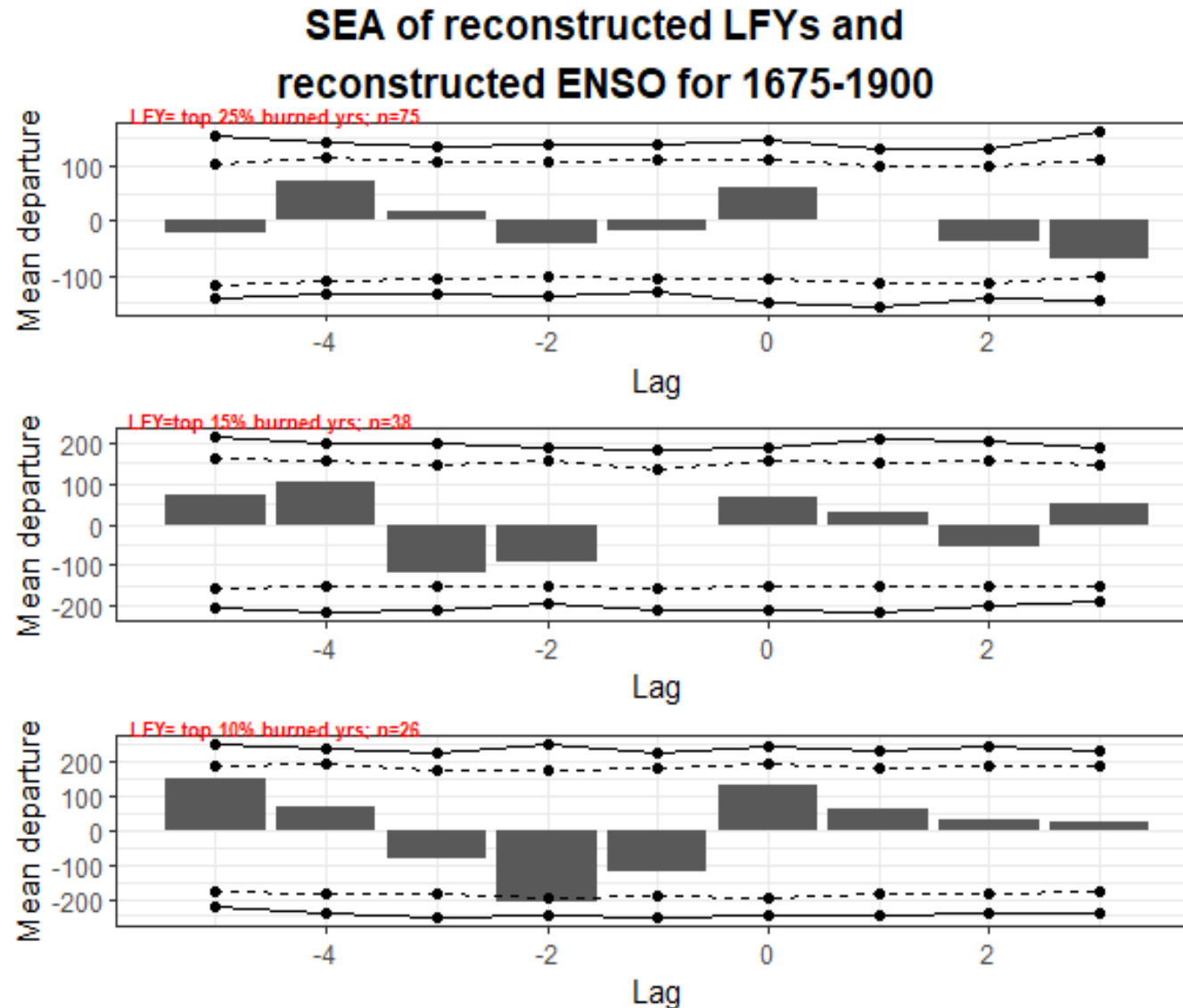
Le test exact de Fisher et la technique de 'bootstrapping'

SEA: L'analyse d'époques superposée

CCF: fonction de corrélations croisées

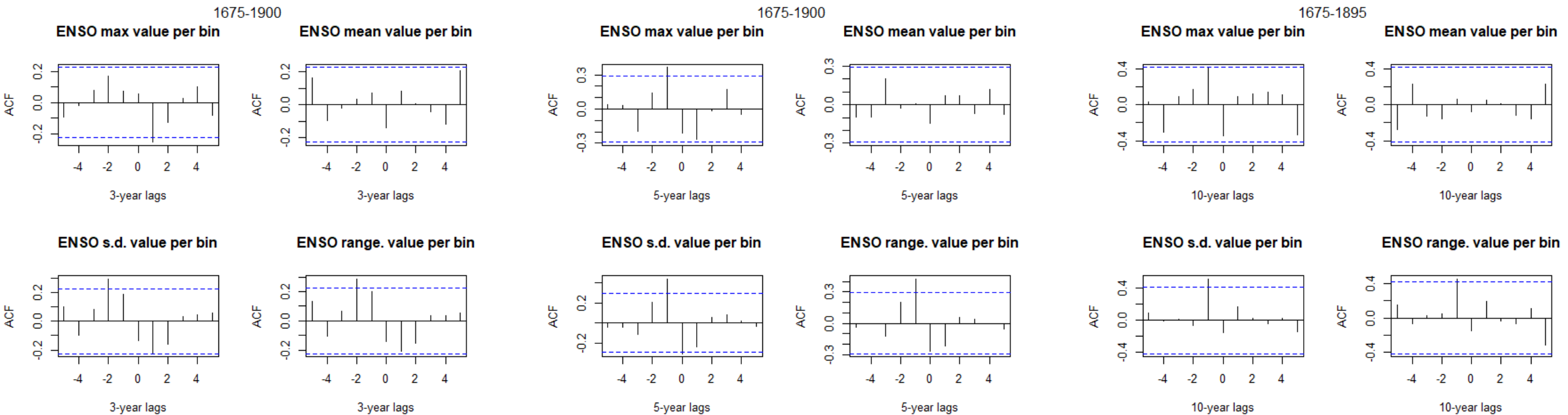
Comparaisons avec données d'observations modernes

Corrélations annuelles avec l'indice ENSO

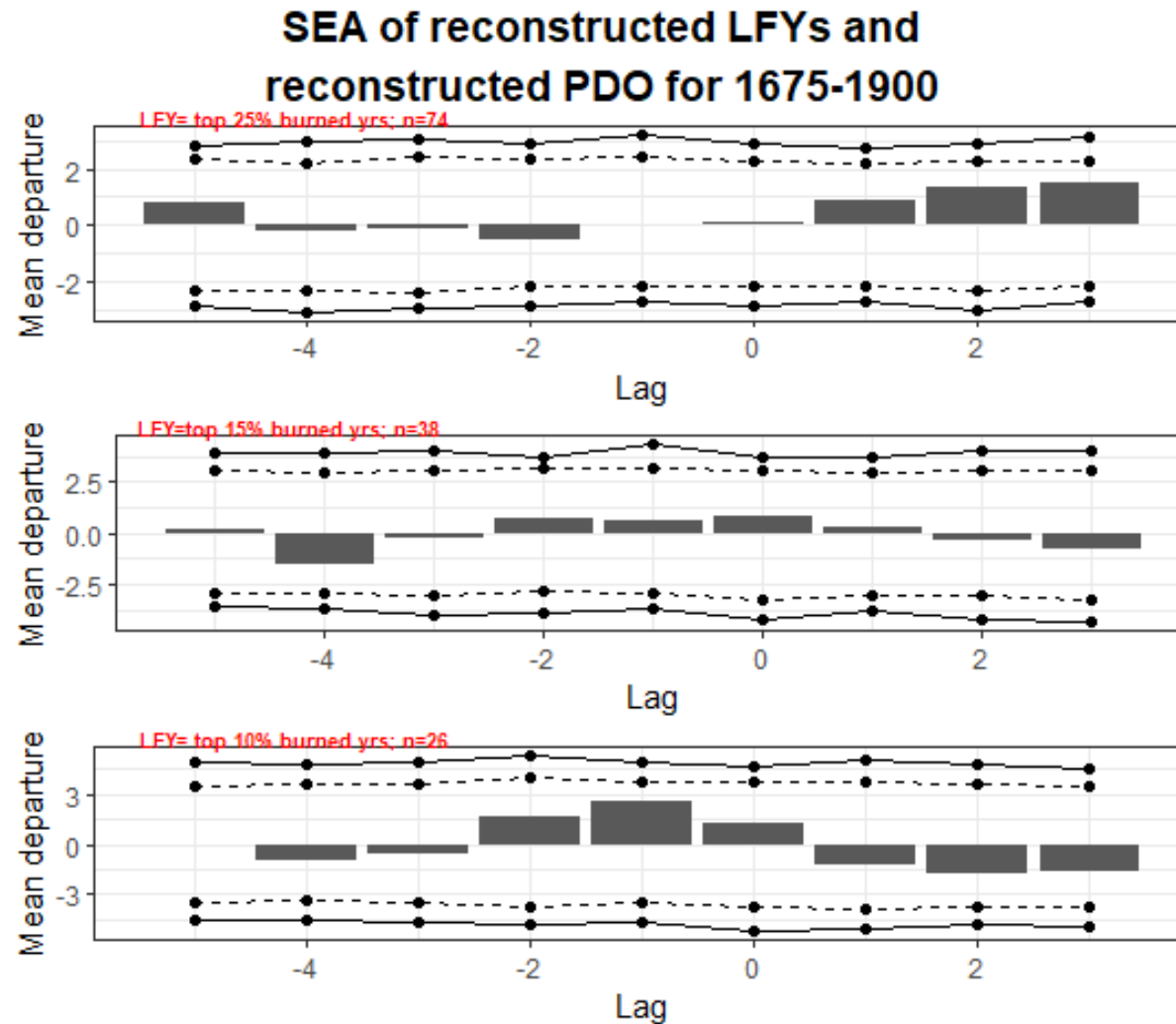




Corrélations par regroupements en tranches de 3, 5, et 10 années

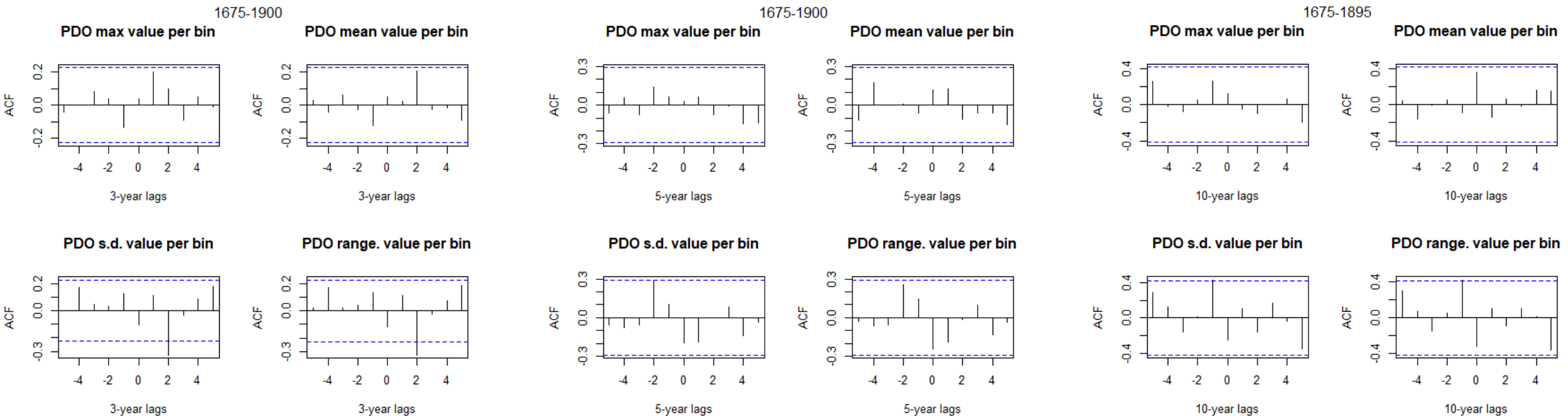


Corrélations annuelles avec l'indice PDO

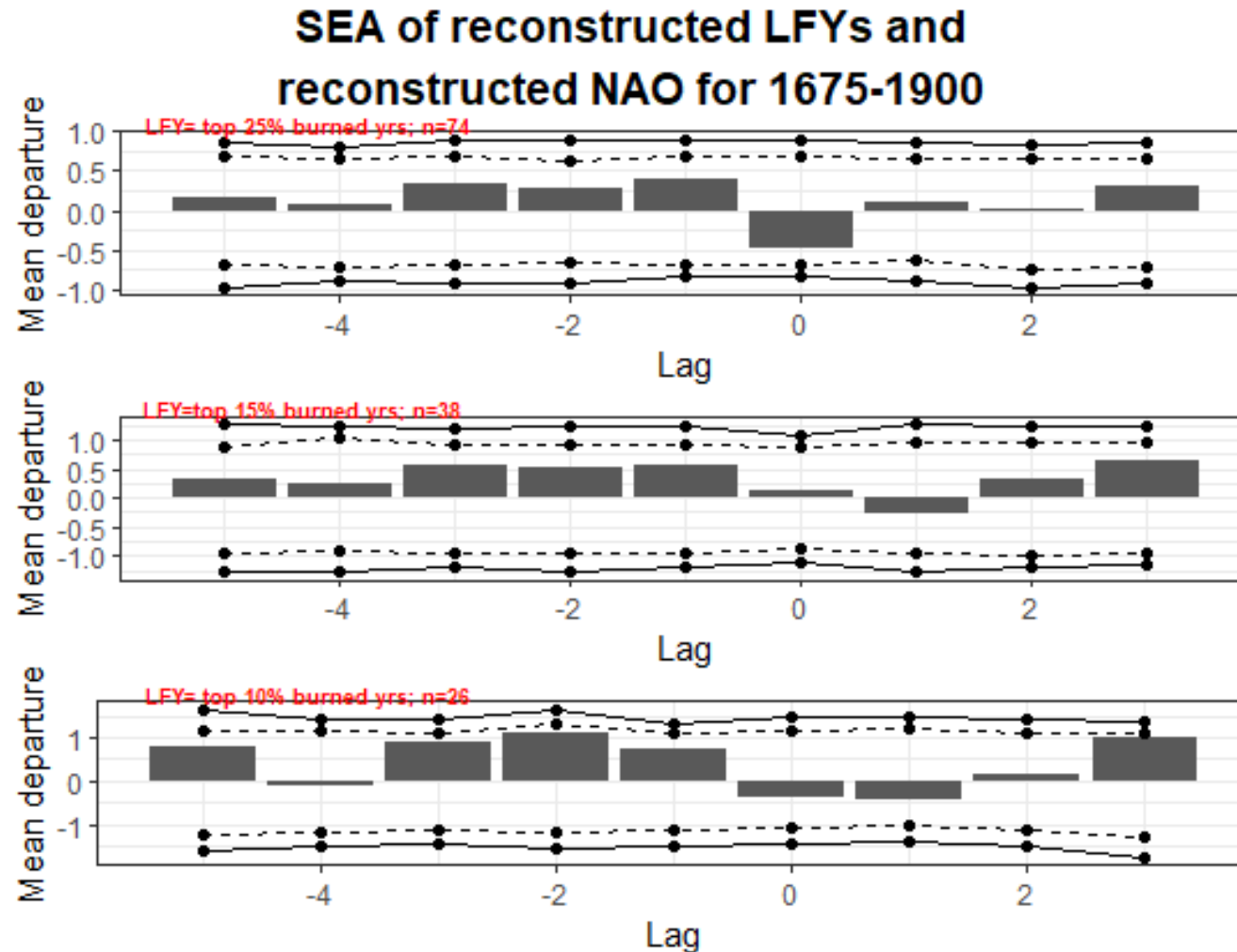




Corrélations par regroupements en tranches de 3, 5, et 10 années

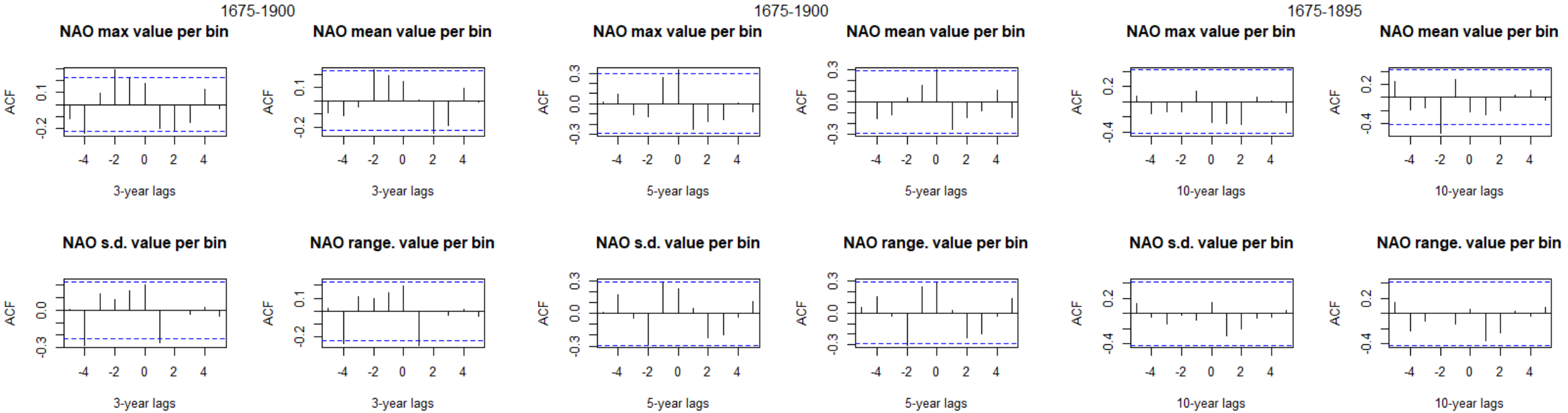


Corrélations annuelles avec l'indice NAO



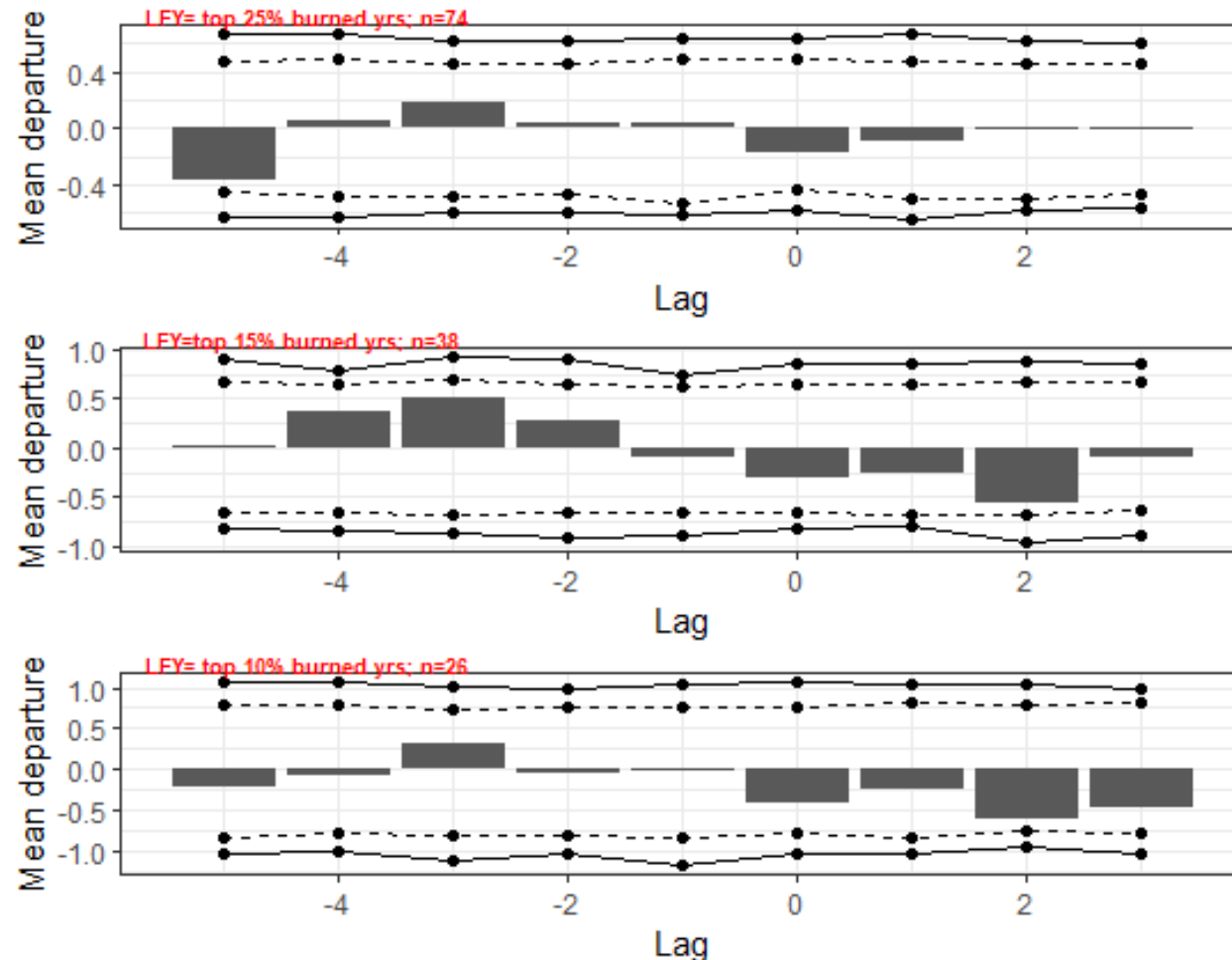


Corrélations par regroupements en tranches de 3, 5, et 10 années



Corrélation annuelle avec AMO

**SEA of reconstructed LFYs and
reconstructed AMO for 1675-1900**





Corrélation quand les données sont groupées en périodes de 3-, 5-, et 10-années

1675-1900

AMO max value per bin

AMO mean value per bin

1675-1900

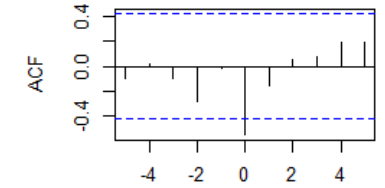
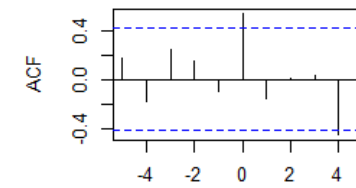
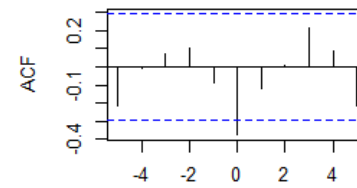
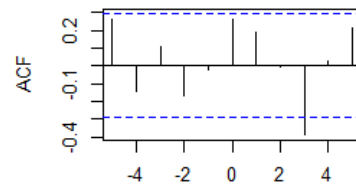
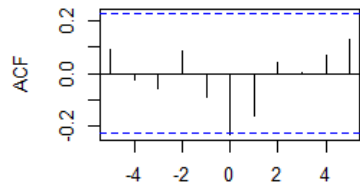
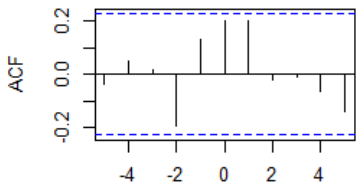
AMO max value per bin

AMO mean value per bin

1675-1895

AMO max value per bin

AMO mean value per bin



3-year lags

3-year lags

5-year lags

5-year lags

10-year lags

10-year lags

AMO s.d. value per bin

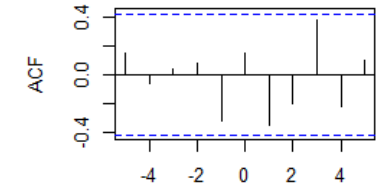
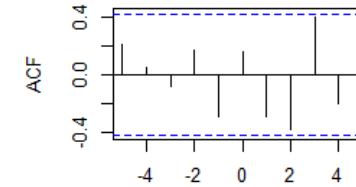
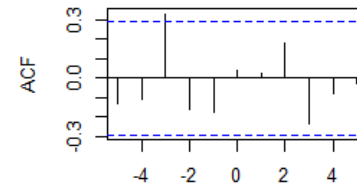
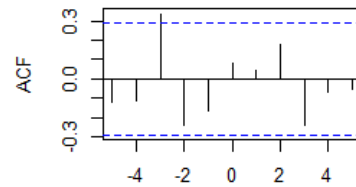
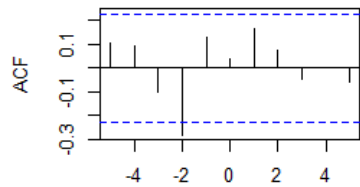
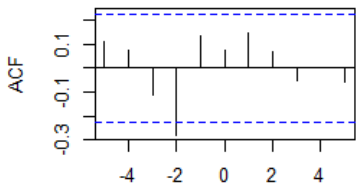
AMO range. value per bin

AMO s.d. value per bin

AMO range. value per bin

AMO s.d. value per bin

AMO range. value per bin



3-year lags

3-year lags

5-year lags

5-year lags

10-year lags

10-year lags



Corrélations annuelles avec l'indice ENSO

Données/observations contemporaines

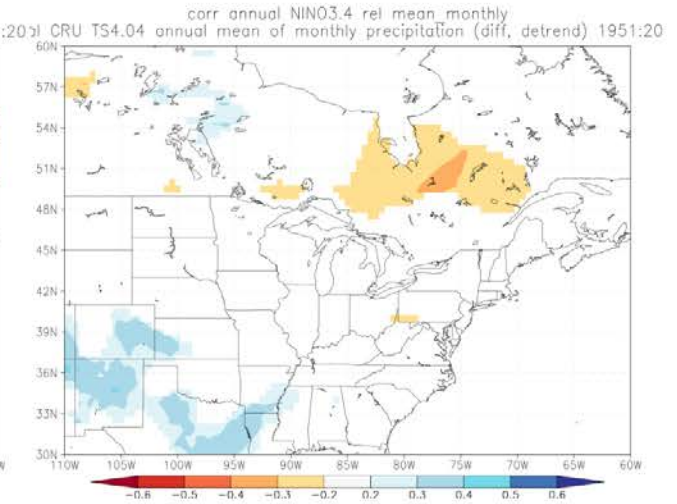
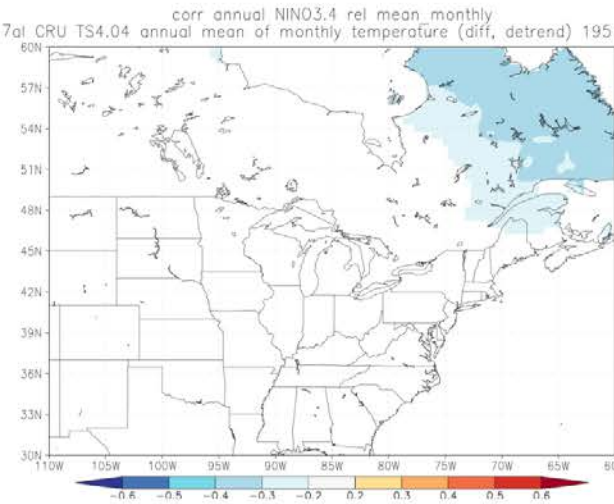
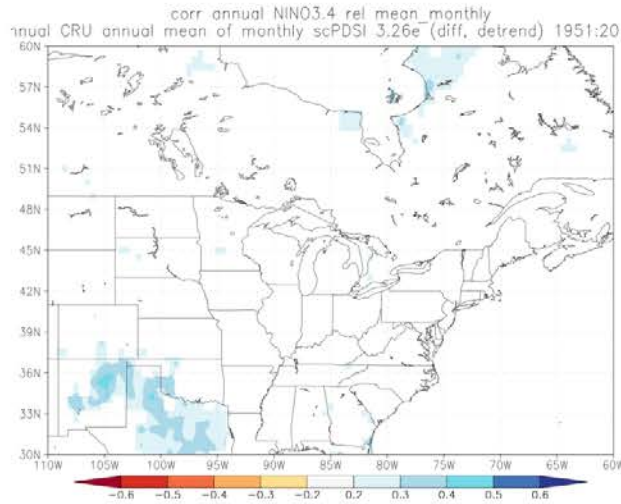
1950-2017

PDSI

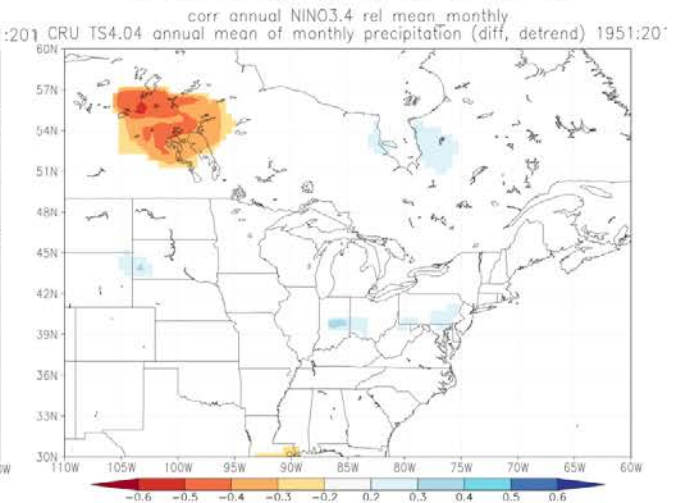
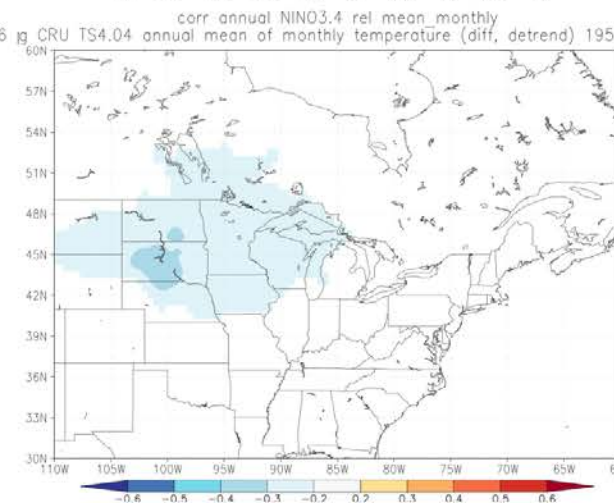
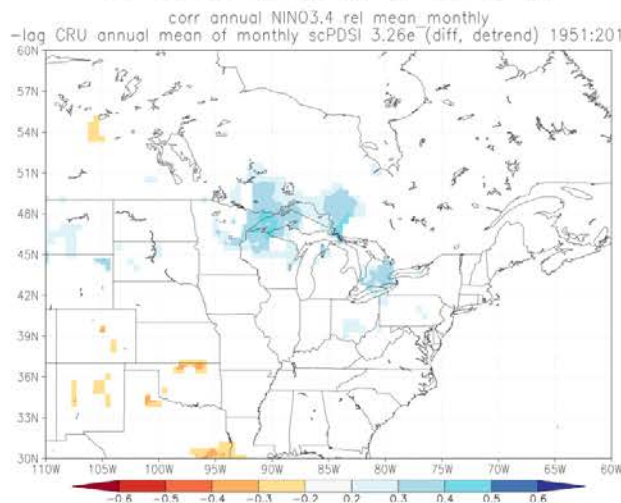
Temperature

Precipitation

0 yrs lag



1 yr lag



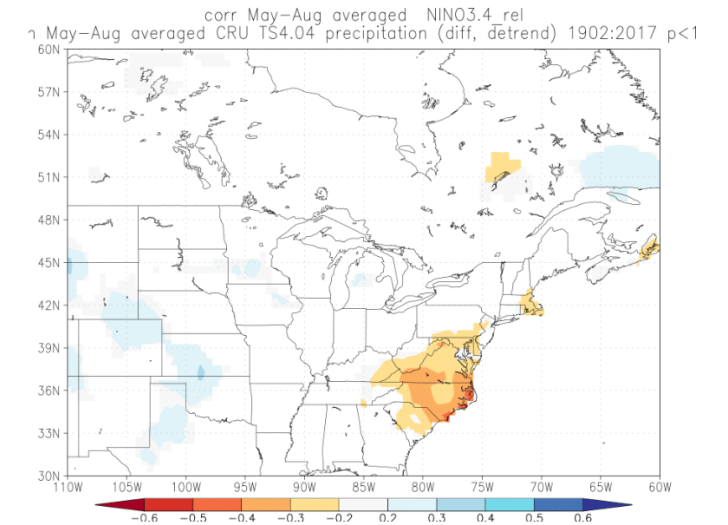
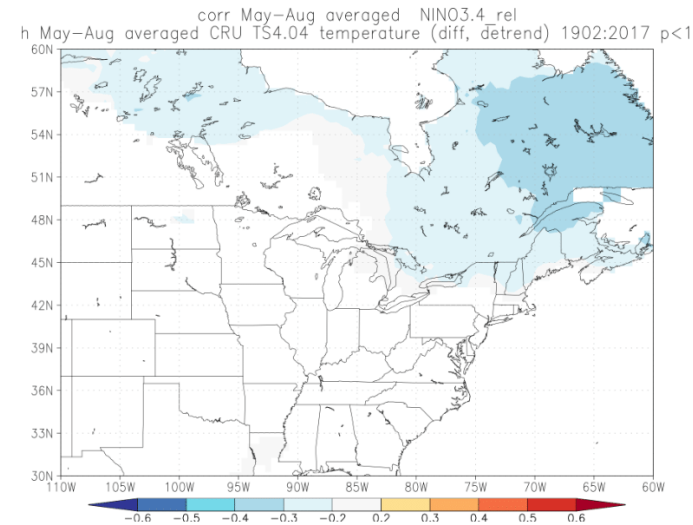
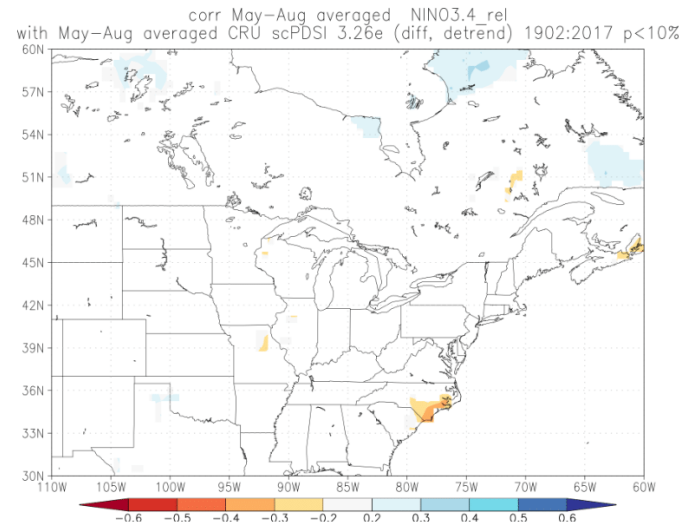
Les effets de l'indice ENSO de mai à août

PDSI

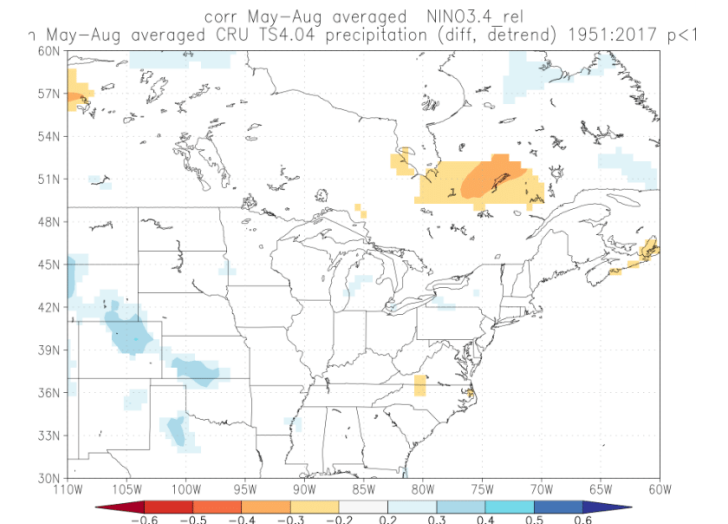
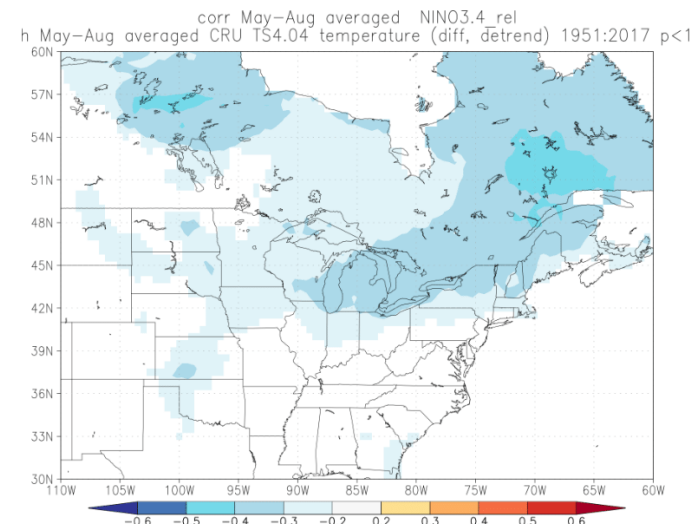
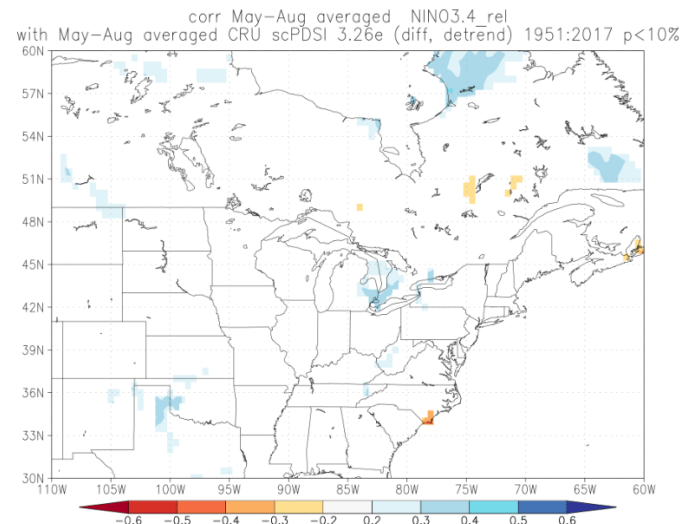
Temperature

Precipitation

1900-2017



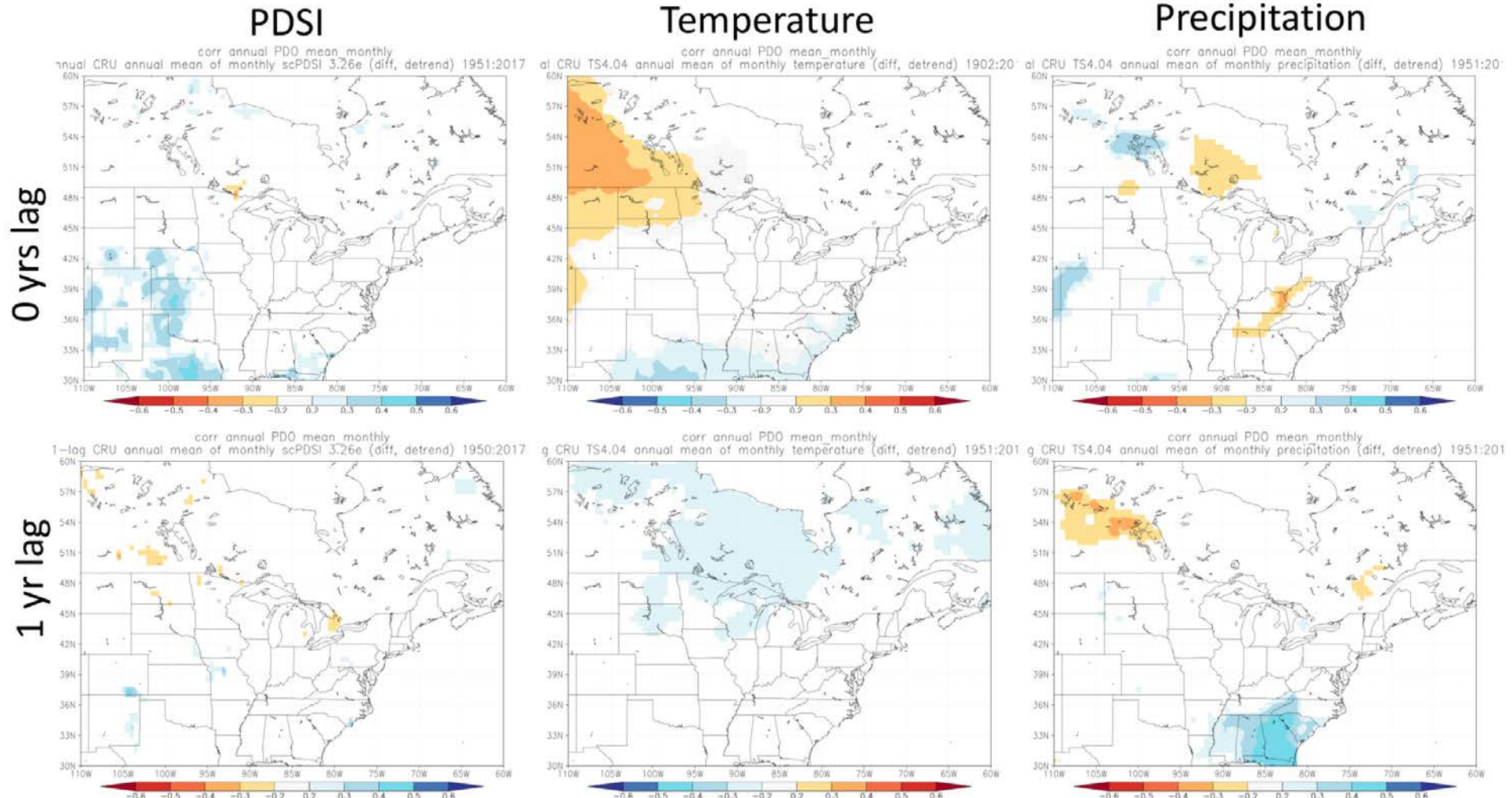
1950-2017



Corrélations annuelles avec l'indice PDO

Données/observations contemporaines:

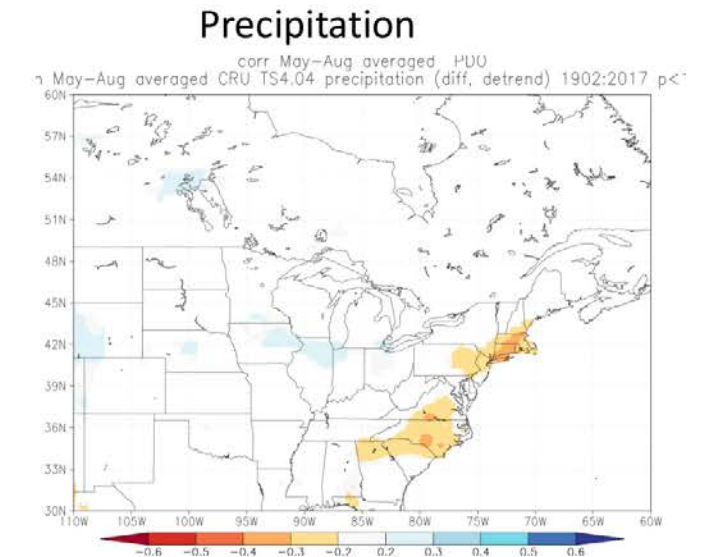
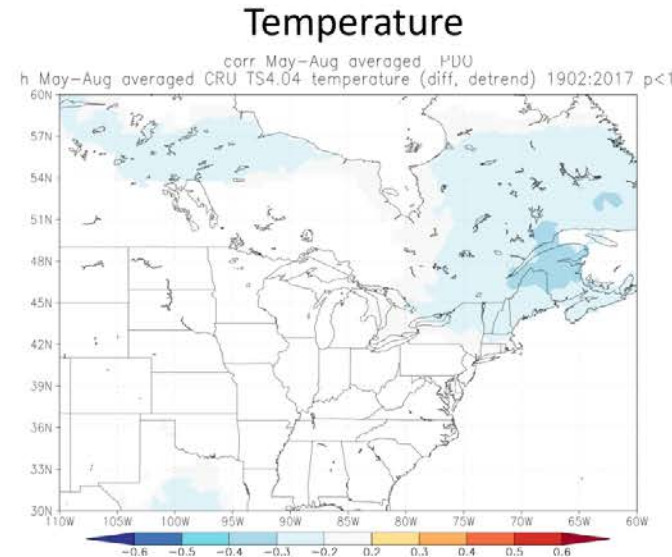
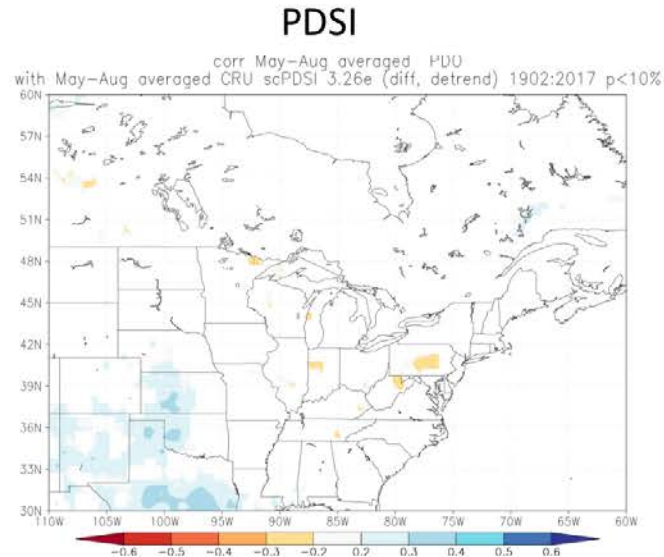
1950-2017



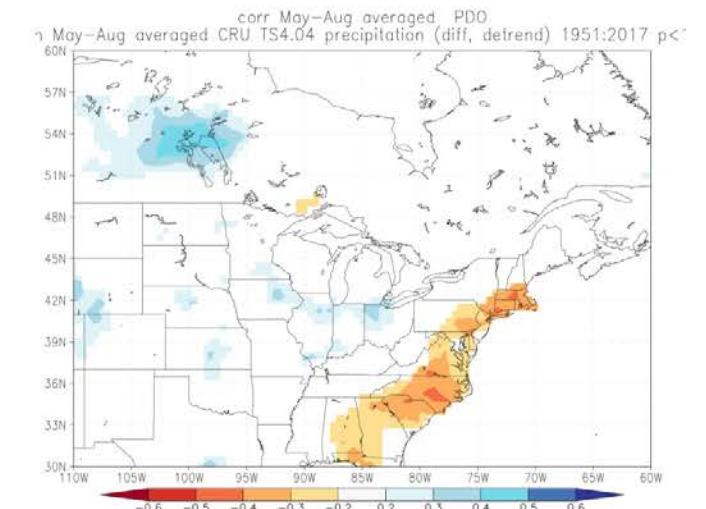
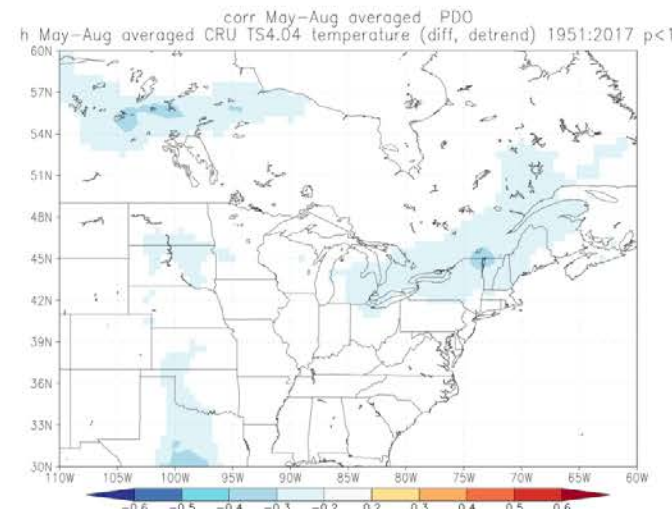
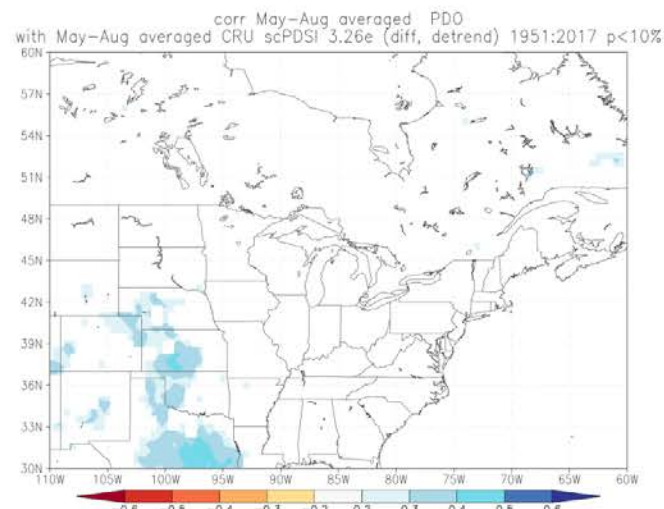


Les effets de l'indice PDO de mai à août

1901-2017



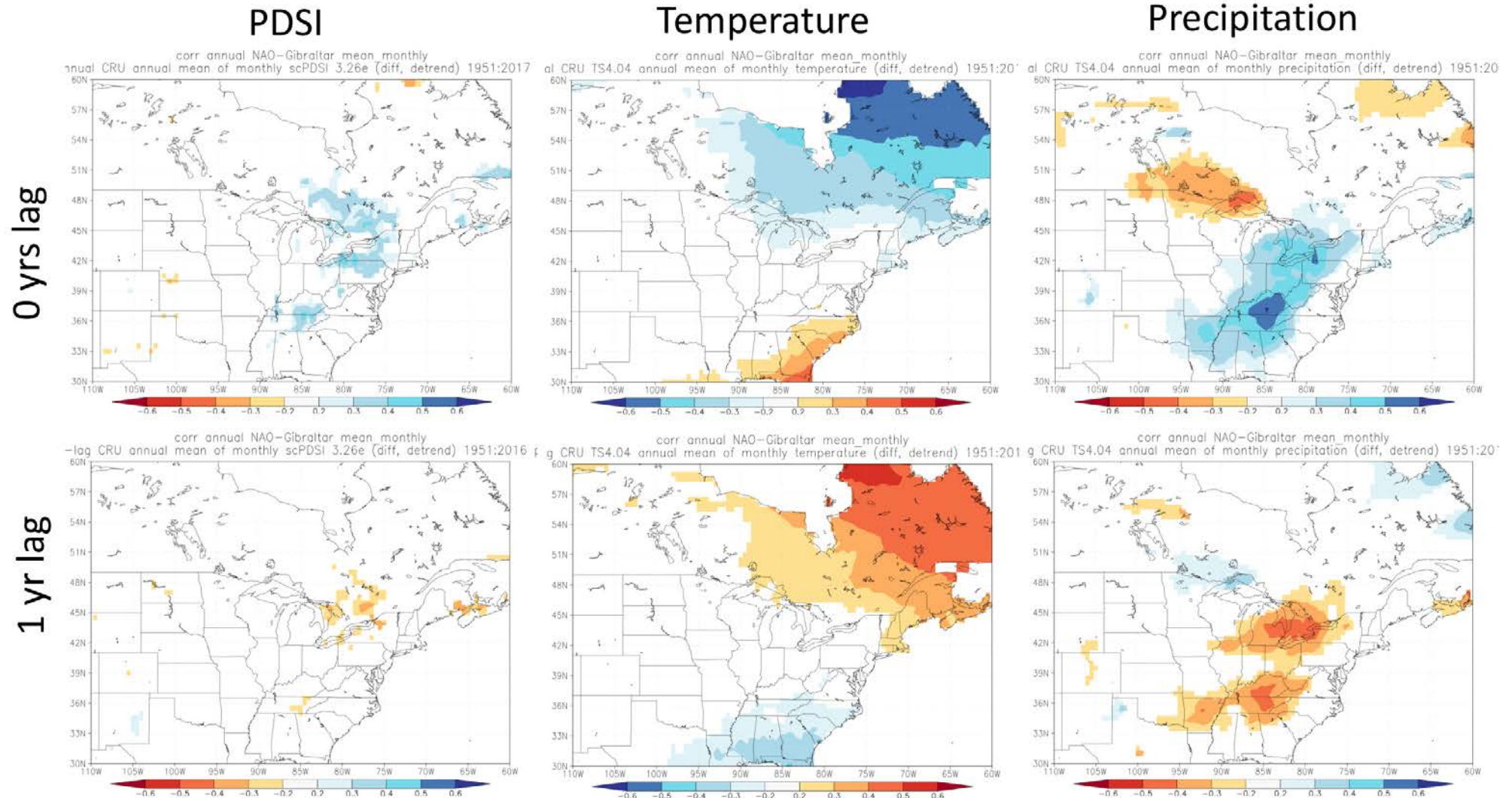
1950-2017



Corrélations annuelles avec l'indice NAO

Données/observations contemporaines

1950-2017





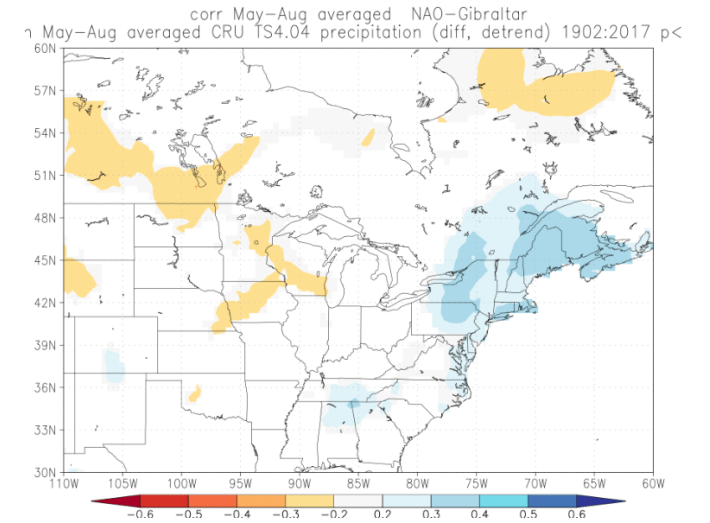
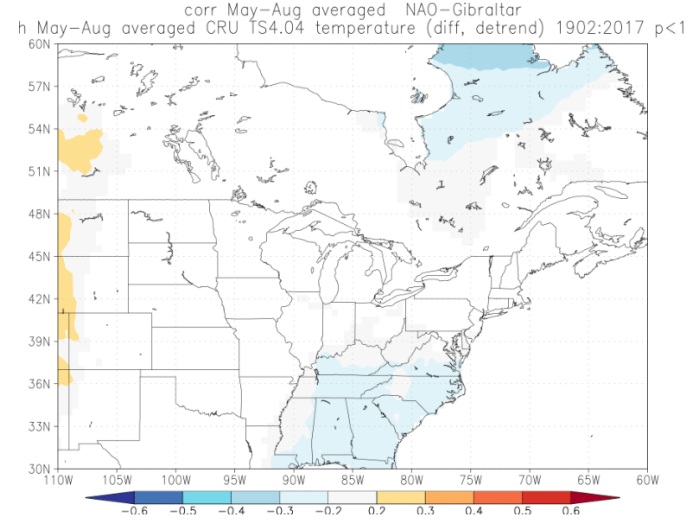
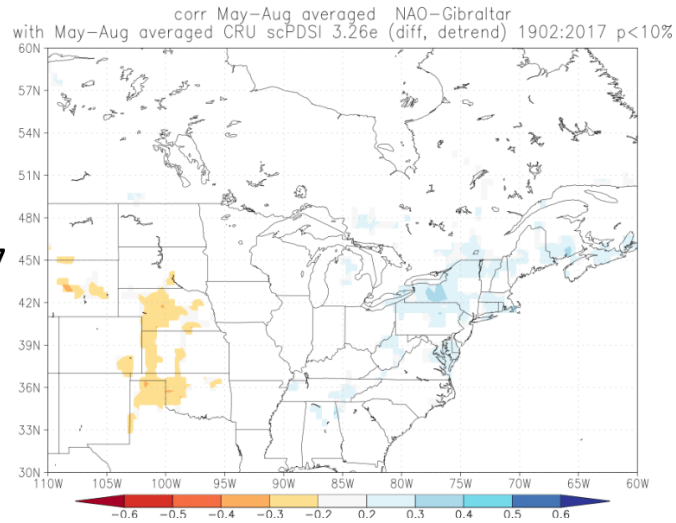
Les effets de l'indice NAO de mai à août

PDSI

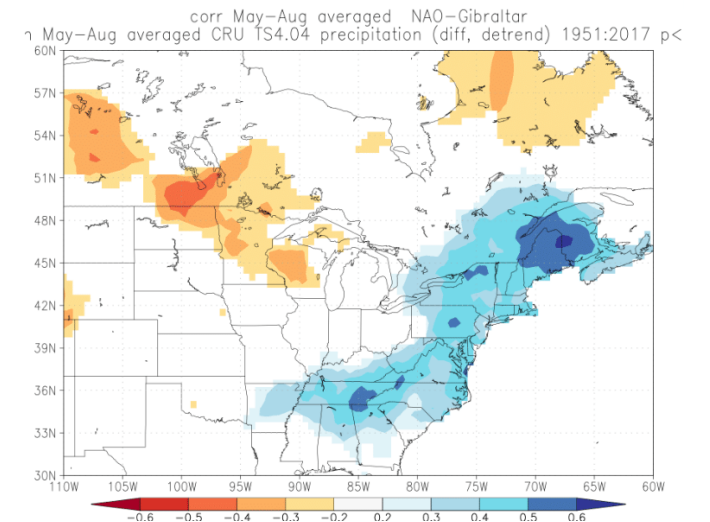
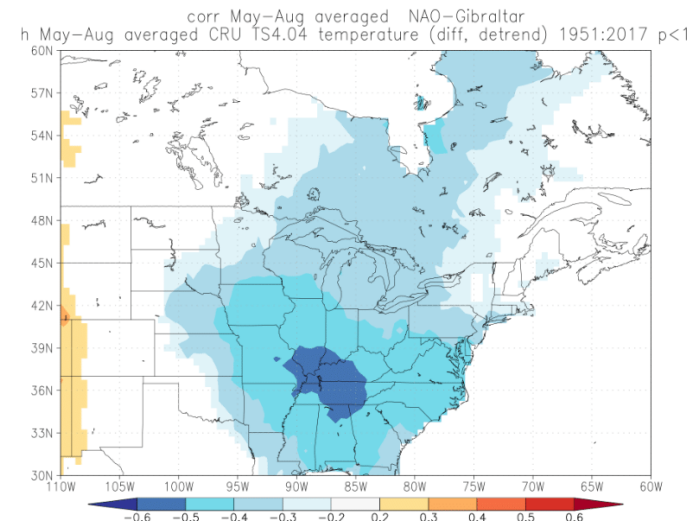
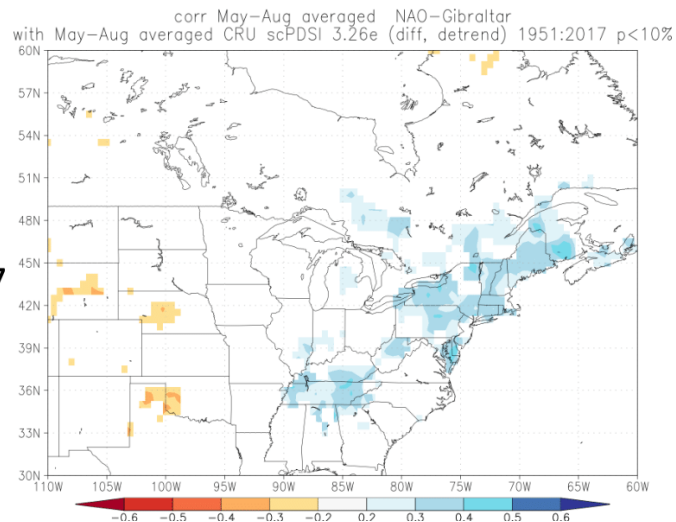
Temperature

Precipitation

1901-2017



1950-2017

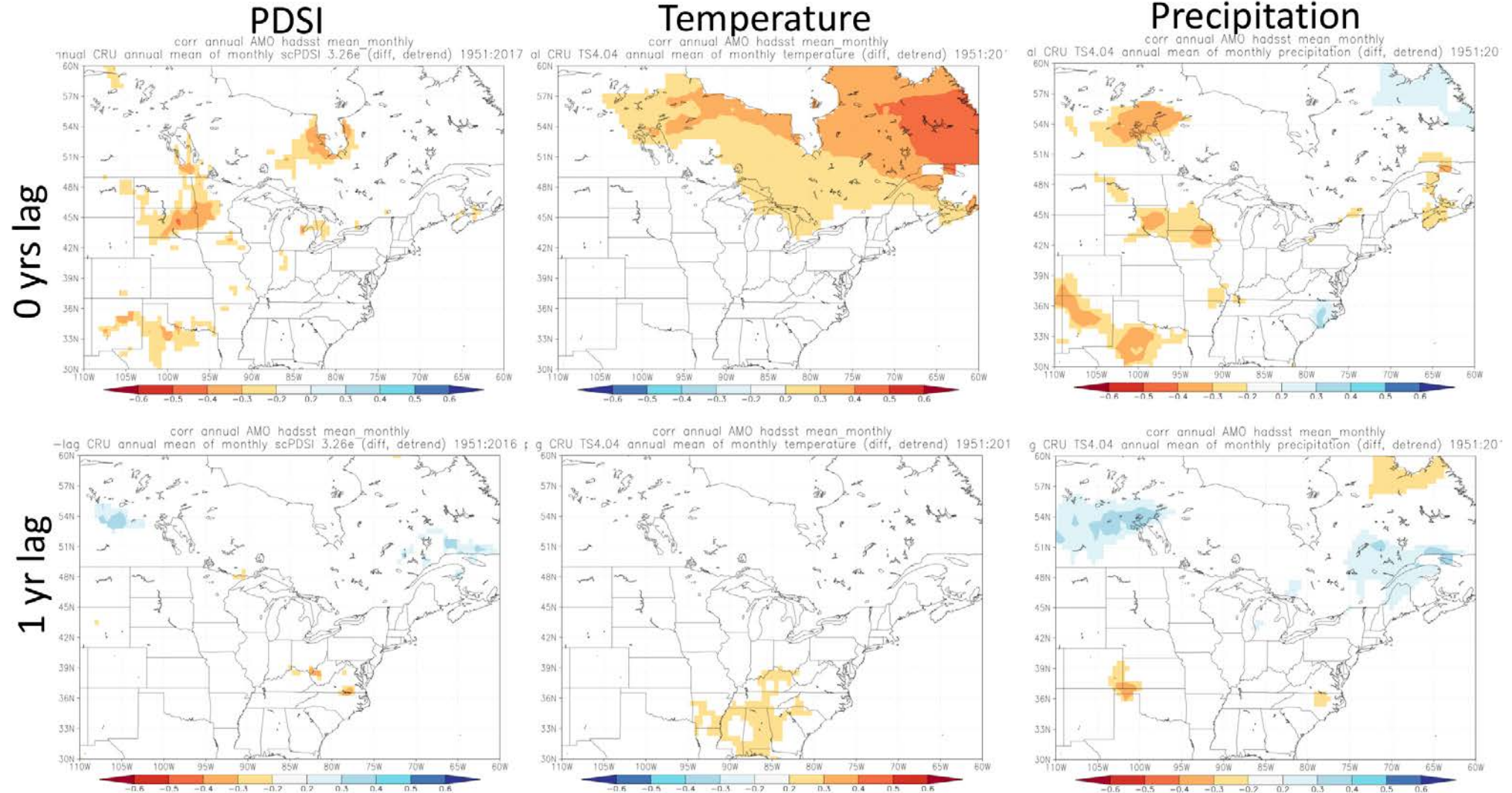




Corrélations annuelles avec l'indice AMO

Données/observations contemporaines

1950-2017

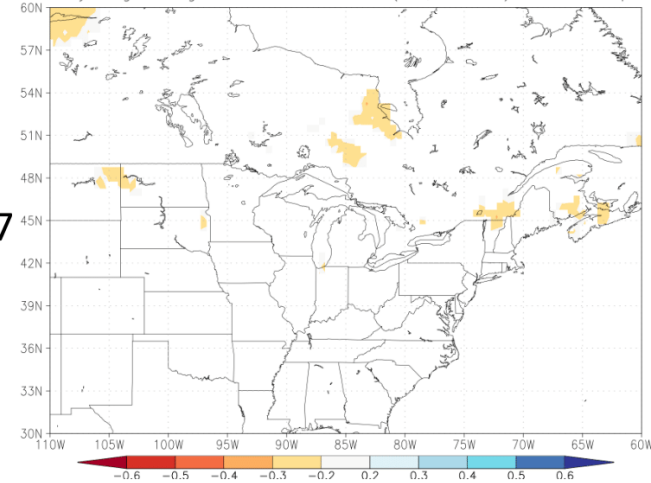




Les effets de l'incide AMO de mai à août

PDSI

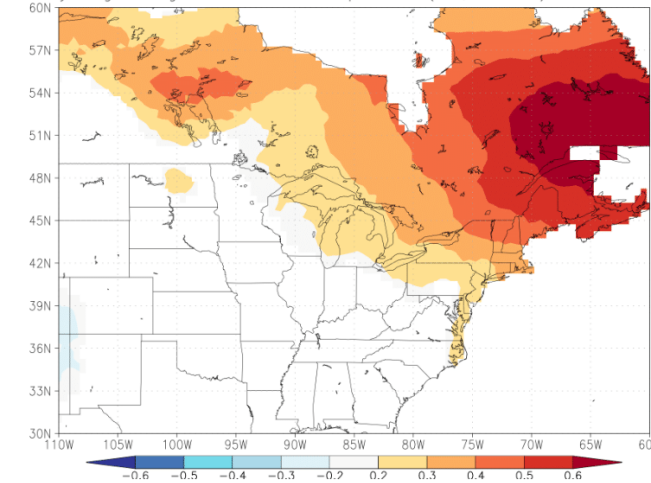
corr May-Aug averaged AMO hadsst
with May-Aug averaged CRU scPDSI 3.26e (diff, detrend) 1902:2017 $p < 10\%$



1901-2017

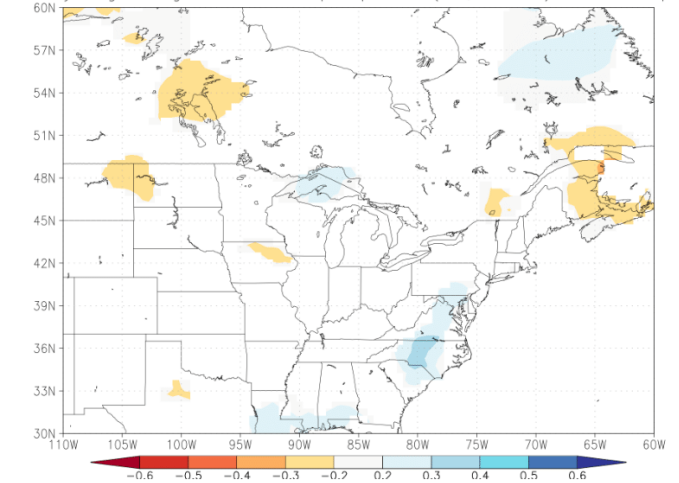
Temperature

corr May-Aug averaged AMO hadsst
h May-Aug averaged CRU TS4.04 temperature (diff, detrend) 1902:2017 $p < 1$



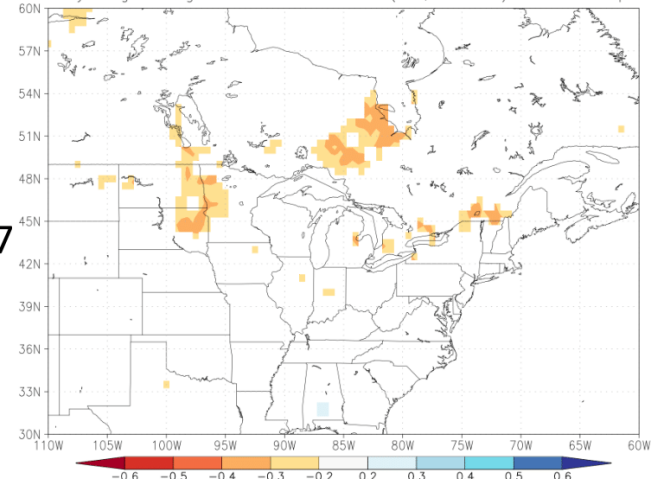
Precipitation

corr May-Aug averaged AMO hadsst
 γ May-Aug averaged CRU TS4.04 precipitation (diff, detrend) 1902:2017 $p < 1$



PDSI

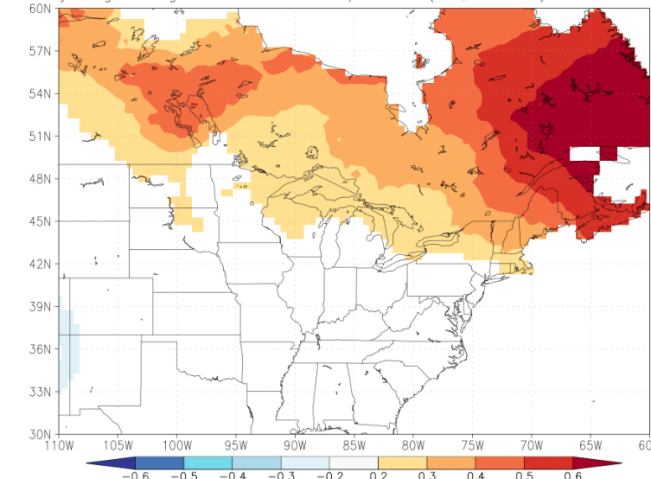
corr May-Aug averaged AMO hadsst
with May-Aug averaged CRU scPDSI 3.26e (diff, detrend) 1951:2017 $p < 10\%$



1950-2017

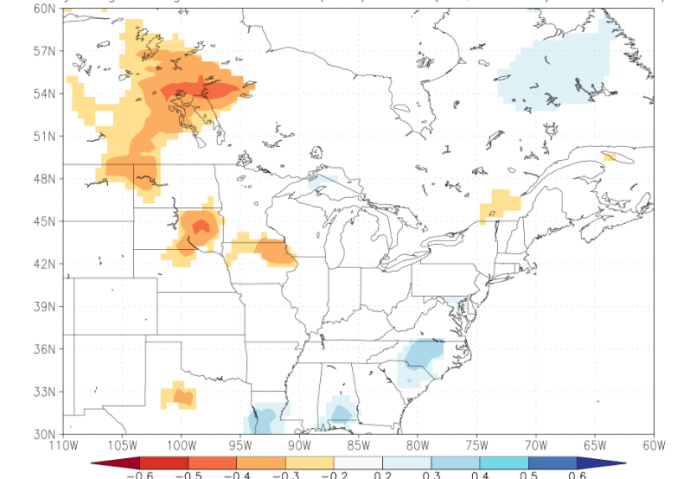
Temperature

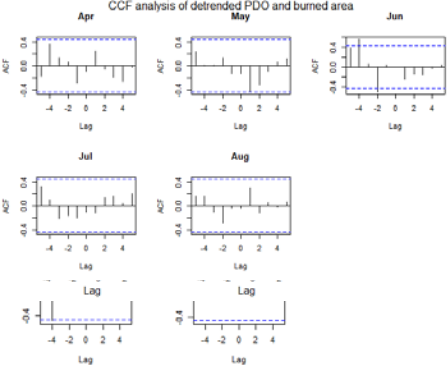
corr May-Aug averaged AMO hadsst
h May-Aug averaged CRU TS4.04 temperature (diff, detrend) 1951:2017 $p < 1$



Precipitation

corr May-Aug averaged AMO hadsst
 γ May-Aug averaged CRU TS4.04 precipitation (diff, detrend) 1951:2017 $p < 1$



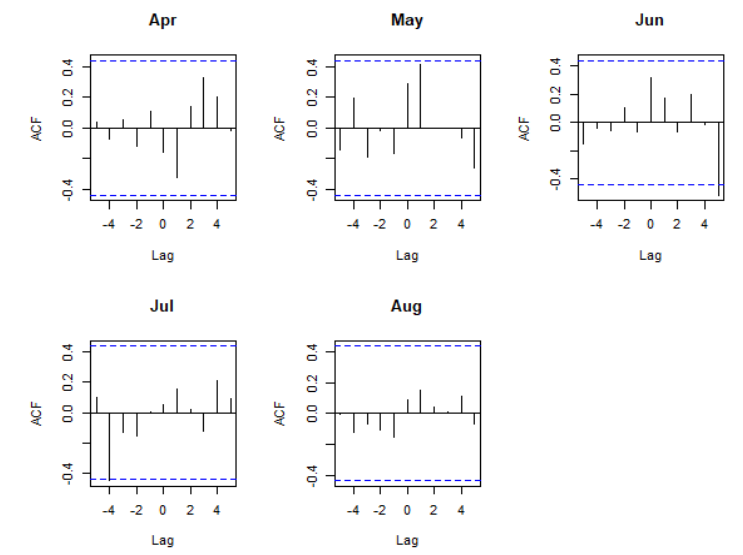
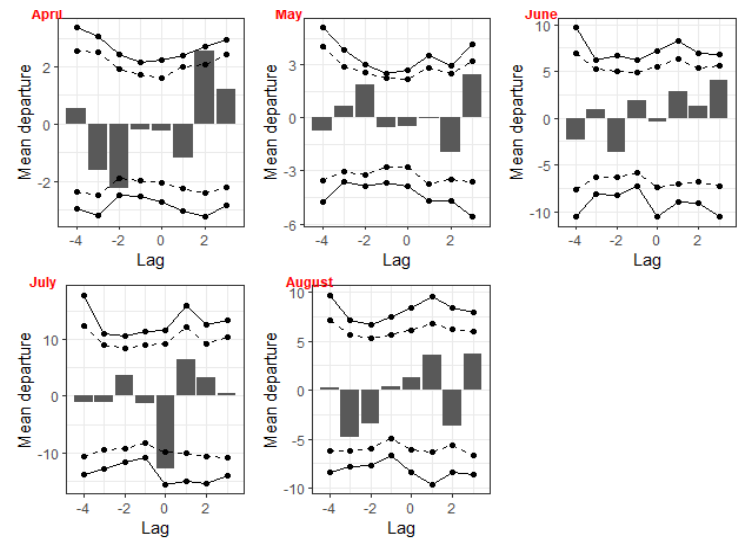
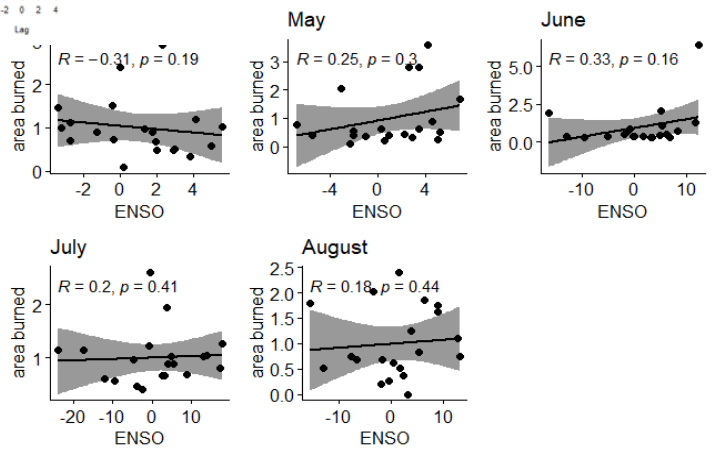


ear correlation

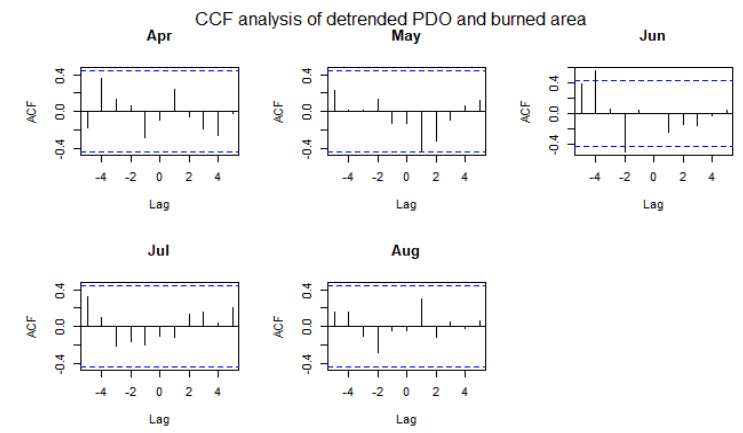
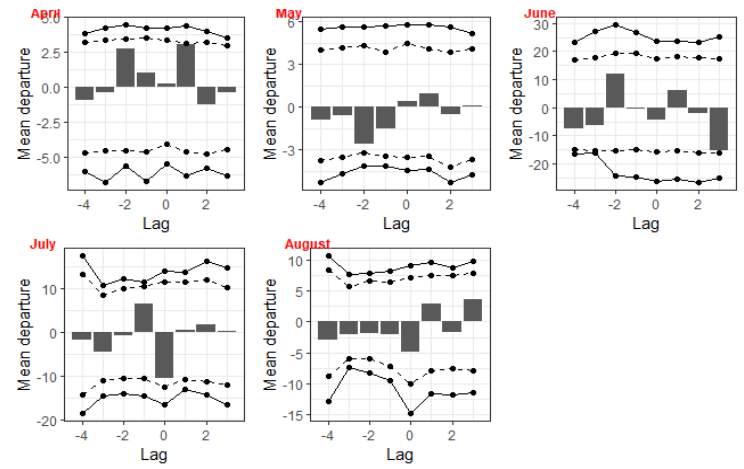
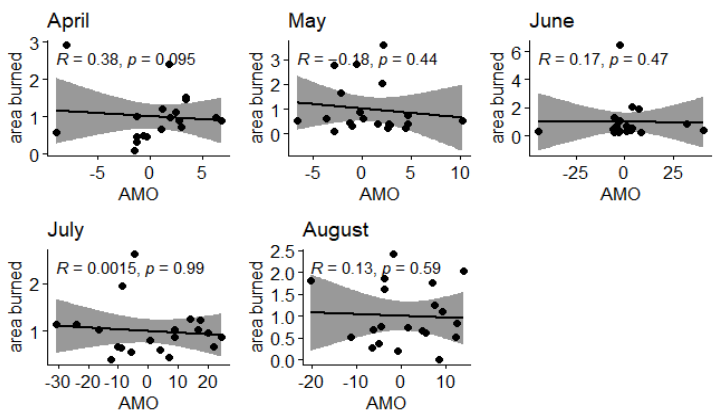
SEA

CCF

ENSO



PDO

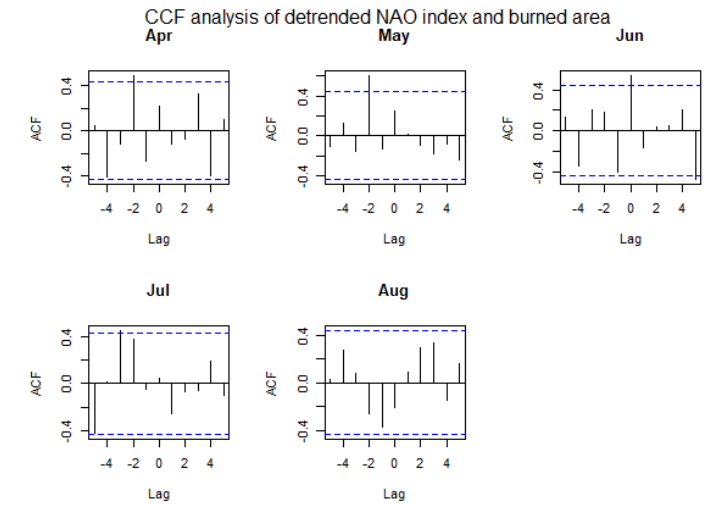
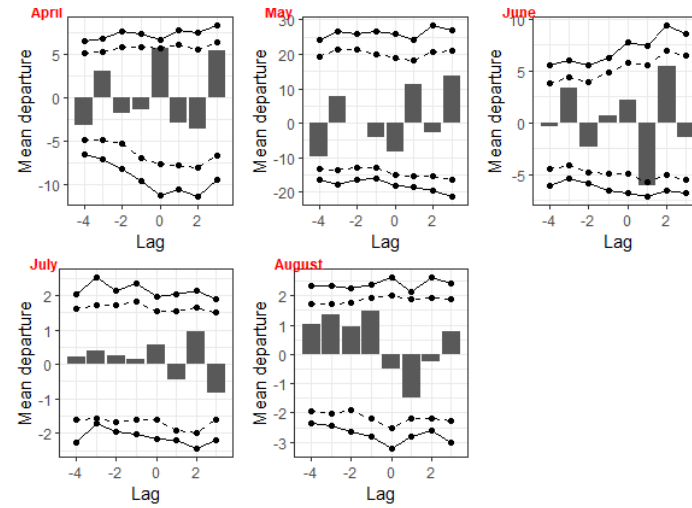
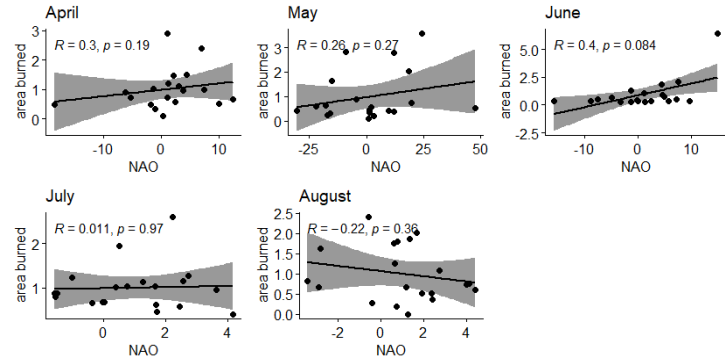


Linear correlation

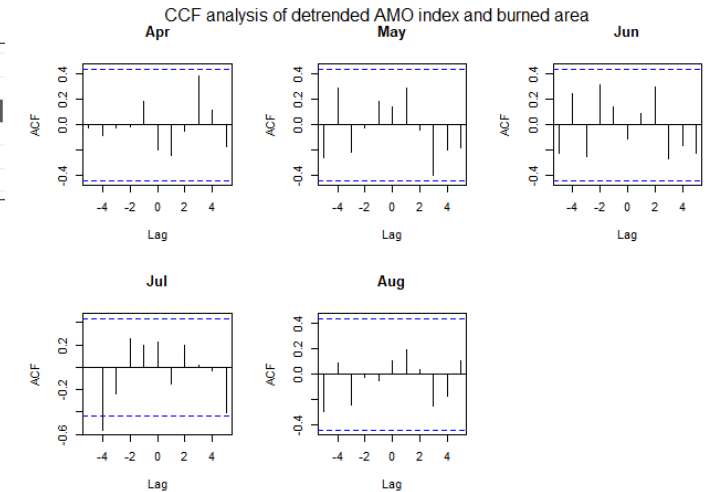
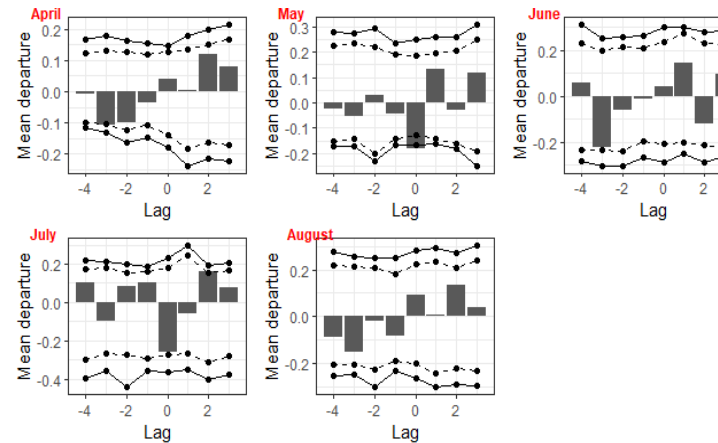
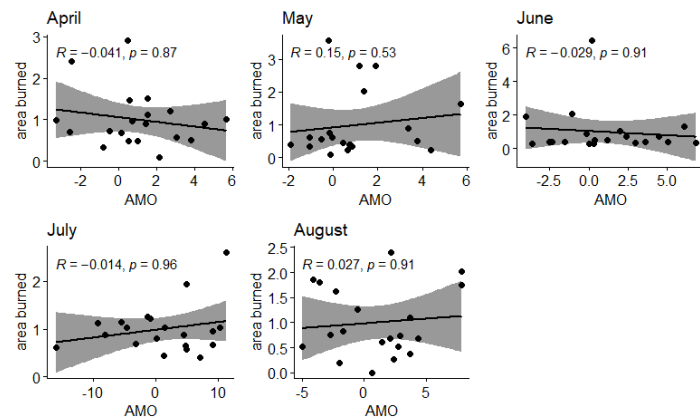
SEA

CCF

ENSO



PDO



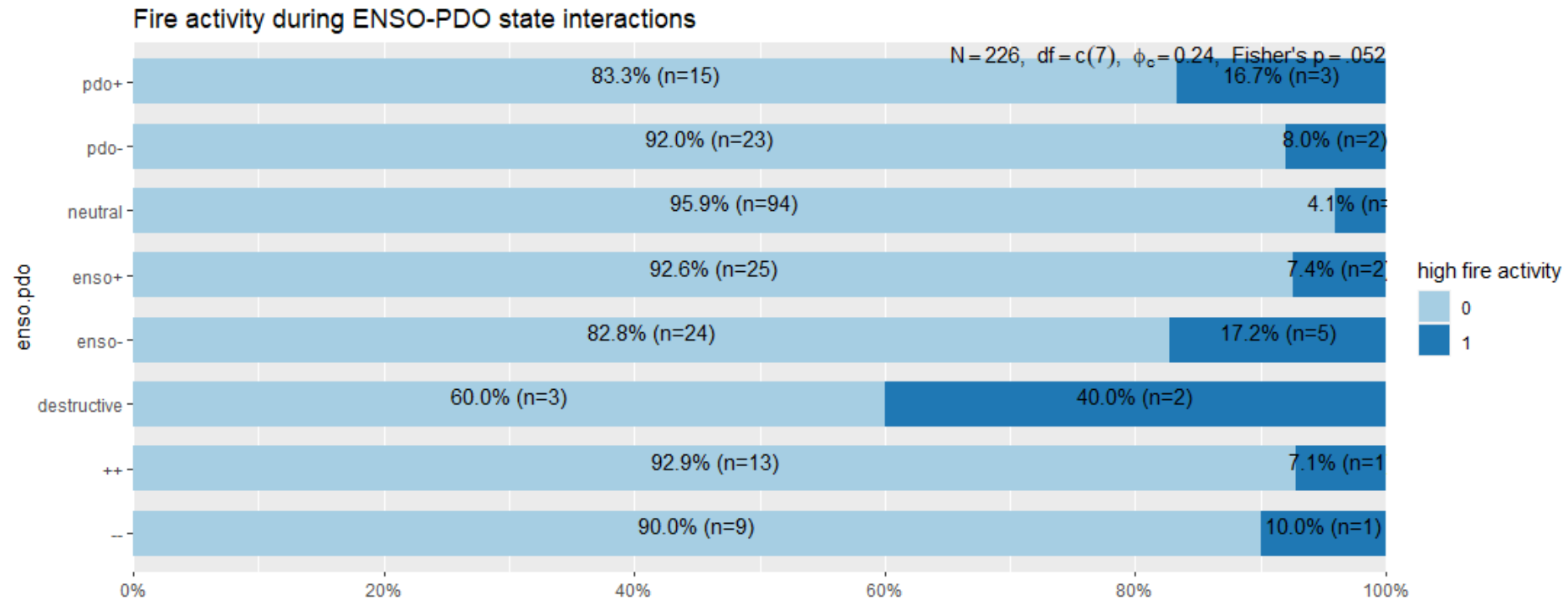


fire activity and ENSO-PDO interaction

climate state combinations	high fire activity		Total
	0	1	
--	9	1	10
	9	1	10
	90 %	10 %	100 %
++	13	1	14
	13	1	14
	92.9 %	7.1 %	100 %
destructive	3	2	5
	5	0	5
	60 %	40 %	100 %
enso-	24	5	29
	26	3	29
	82.8 %	17.2 %	100 %
enso+	25	2	27
	25	2	27
	92.6 %	7.4 %	100 %
neutral	94	4	98
	89	9	98
	95.9 %	4.1 %	100 %
pdo-	23	2	25
	23	2	25
	92 %	8 %	100 %
pdo+	15	3	18
	16	2	18
	83.3 %	16.7 %	100 %
Total	206	20	226
	206	20	226
	91.2 %	8.8 %	100 %

$\chi^2=12.831 \cdot df=7 \cdot \text{Cramer's } V=0.238 \cdot \text{Fisher's } p=0.049$

observed values
expected values
% within climate state combinations

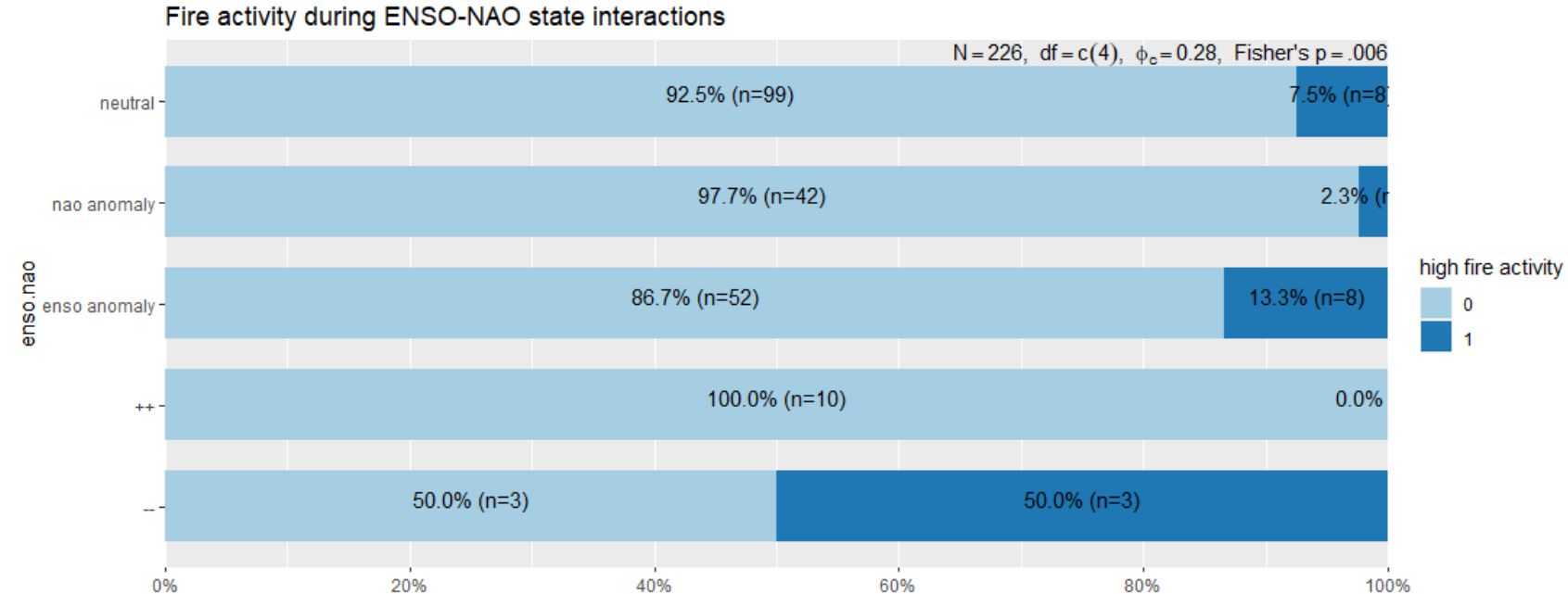


Les années d'activité de feu élevé sont celles où au moins 8 sites ont brûlé



fire activity and ENSO-NAO interaction

<i>climate state combinations</i>	<i>high fire activity</i>		<i>Total</i>
	0	1	
--	3	3	6
	5	1	6
	50 %	50 %	100 %
++	10	0	10
	9	1	10
	100 %	0 %	100 %
enso anomaly	52	8	60
	55	5	60
	86.7 %	13.3 %	100 %
nao anomaly	42	1	43
	39	4	43
	97.7 %	2.3 %	100 %
neutral	99	8	107
	98	9	107
	92.5 %	7.5 %	100 %
<i>Total</i>	206	20	226
	206	20	226
	91.2 %	8.8 %	100 %



$\chi^2 = 17.581 \cdot df = 4 \cdot \text{Cramer's } V = 0.279 \cdot \text{Fisher's } p = 0.006$

observed values

expected values

% within climate state combinations



États positifs ou négatifs utilisant la moyenne		Anomalie positives, anomalie négatives ou états neutres utilisant la écart-type		Anomalies positives, anomalies négatives ou états neutres en utilisant 20% -60% -20%	
ENSO+	PDO-	ENSO-	PDO neutral	ENSO-	PDO neutral
ENSO+	PDO+	ENSO-	PDO +	ENSO-	PDO+
ENSO+	AMO-	ENSO-	AMO neutral	ENSO-	NAO neutral
ENSO+	AMO+	PDO-	NAO neutral	ENSO-	NAO+
NAO+	AMO-	PDO-	AMO neutral	ENSO-	AMO-
NAO+	AMO+	NAO-	AMO neutral	ENSO-	AMO neutral
				ENSO-	AMO+
				PDO-	NAO neutral
				PDO-	AMO-
				PDO-	AMO neutral



À suivre...

Merci beaucoup!