

# Results for MSc Thesis

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## 1 Introduction

This document will consist of every result produced for my thesis, categorised and labelled correctly.

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## 2 Time series

### 2.1 Nimbus-7 seaice timeseries

Below are the mean SIC time series for seaice in Antarctica. All of these are produced from the NSIDC dataset with different variations of post-processing.

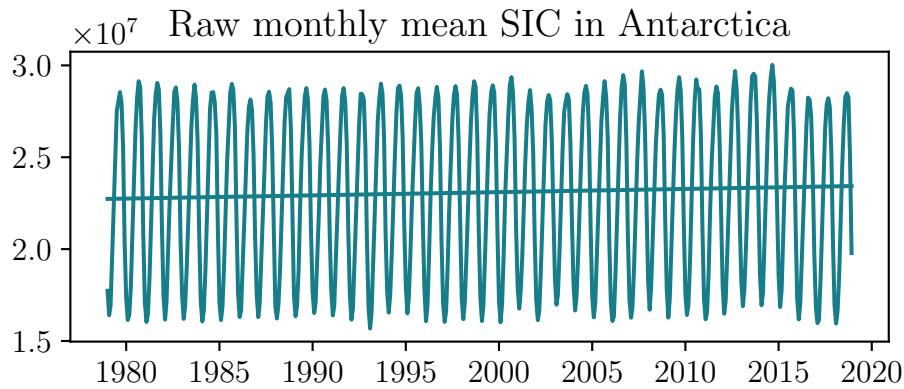


Figure 1: Mean raw monthly raw SIC in Antarctica from the NSIDC dataset.

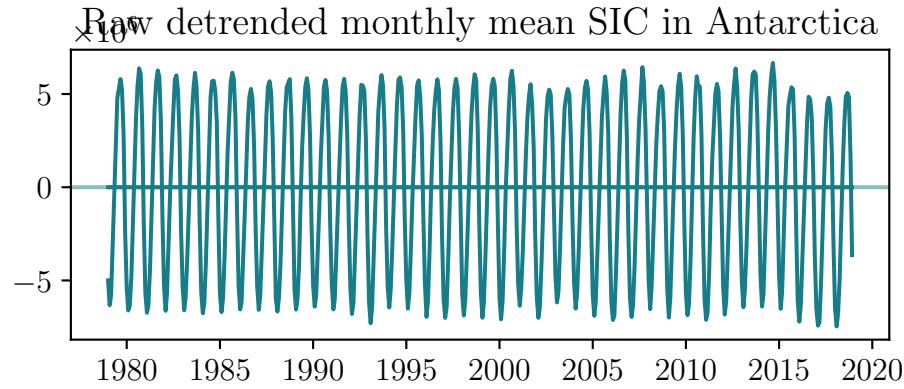


Figure 2: Mean raw monthly detrended SIC in Antarctica from the NSIDC dataset.

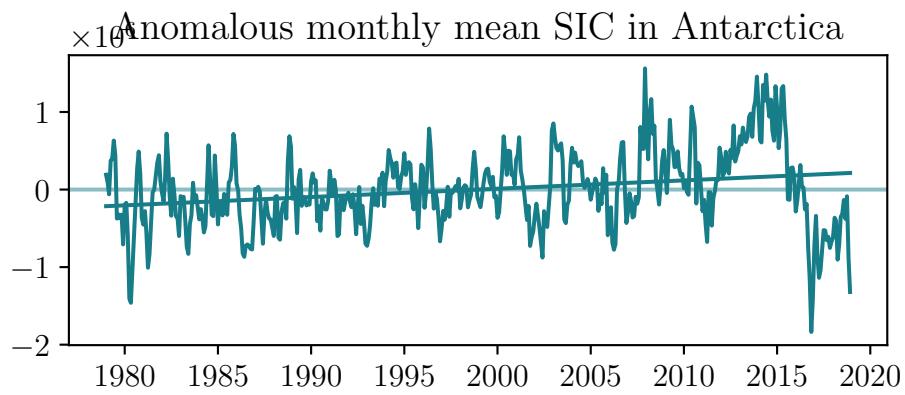


Figure 3: Mean anomalous monthly raw SIC in Antarctica from the NSIDC dataset.

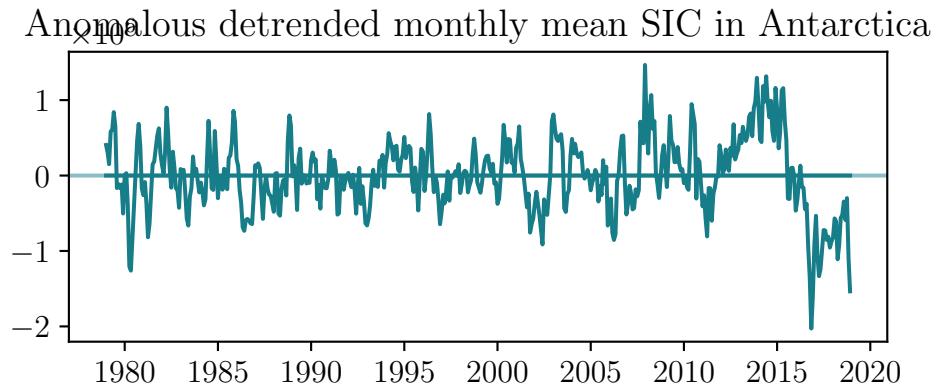


Figure 4: Mean anomalous monthly detrended SIC in Antarctica from the NSIDC dataset.

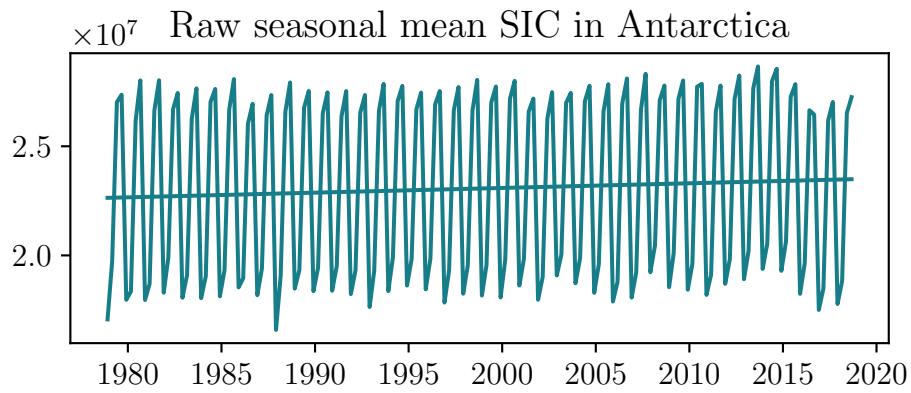


Figure 5: Mean raw seasonal raw SIC in Antarctica from the NSIDC dataset.

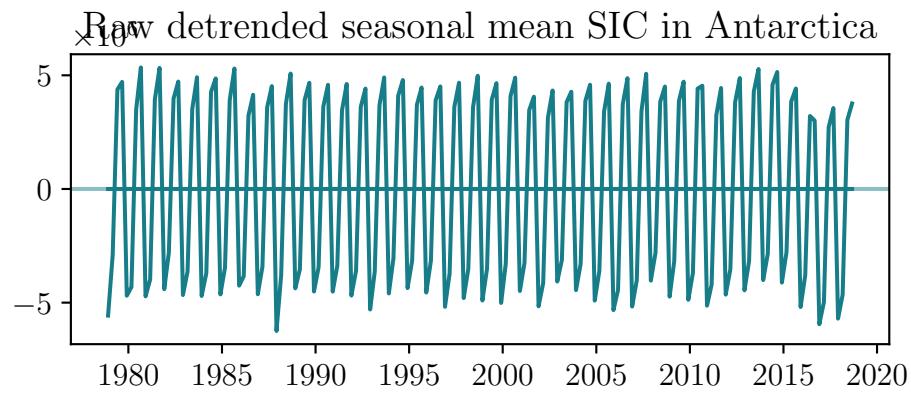


Figure 6: Mean raw seasonal detrended SIC in Antarctica from the NSIDC dataset.

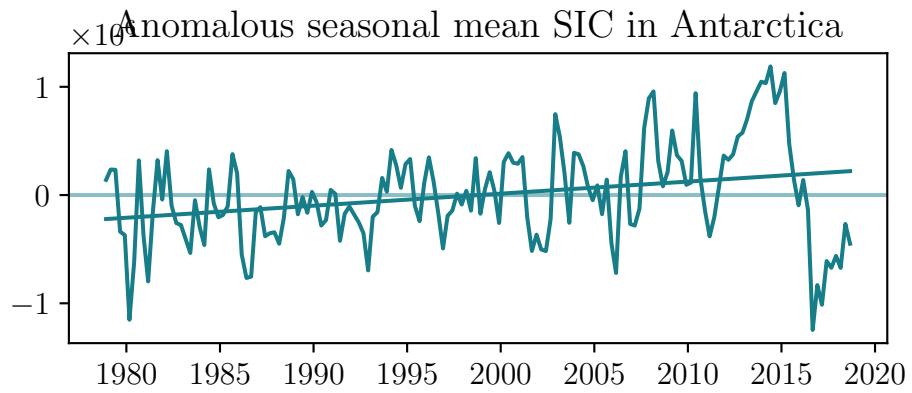


Figure 7: Mean anomalous seasonal raw SIC in Antarctica from the NSIDC dataset.

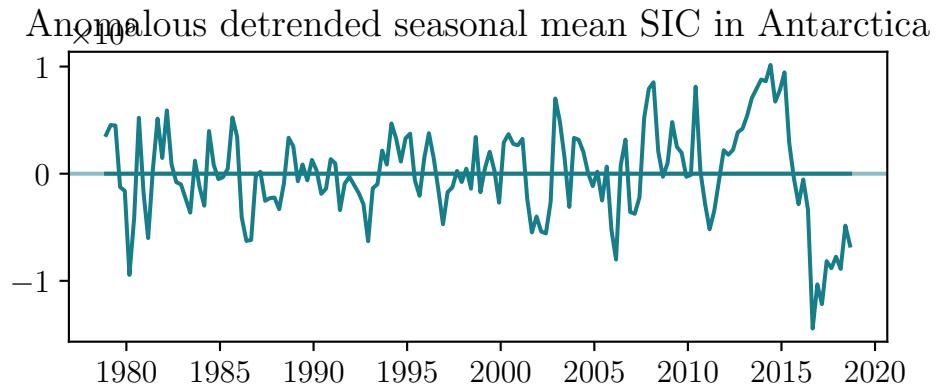


Figure 8: Mean anomalous seasonal detrended SIC in Antarctica from the NSIDC dataset.

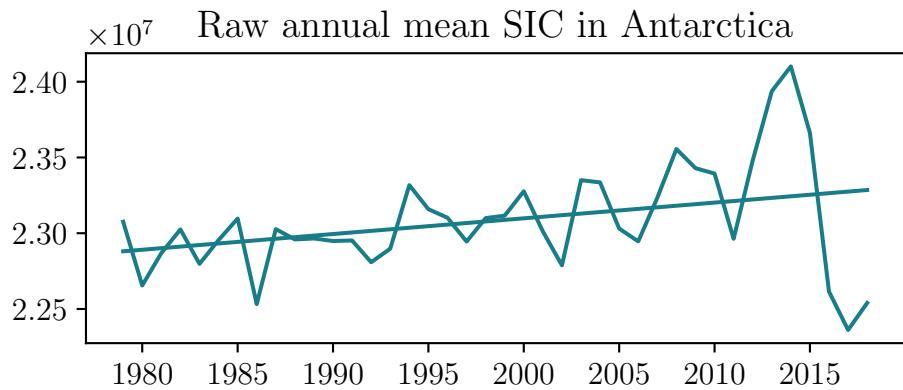


Figure 9: Mean raw annual raw SIC in Antarctica from the NSIDC dataset.

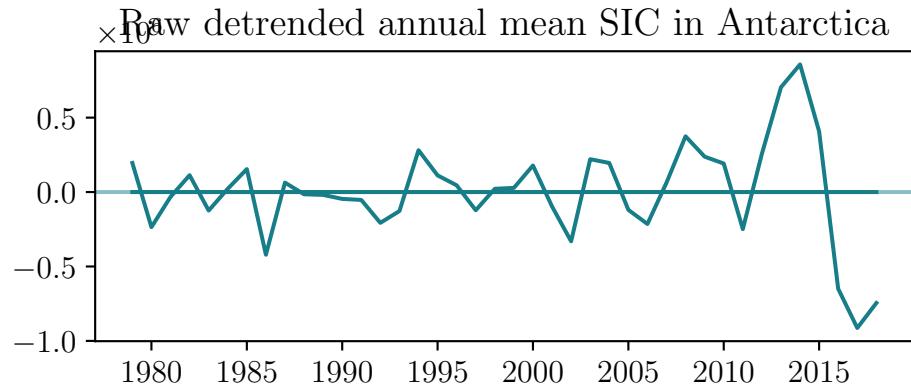


Figure 10: Mean raw annual detrended SIC in Antarctica from the NSIDC dataset.

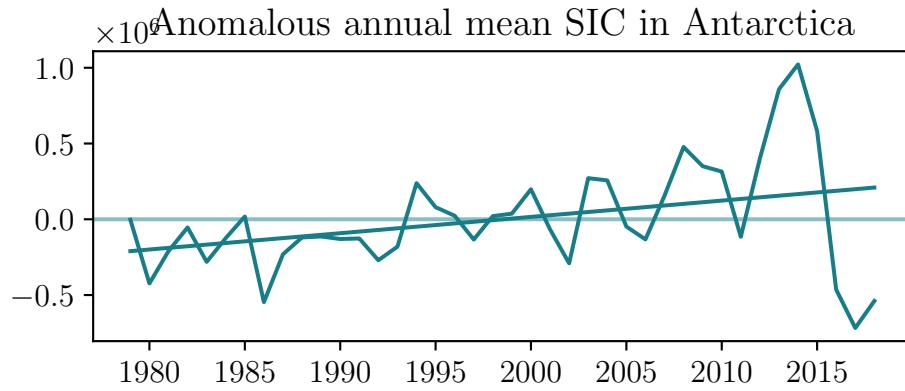


Figure 11: Mean anomalous annual raw SIC in Antarctica from the NSIDC dataset.

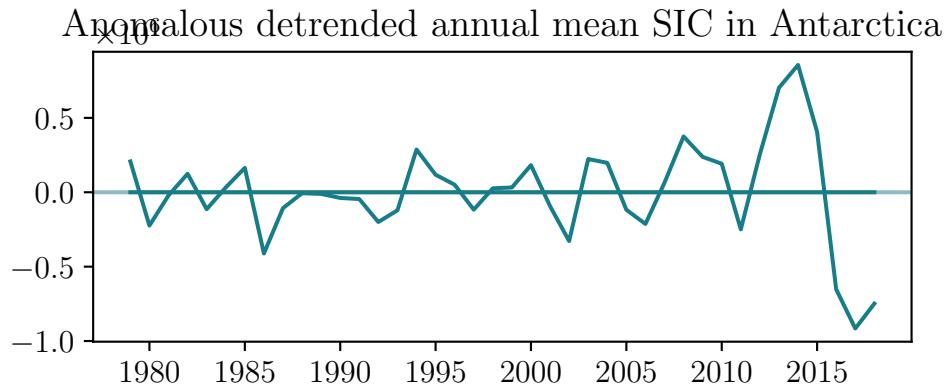


Figure 12: Mean anomalous annual detrended SIC in Antarctica from the NSIDC dataset.

## 2.2 ERA5 seaice timeseries

Below are the mean SIC time series for seaice in Antarctica. All of these are produced from the ECMWF ERA5 dataset with different variations of post-processing.

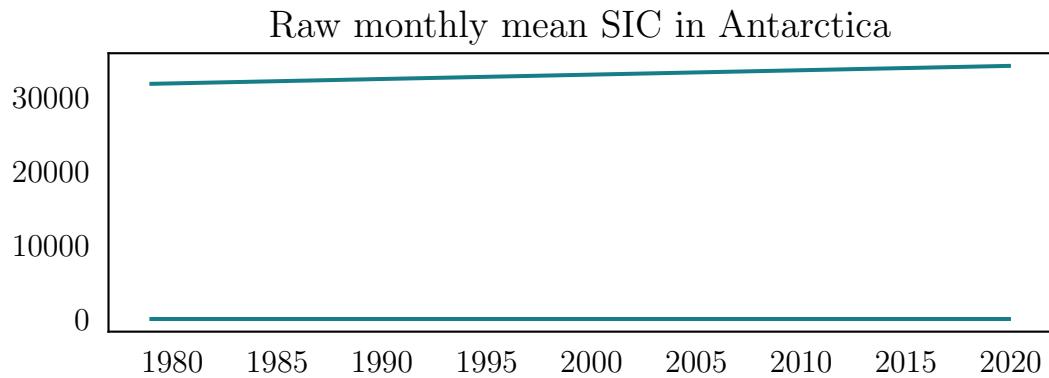


Figure 13: Mean raw monthly raw SIC in Antarctica from the ECMWF ERA5 dataset.

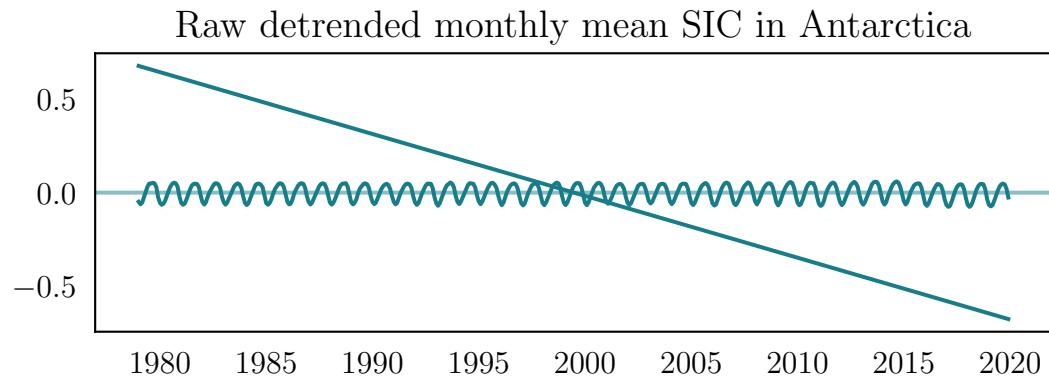


Figure 14: Mean raw monthly detrended SIC in Antarctica from the ECMWF ERA5 dataset.

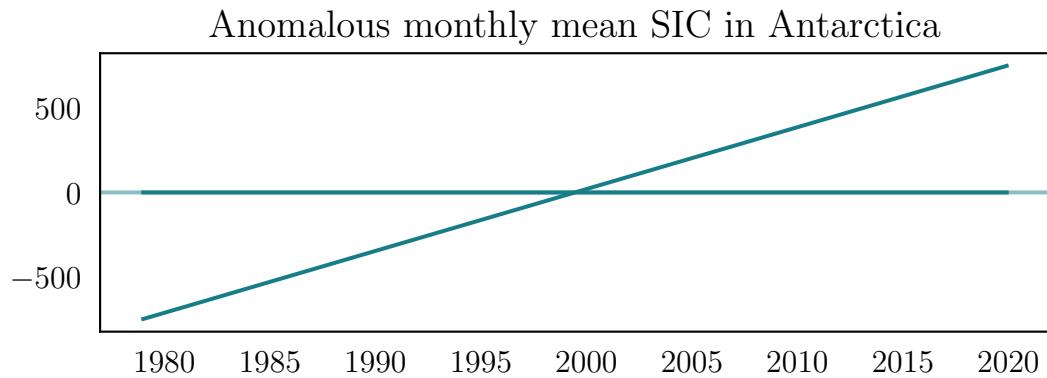


Figure 15: Mean anomalous monthly raw SIC in Antarctica from the ECMWF ERA5 dataset.

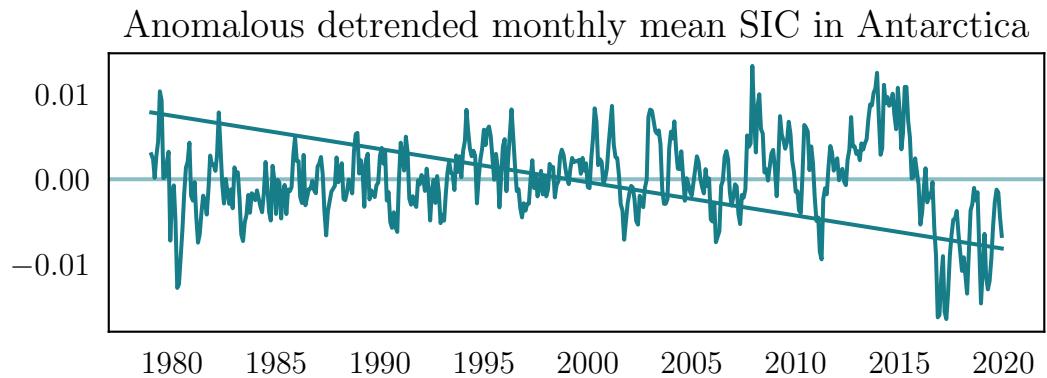


Figure 16: Mean anomalous monthly detrended SIC in Antarctica from the ECMWF ERA5 dataset.

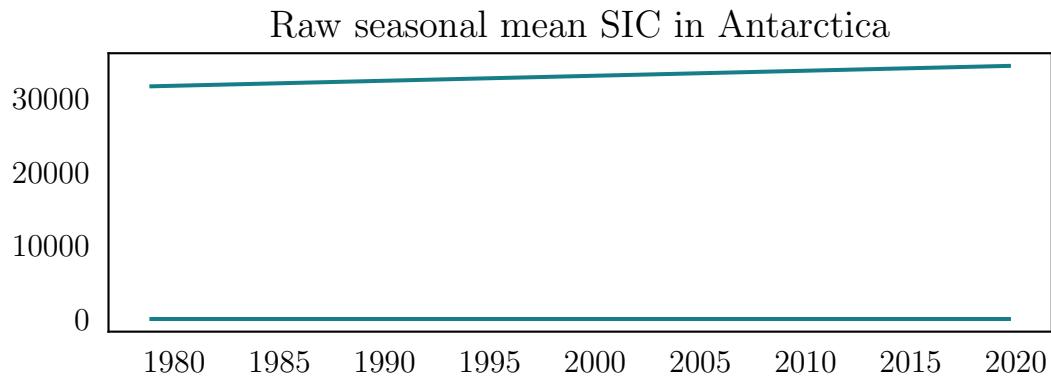


Figure 17: Mean raw seasonal raw SIC in Antarctica from the ECMWF ERA5 dataset.

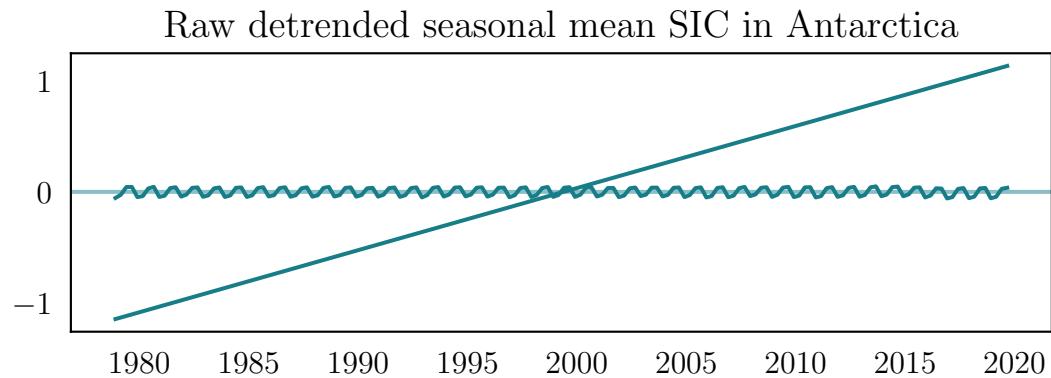


Figure 18: Mean raw seasonal detrended SIC in Antarctica from the ECMWF ERA5 dataset.

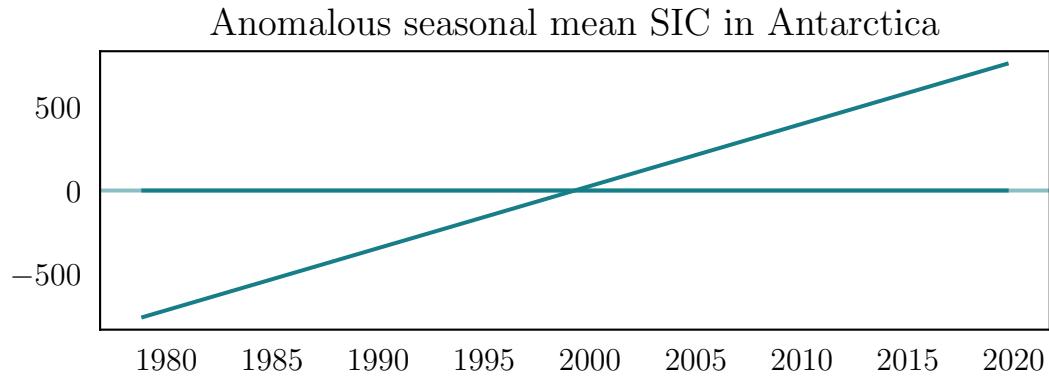


Figure 19: Mean anomalous seasonal raw SIC in Antarctica from the ECMWF ERA5 dataset.

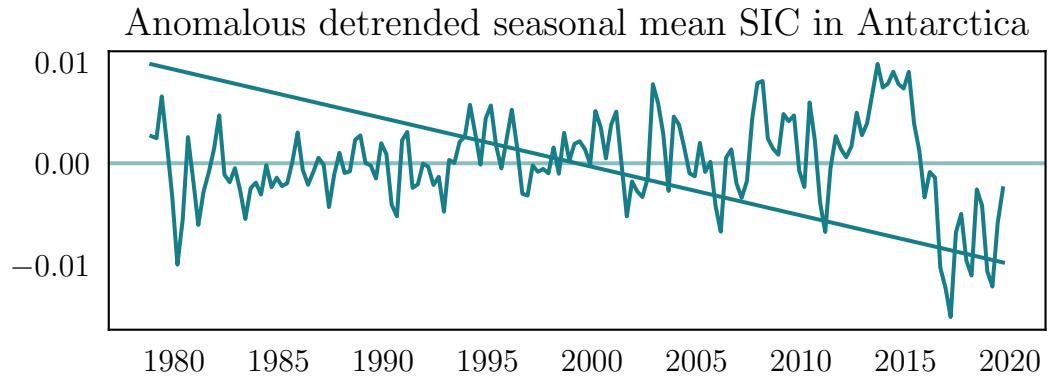


Figure 20: Mean anomalous seasonal detrended SIC in Antarctica from the ECMWF ERA5 dataset.

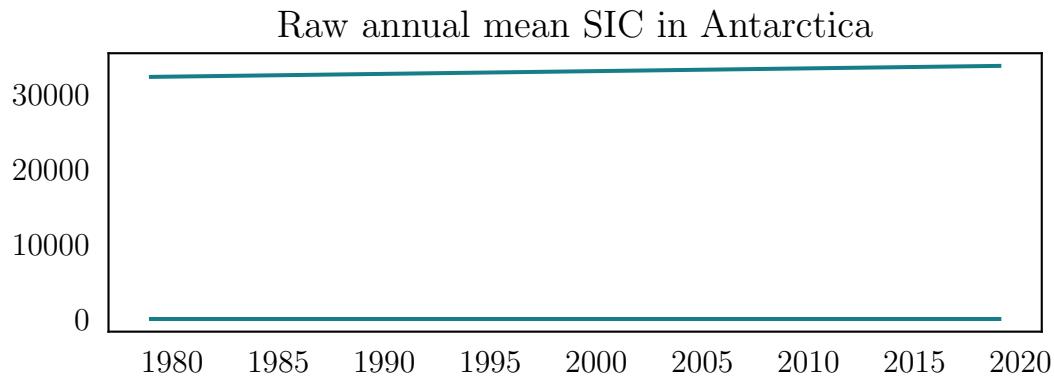


Figure 21: Mean raw annual raw SIC in Antarctica from the ECMWF ERA5 dataset.

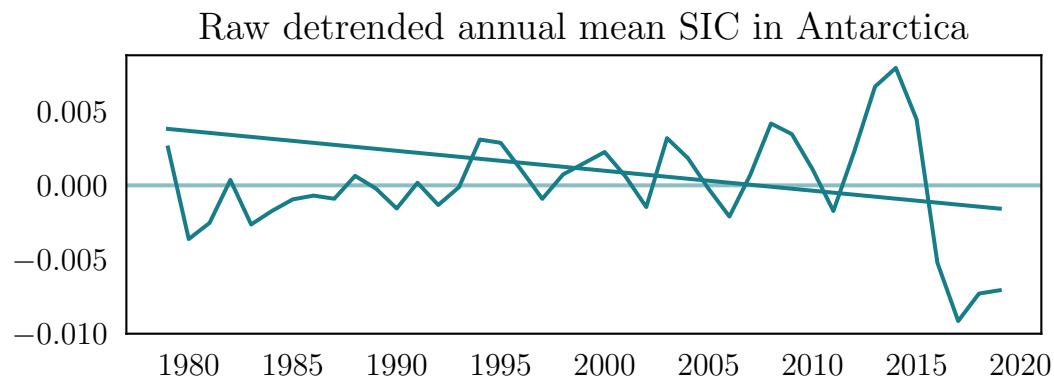


Figure 22: Mean raw annual detrended SIC in Antarctica from the ECMWF ERA5 dataset.

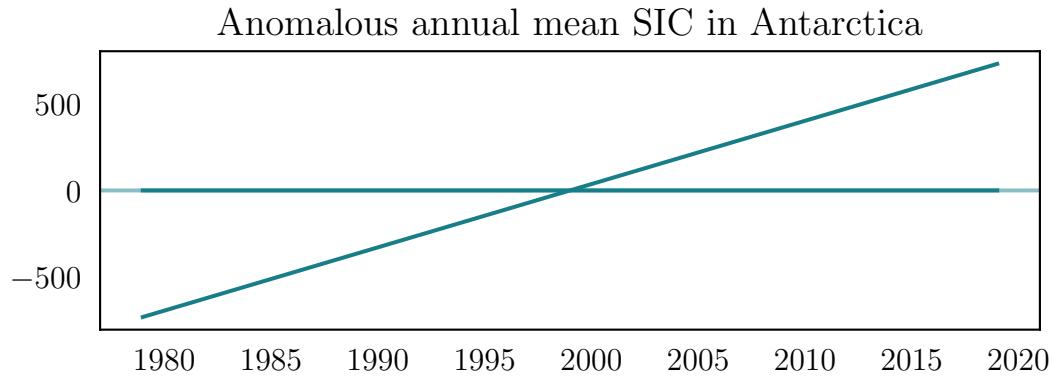


Figure 23: Mean anomalous annual raw SIC in Antarctica from the ECMWF ERA5 dataset.

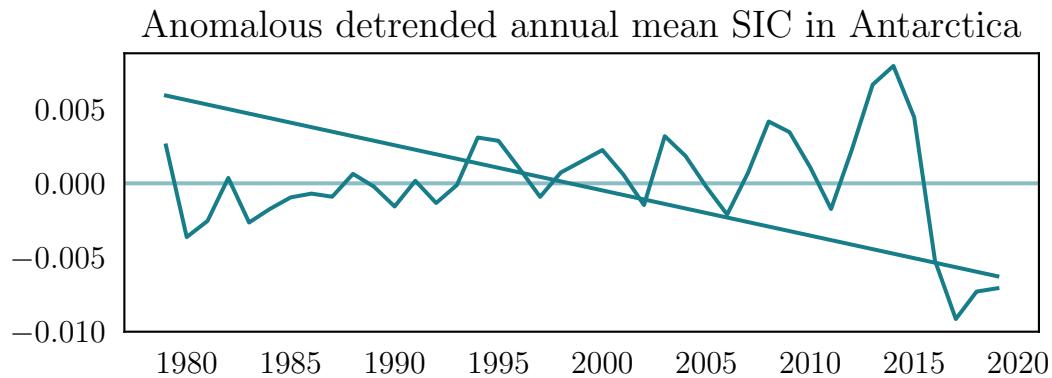


Figure 24: Mean anomalous annual detrended SIC in Antarctica from the ECMWF ERA5 dataset.

### 2.3 Comparison of datasets

We can plot these time series together to look at how similar they are.

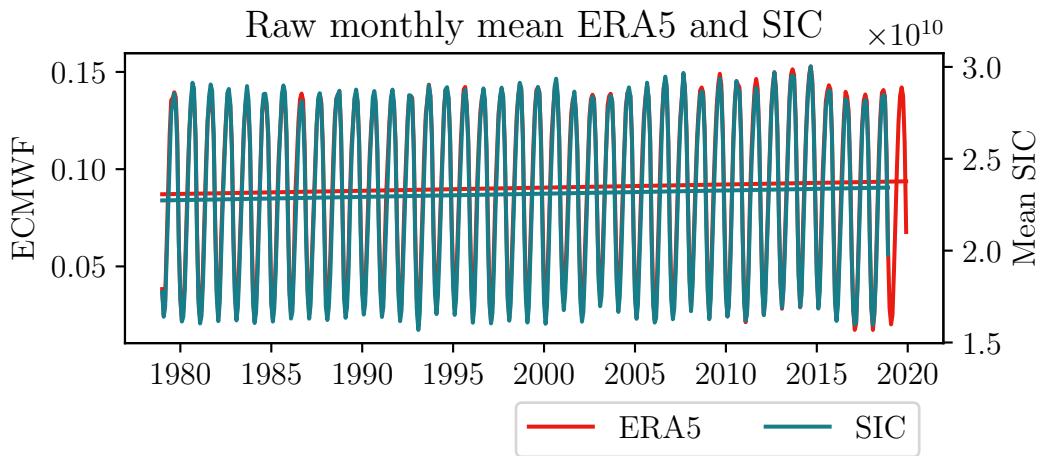


Figure 25: Comparison of mean raw monthly raw SIC in Antarctica datasets.

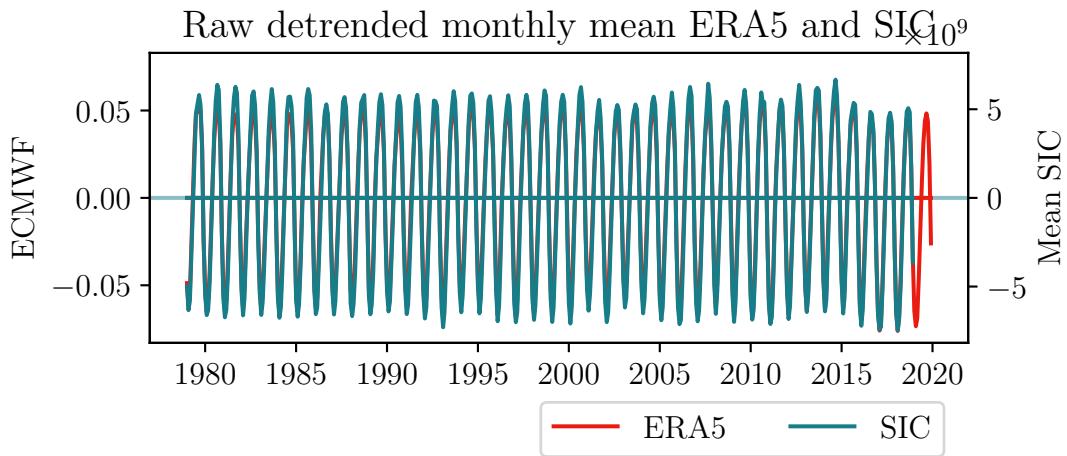


Figure 26: Comparison of mean raw monthly detrended SIC in Antarctica datasets.

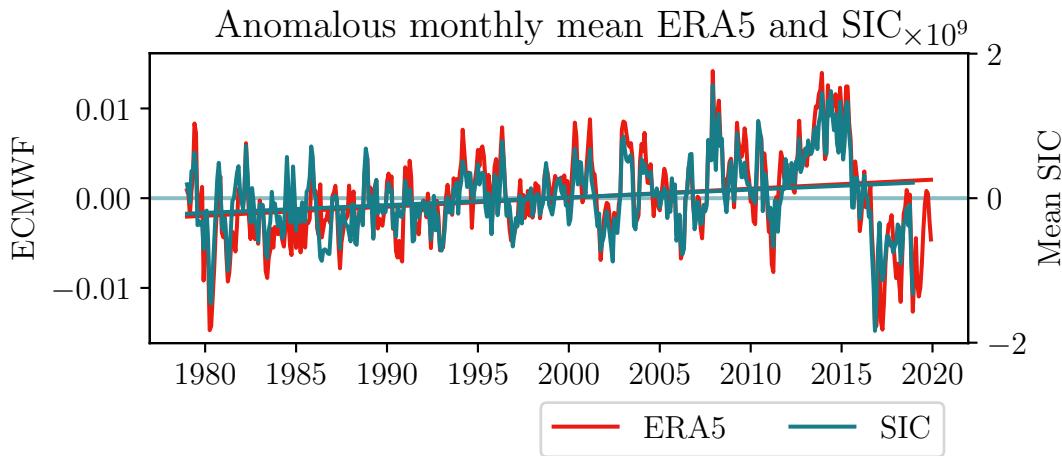


Figure 27: Comparison of mean anomalous monthly raw SIC in Antarctica datasets.

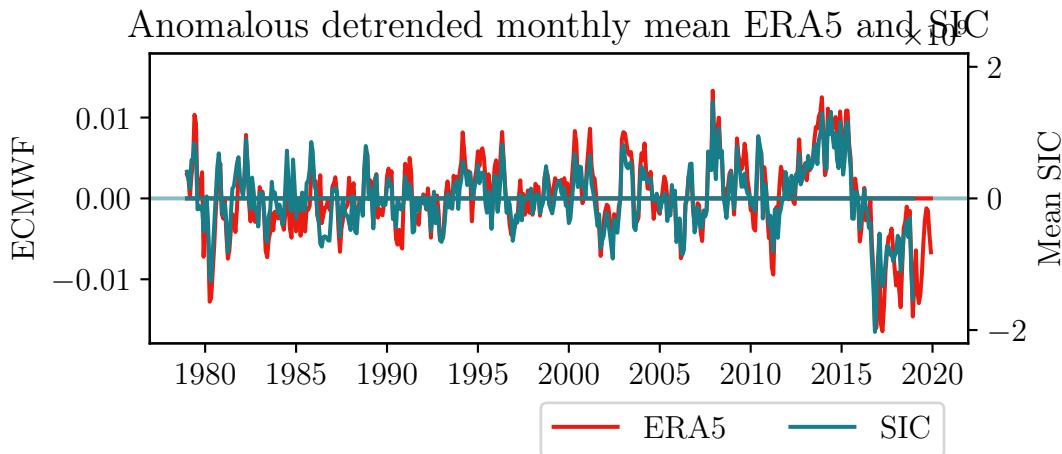


Figure 28: Comparison of mean anomalous monthly detrended SIC in Antarctica datasets.

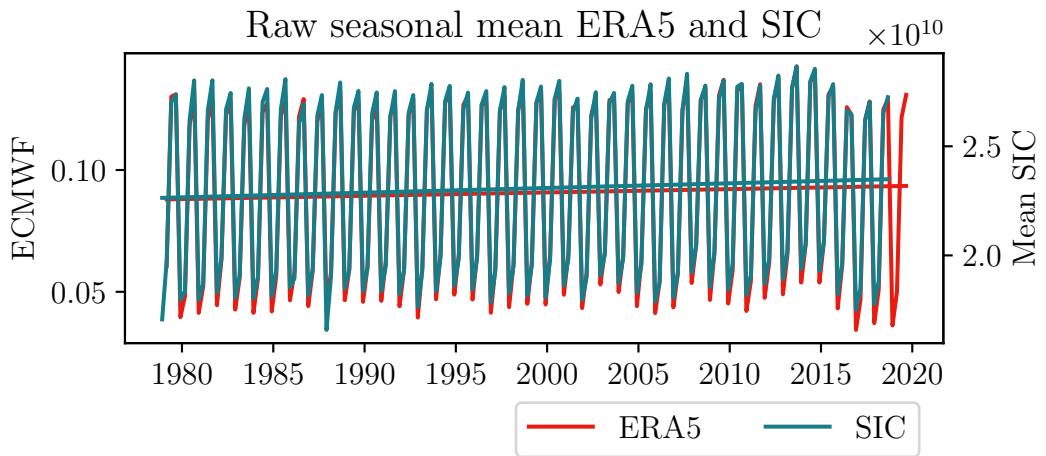


Figure 29: Comparison of mean raw seasonal raw SIC in Antarctica datasets.

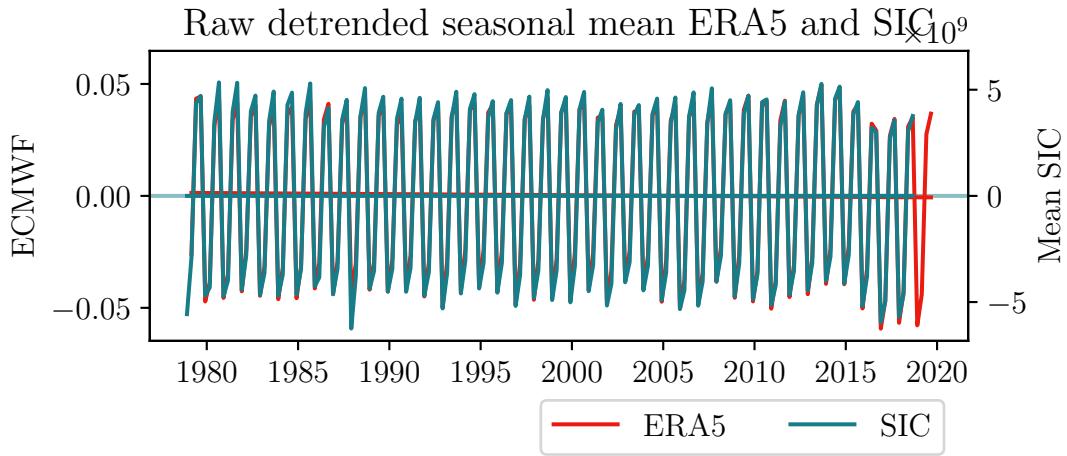


Figure 30: Comparison of mean raw seasonal detrended SIC in Antarctica datasets.

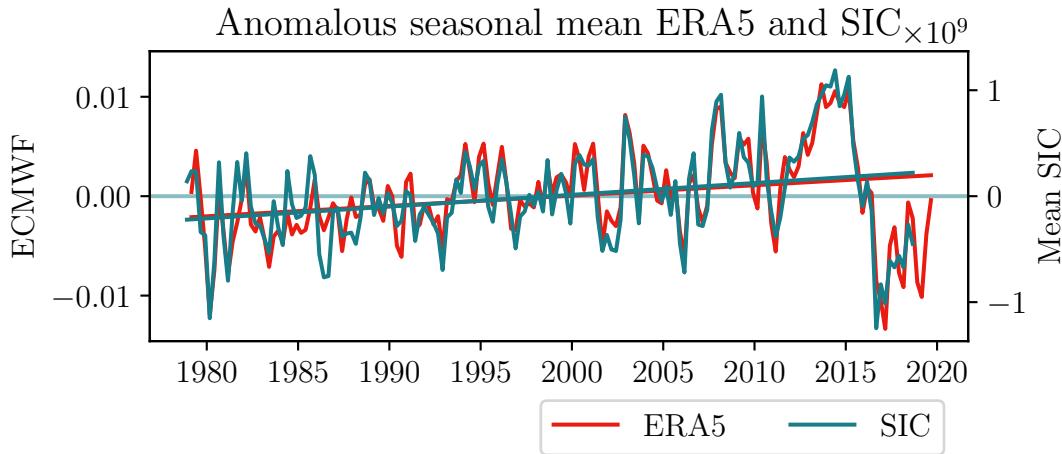


Figure 31: Comparison of mean anomalous seasonal raw SIC in Antarctica datasets.

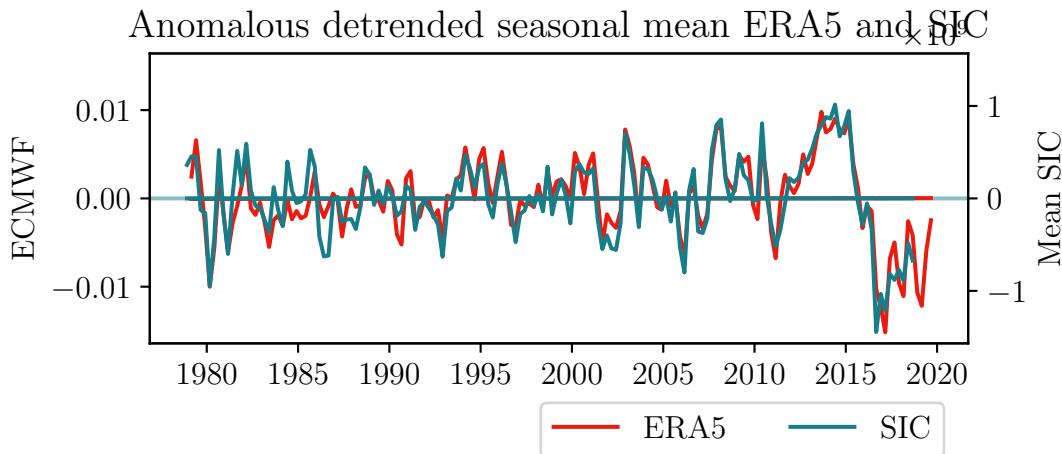


Figure 32: Comparison of mean anomalous seasonal detrended SIC in Antarctica datasets.

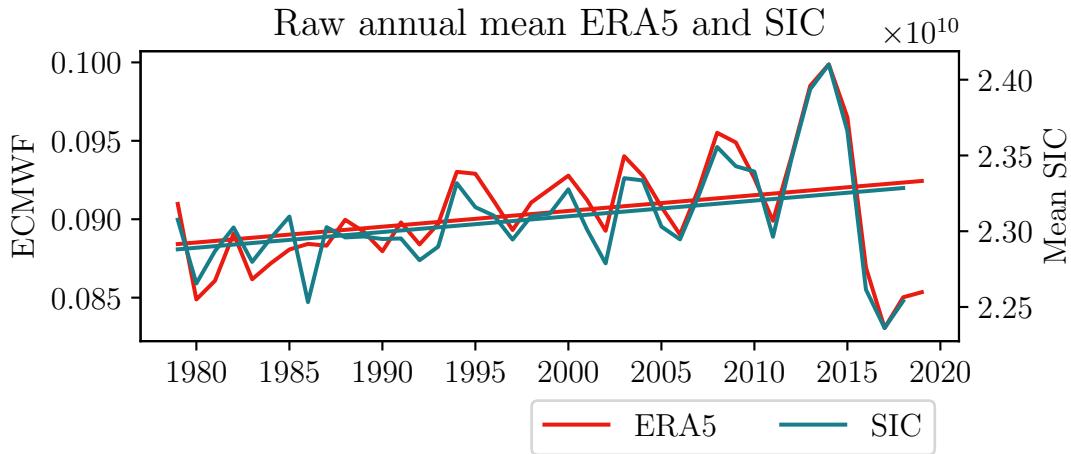


Figure 33: Comparison of mean raw annual raw SIC in Antarctica datasets.

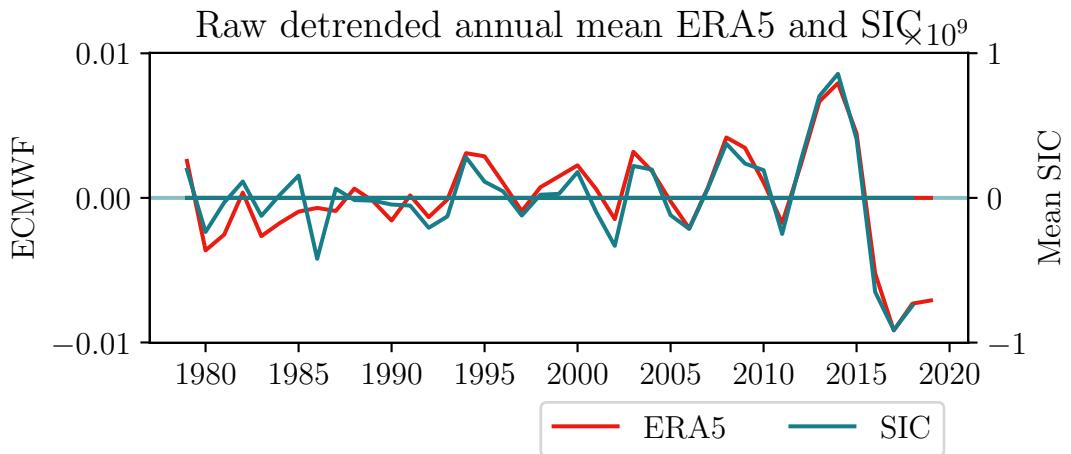


Figure 34: Comparison of mean raw annual detrended SIC in Antarctica datasets.

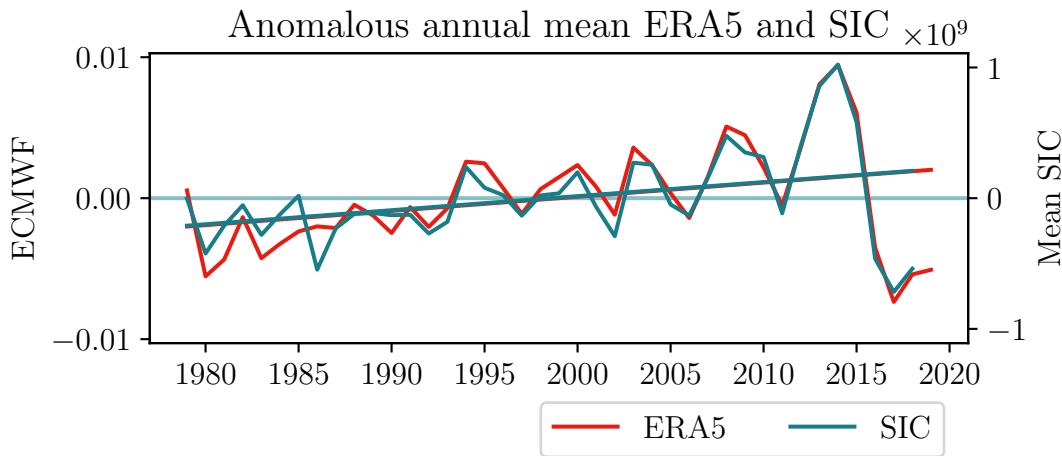


Figure 35: Comparison of mean anomalous annual raw SIC in Antarctica datasets.

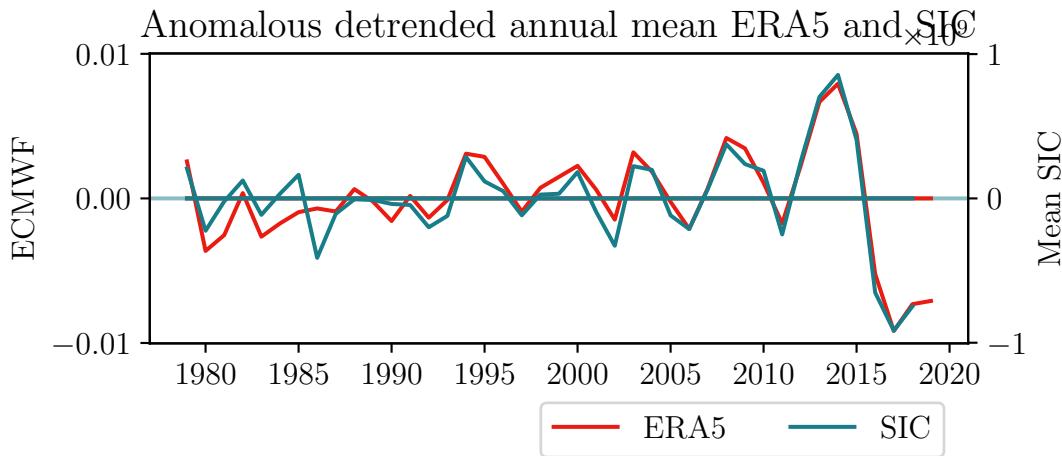
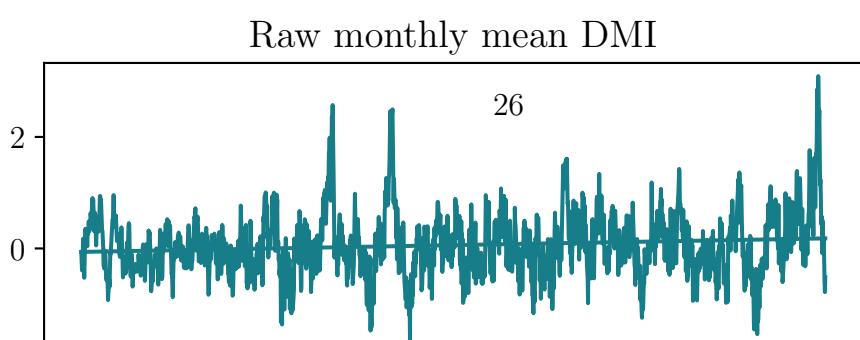
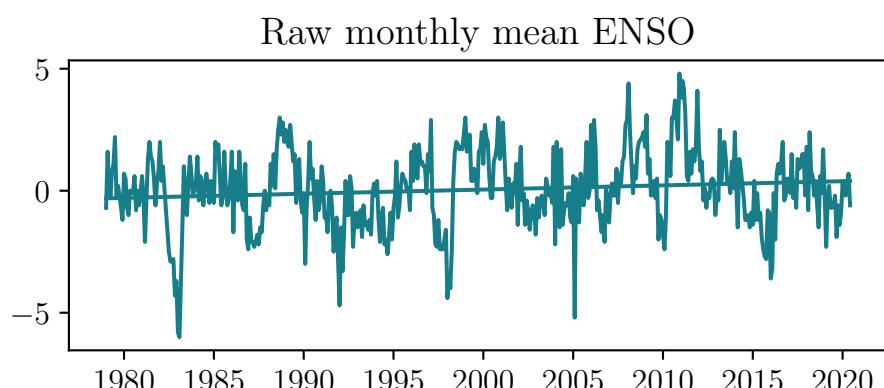
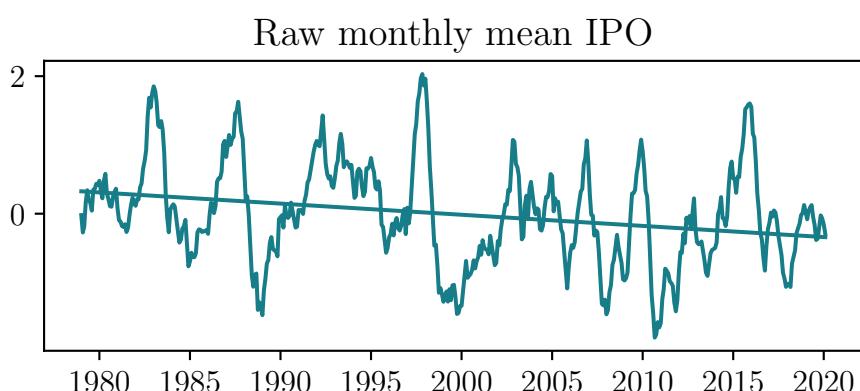
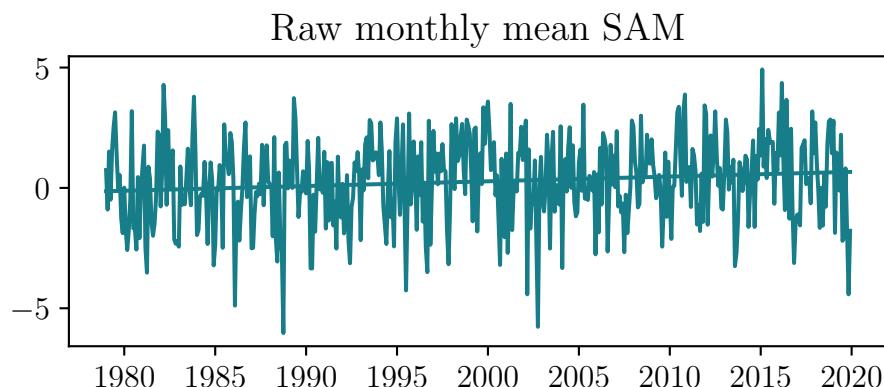


Figure 36: Comparison of mean anomalous annual detrended SIC in Antarctica datasets.



### 3 Indices and SIC

#### 3.1 Index time series



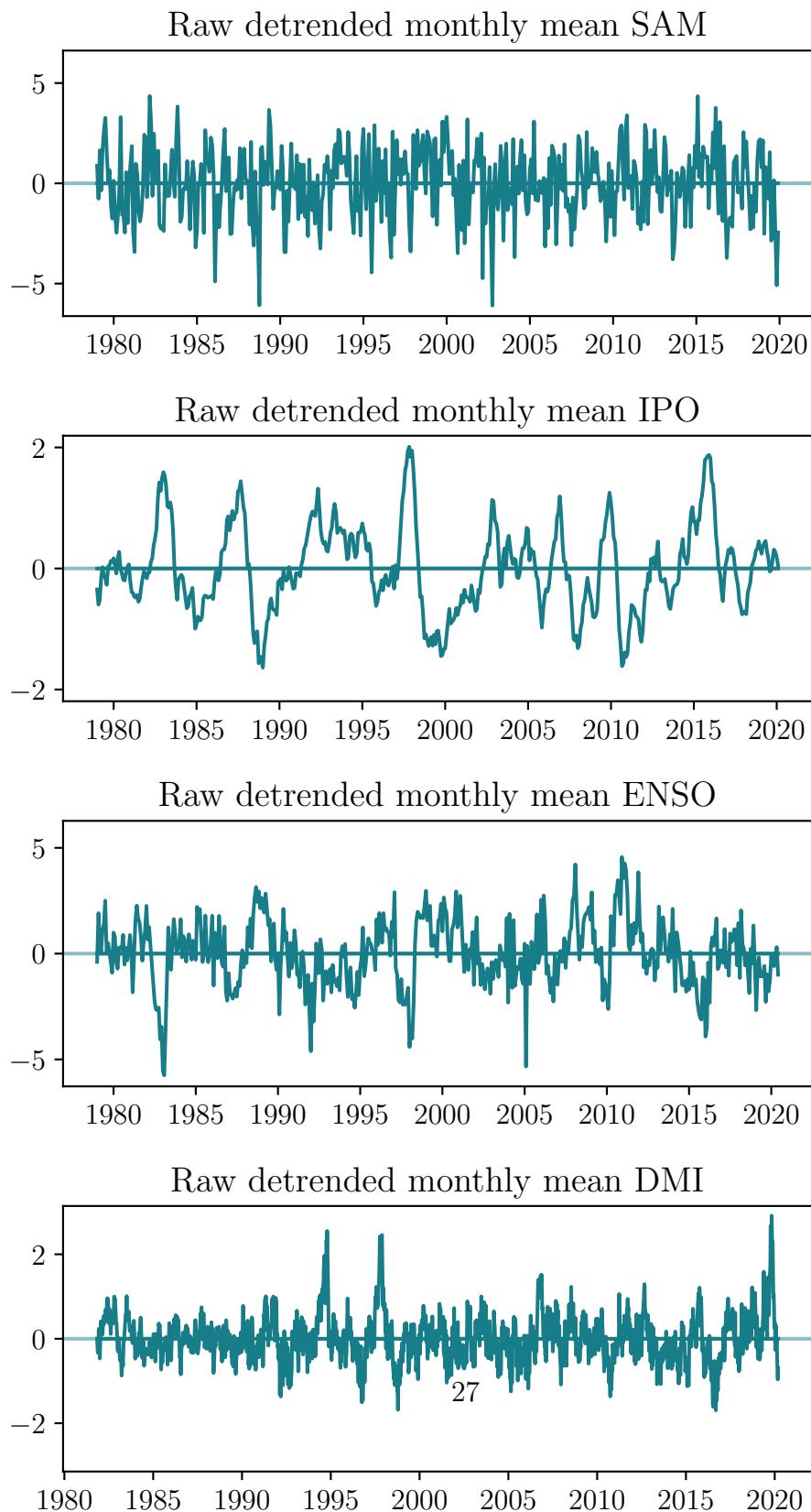


Figure 38: raw monthly detrended index values

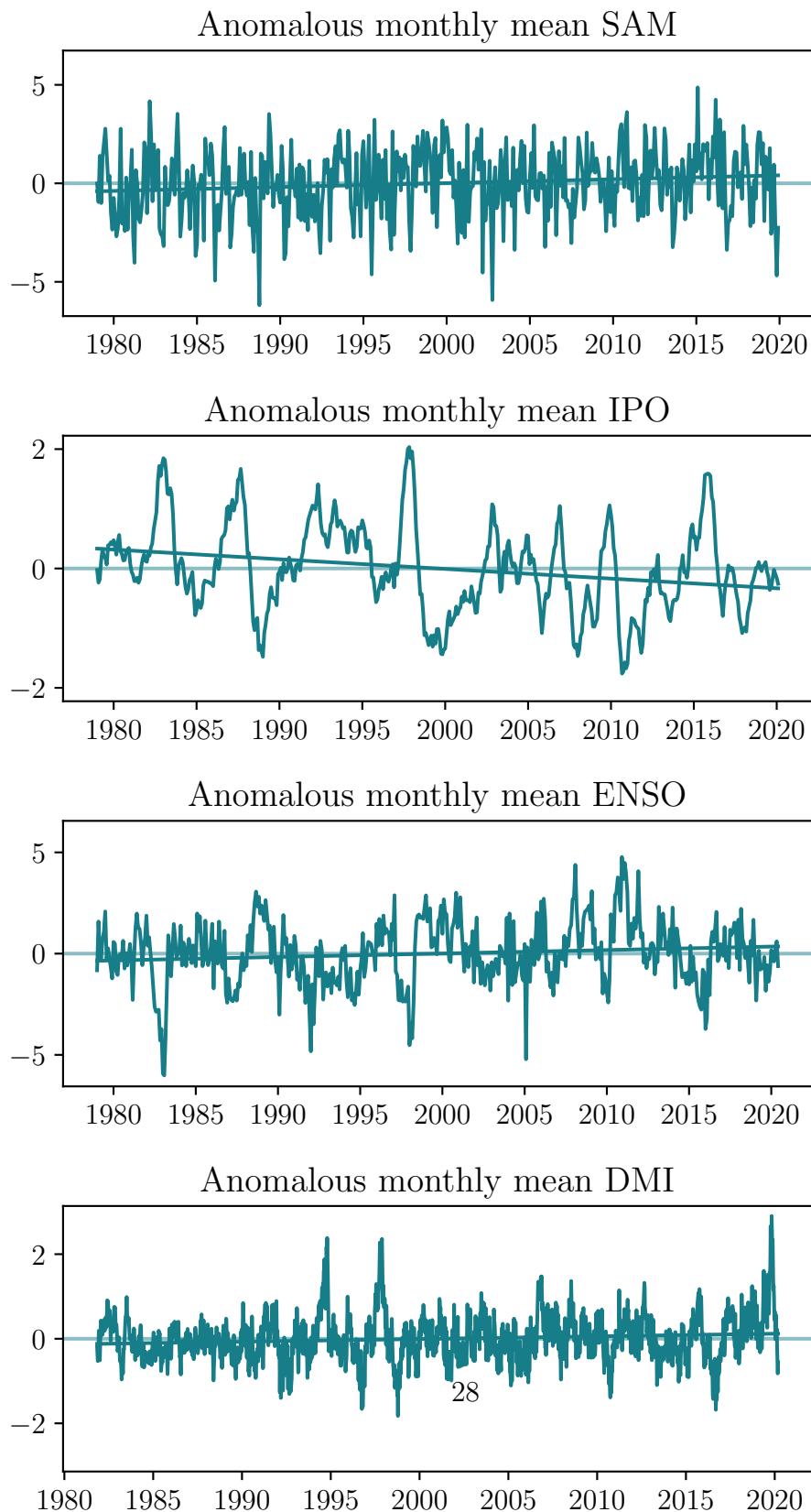


Figure 39: anomalous monthly raw index values

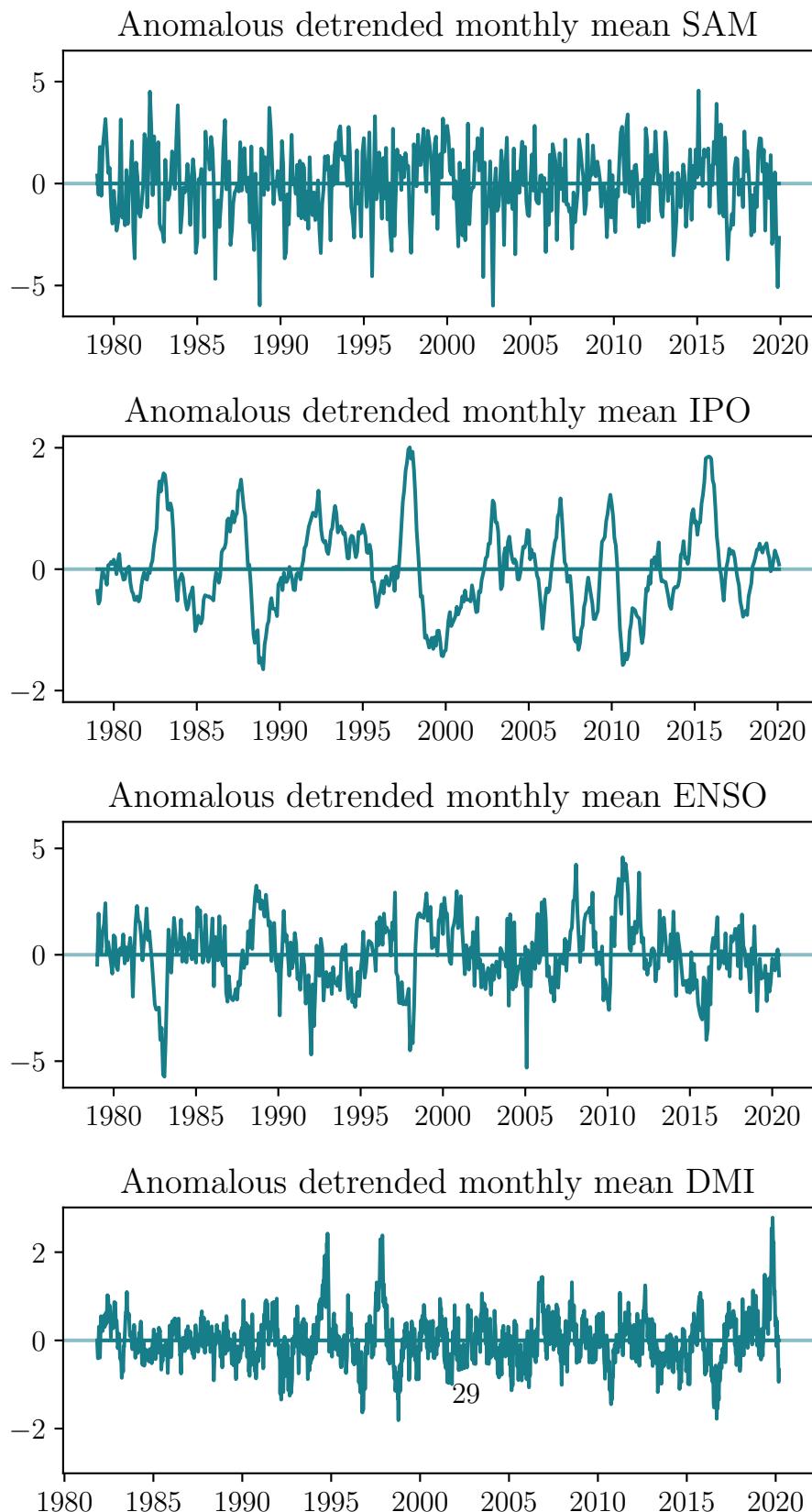


Figure 40: anomalous monthly detrended index values

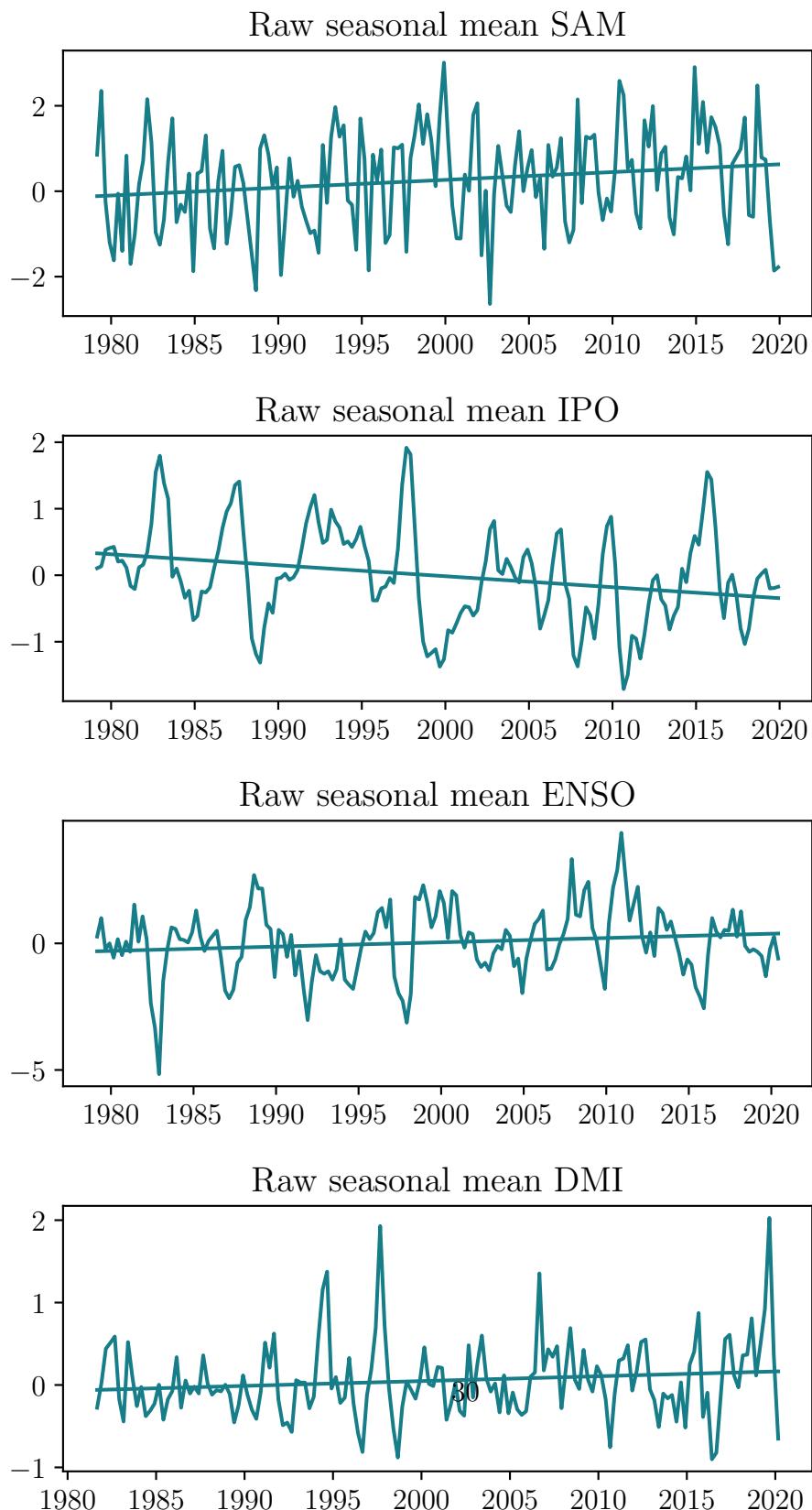


Figure 41: raw seasonal raw index values

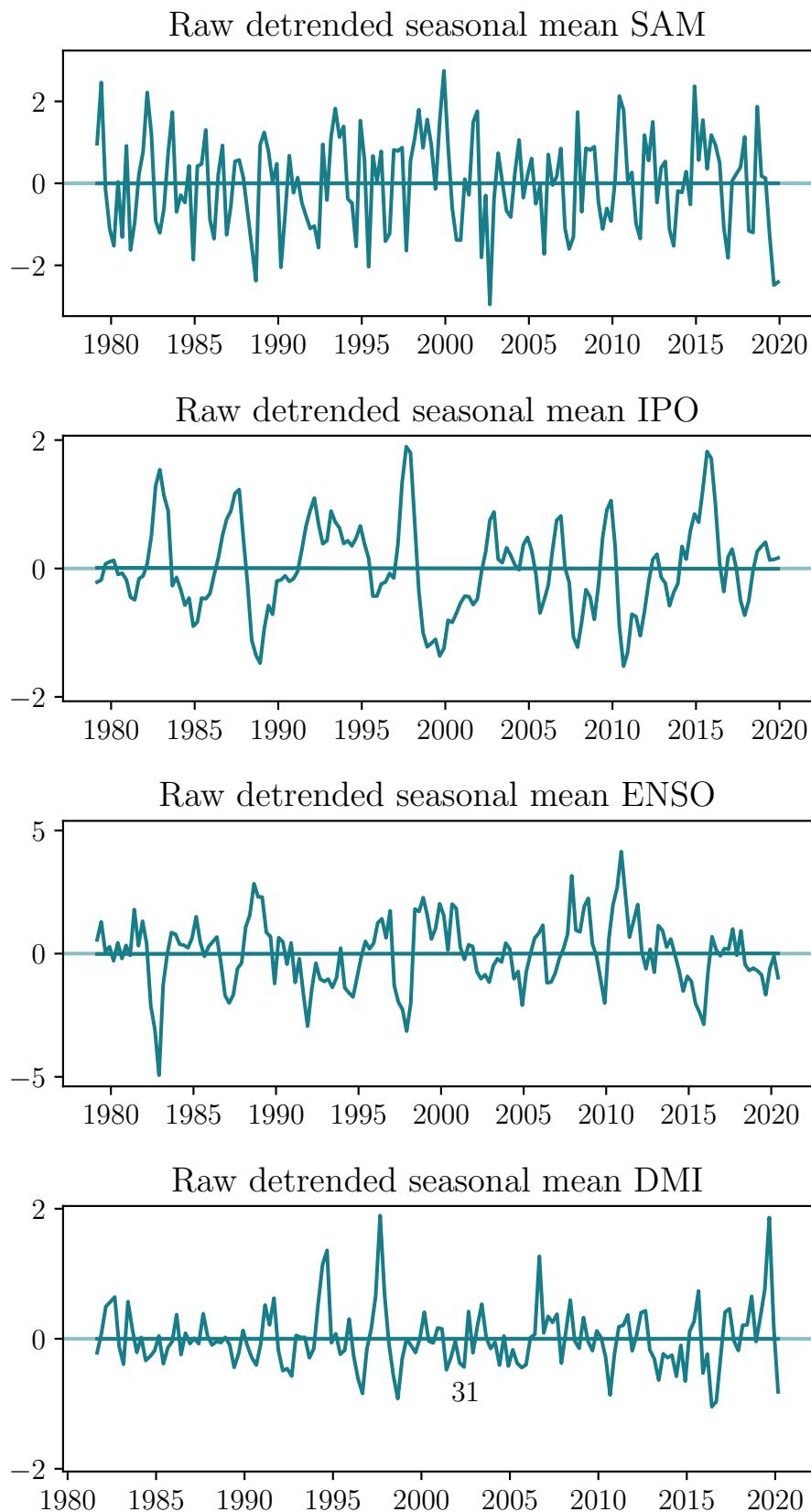


Figure 42: raw seasonal detrended index values

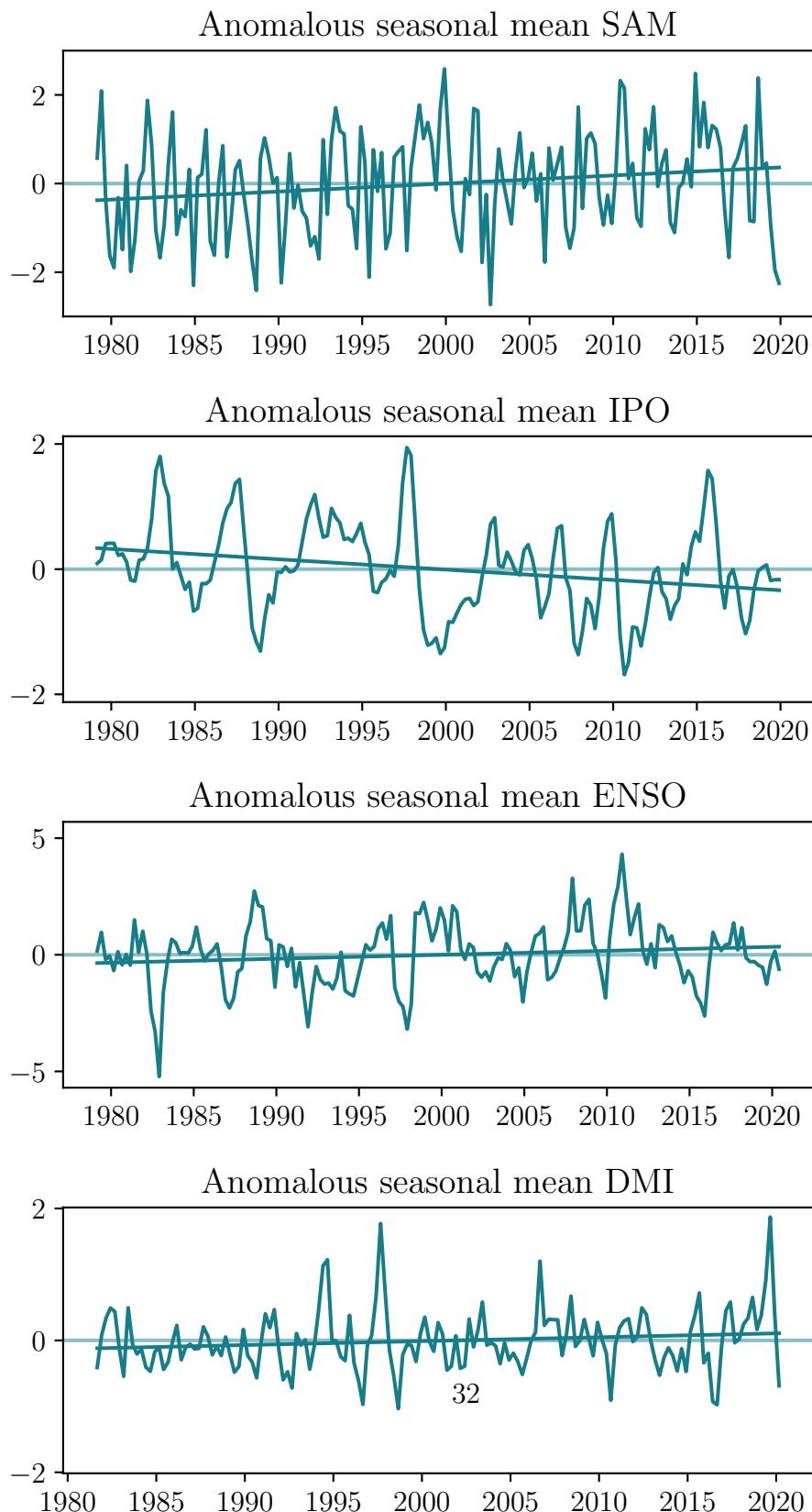


Figure 43: anomalous seasonal raw index values

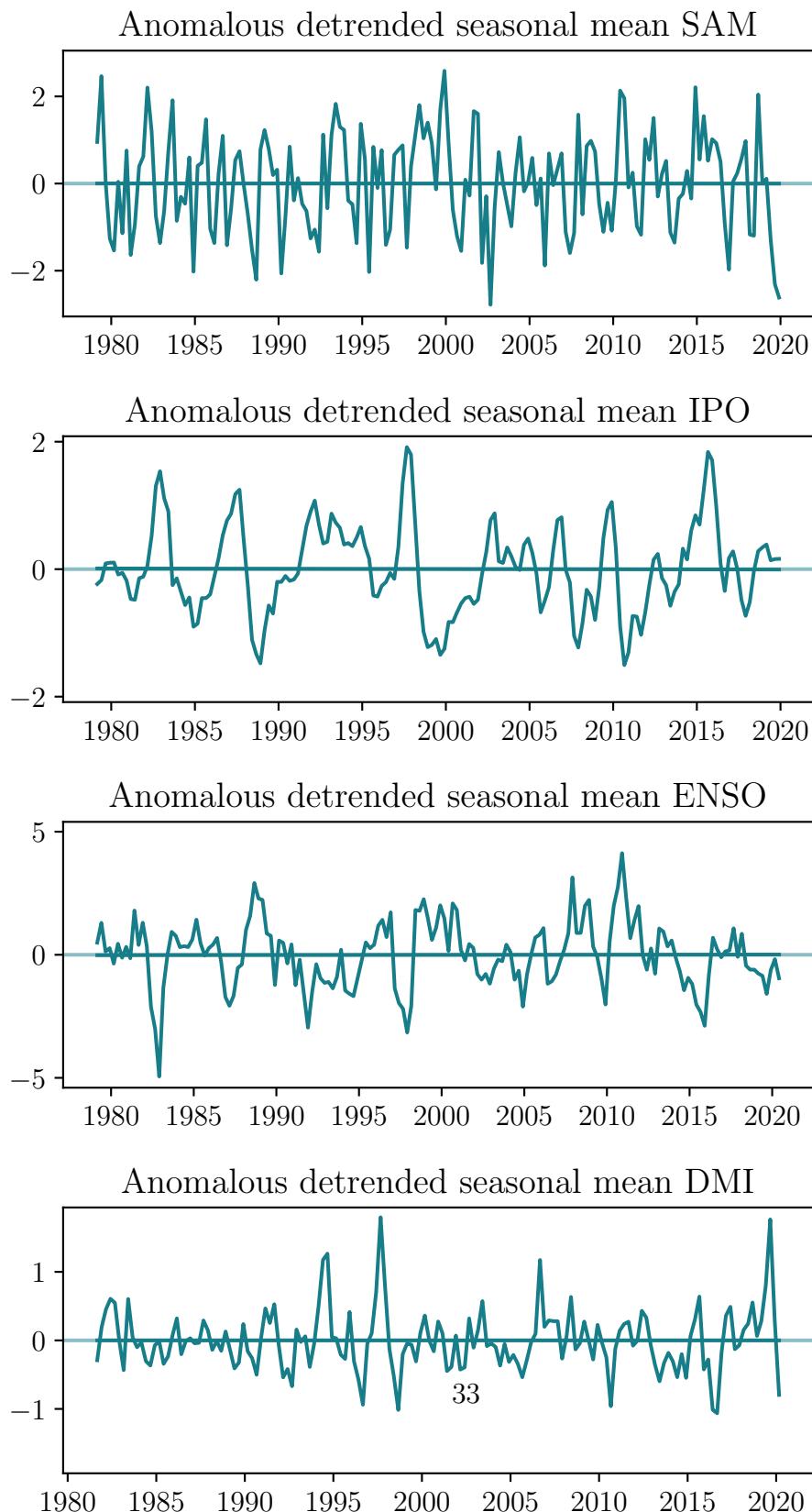


Figure 44: anomalous seasonal detrended index values

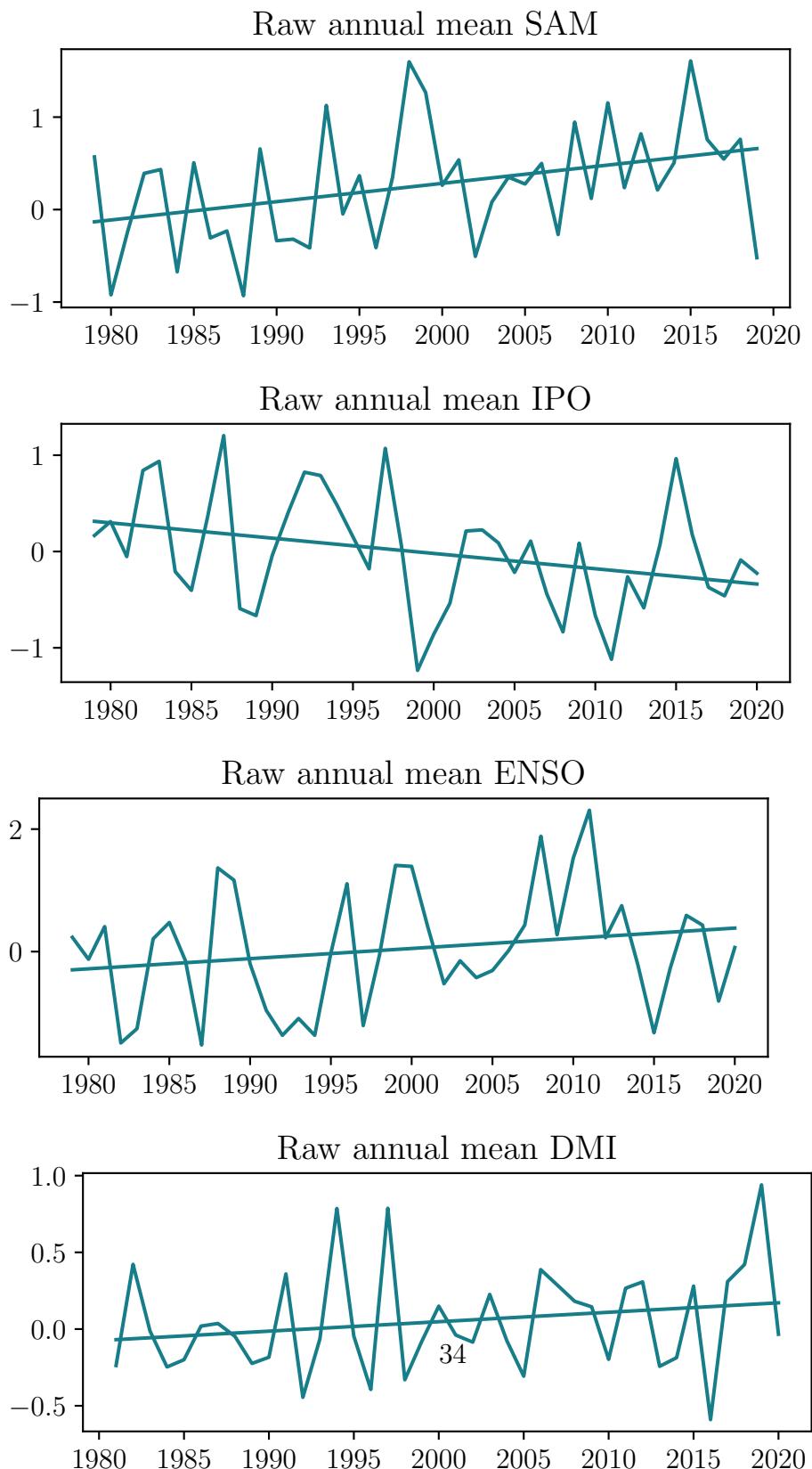


Figure 45: raw annual raw index values

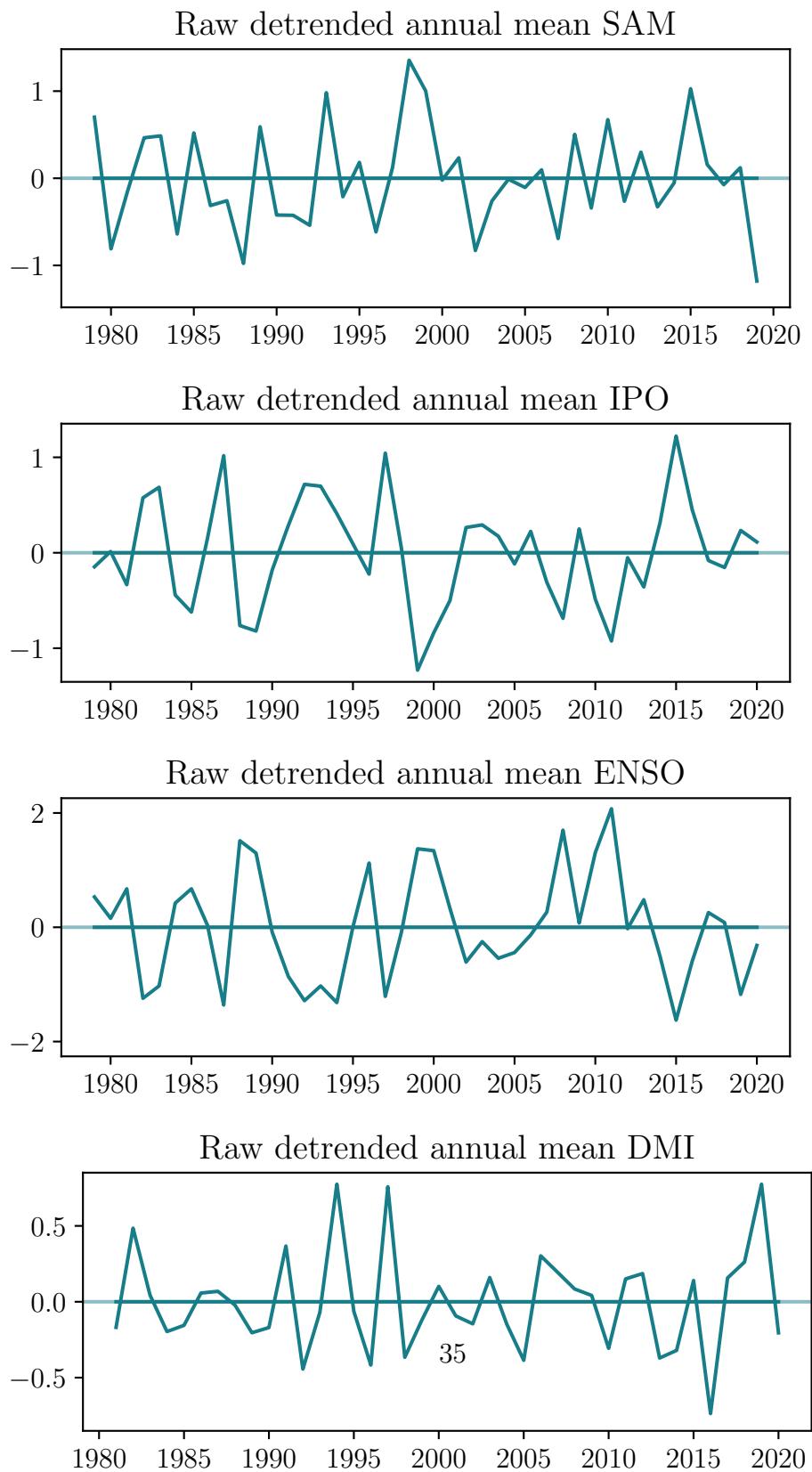


Figure 46: raw annual detrended index values

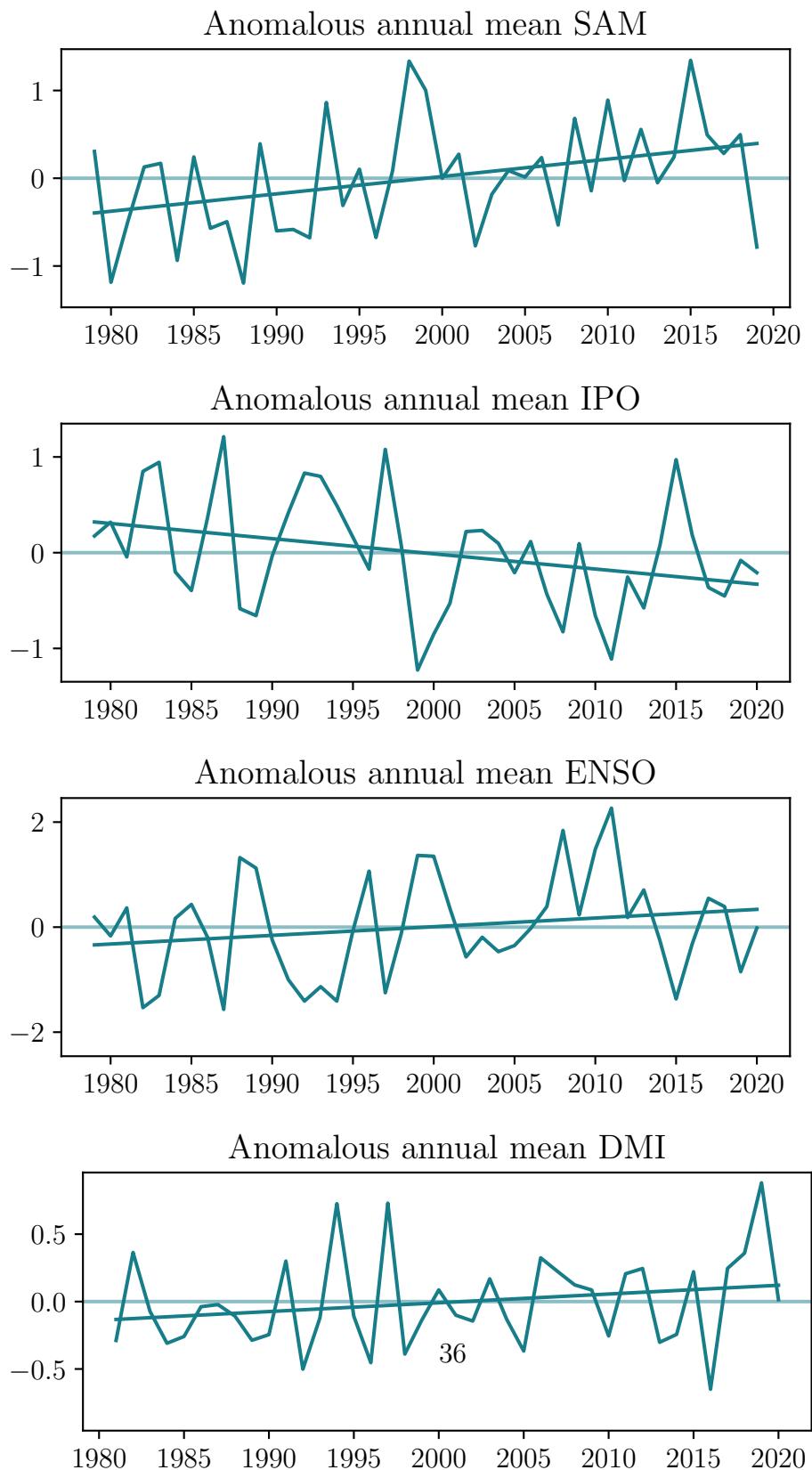


Figure 47: anomalous annual raw index values

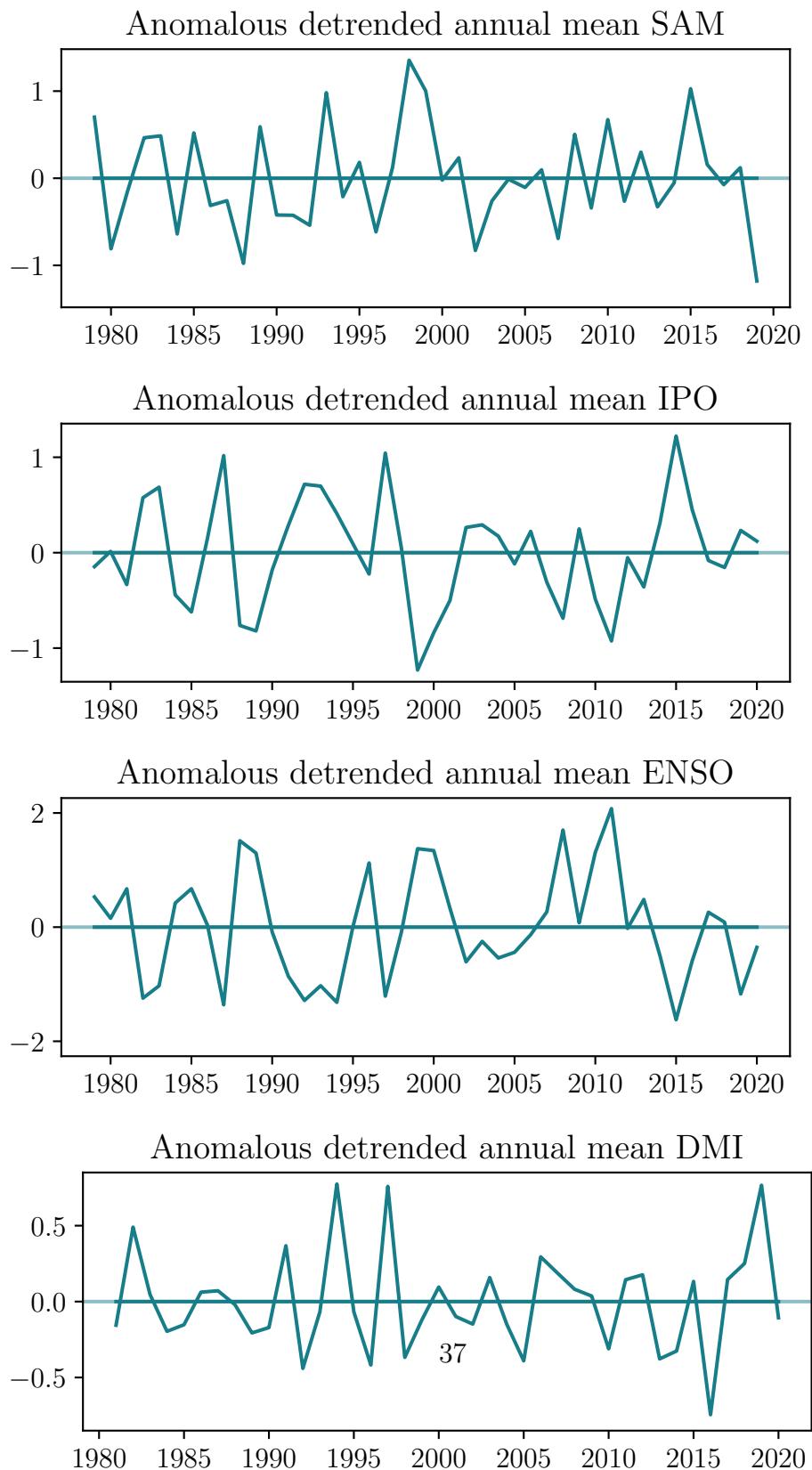


Figure 48: anomalous annual detrended index values

### 3.2 Comparing with SIC

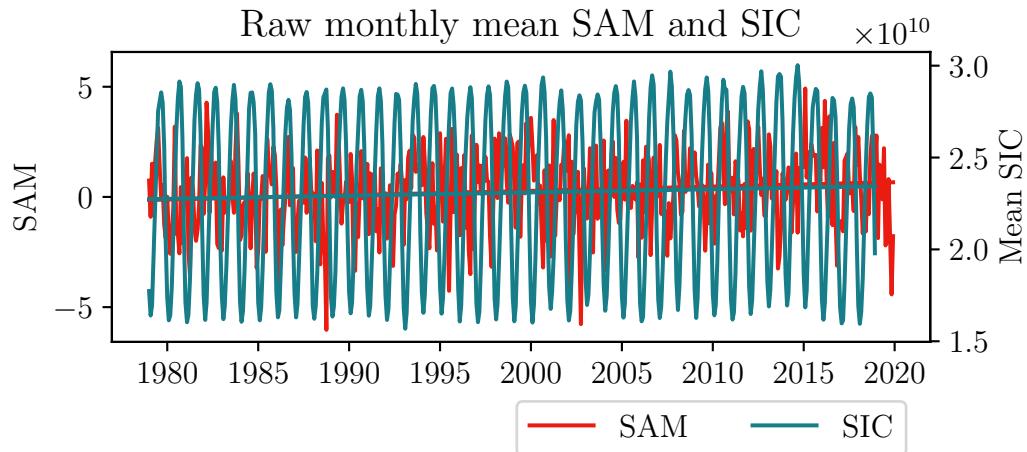


Figure 49: raw monthly raw SAM compared with SIC

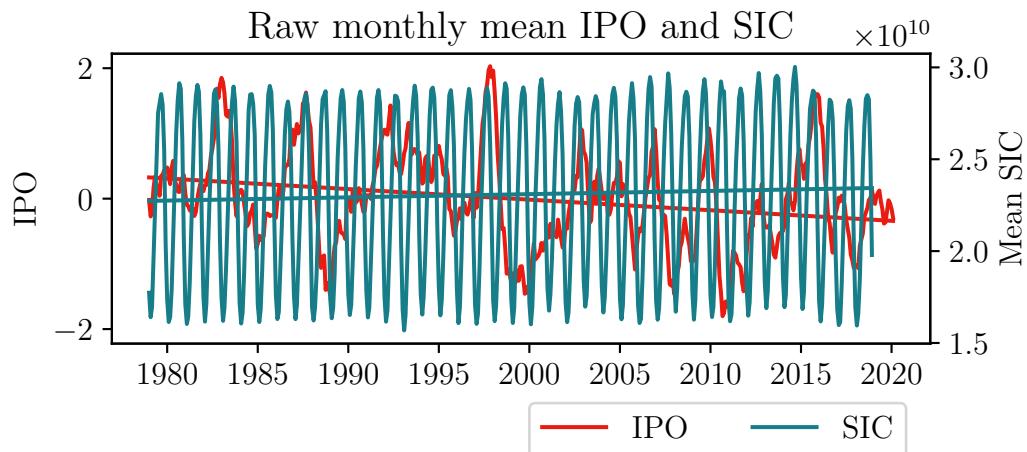


Figure 50: raw monthly raw IPO compared with SIC

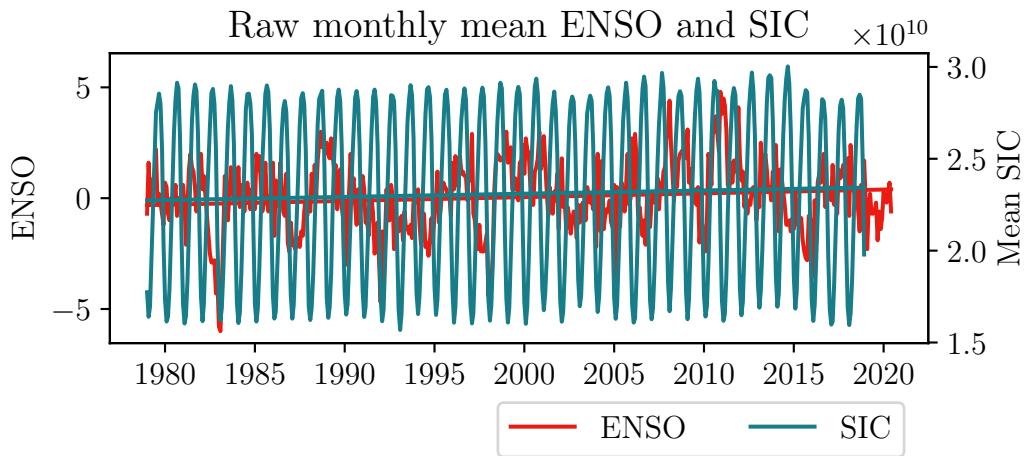


Figure 51: raw monthly raw ENSO compared with SIC

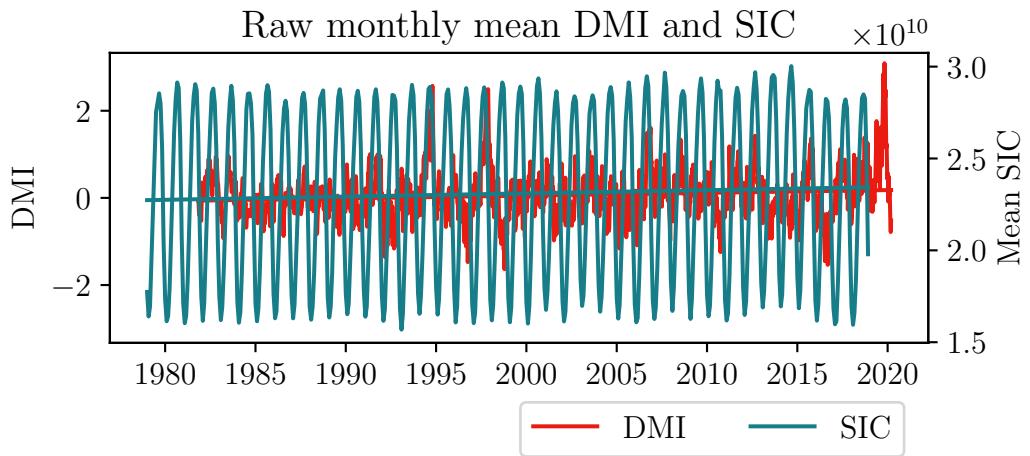


Figure 52: raw monthly raw DMI compared with SIC

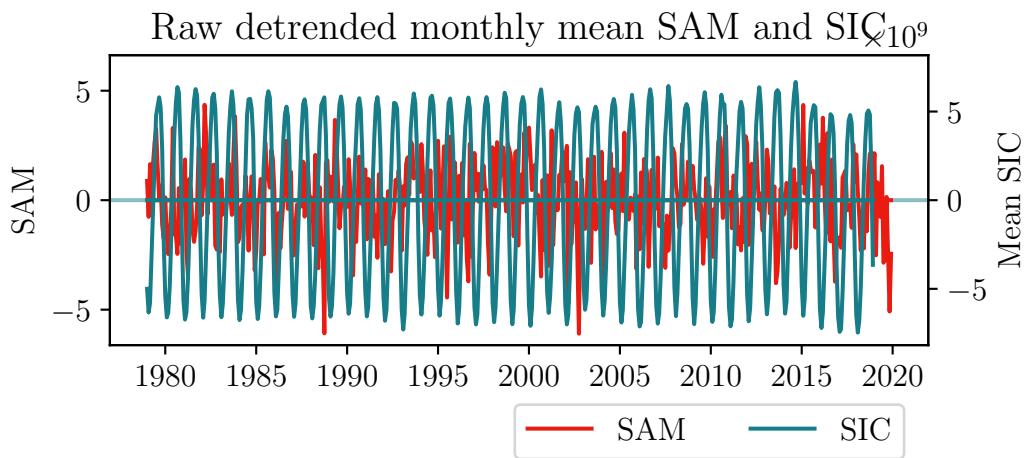


Figure 53: raw monthly detrended SAM compared with SIC

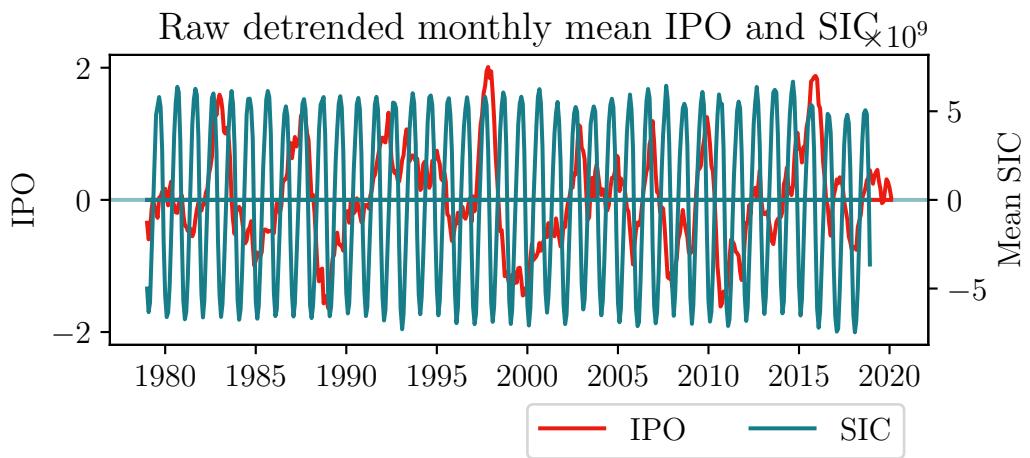


Figure 54: raw monthly detrended IPO compared with SIC

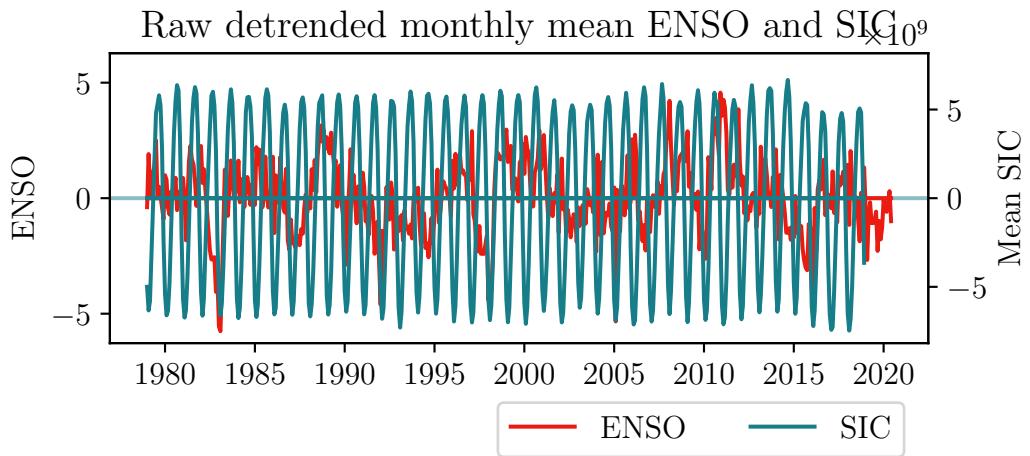


Figure 55: raw monthly detrended ENSO compared with SIC

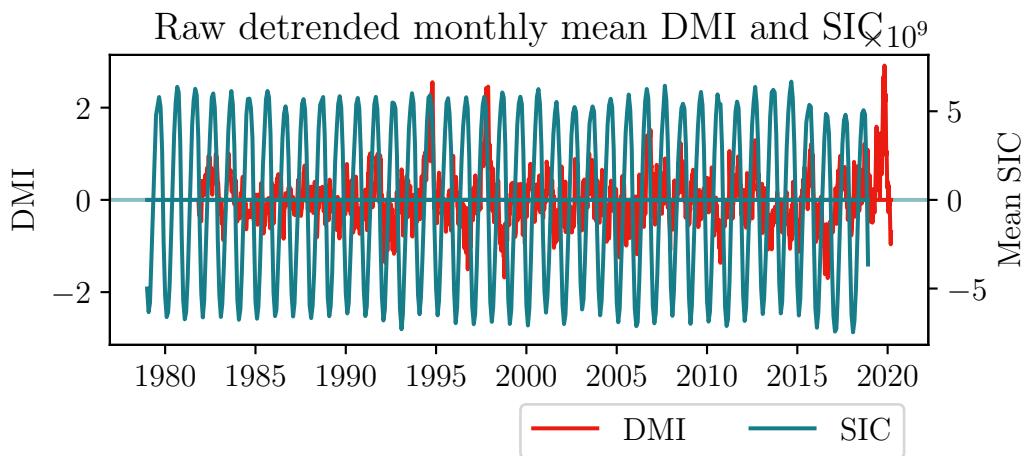


Figure 56: raw monthly detrended DMI compared with SIC

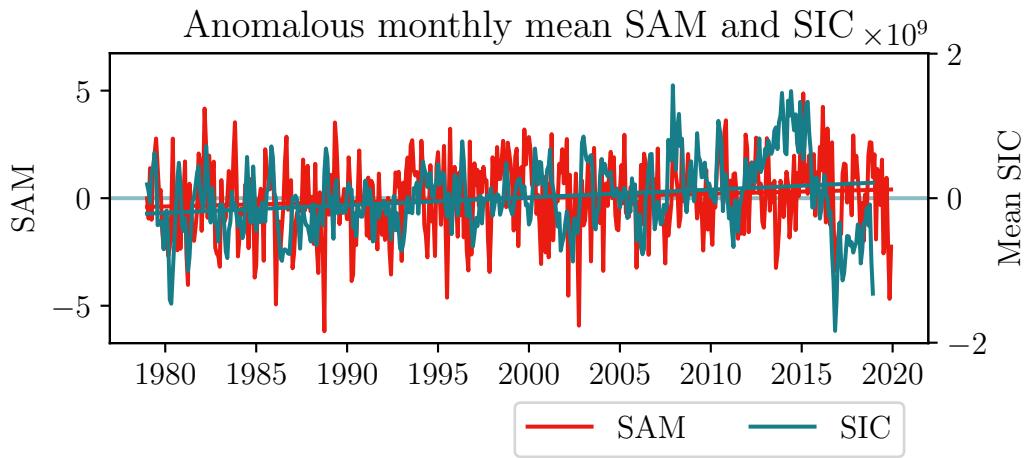


Figure 57: anomalous monthly raw SAM compared with SIC

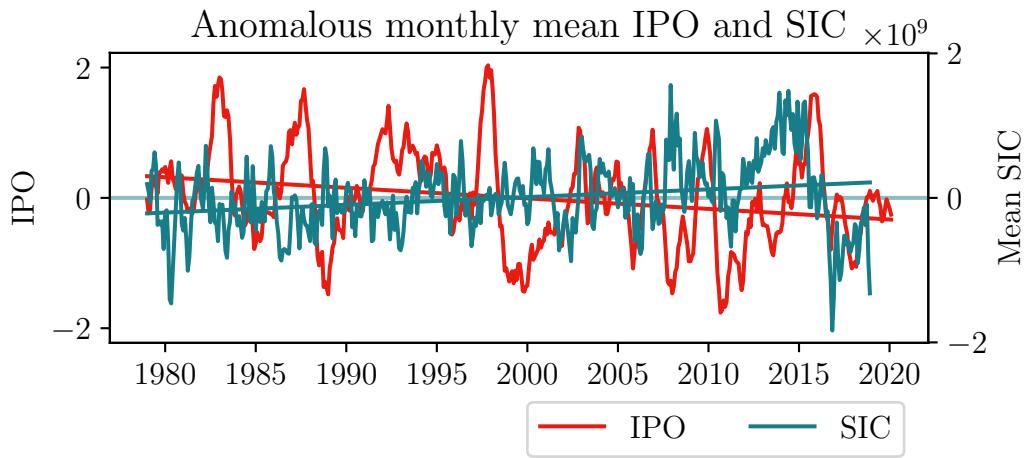


Figure 58: anomalous monthly raw IPO compared with SIC

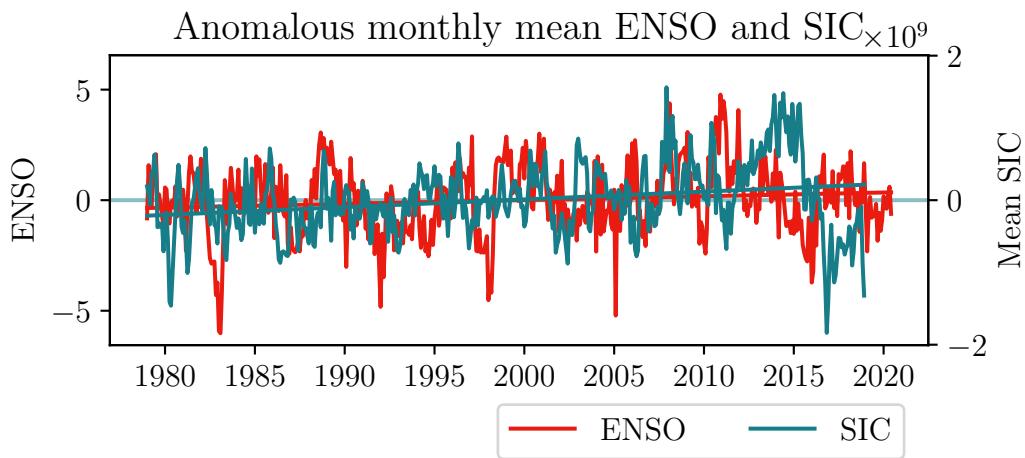


Figure 59: anomalous monthly raw ENSO compared with SIC

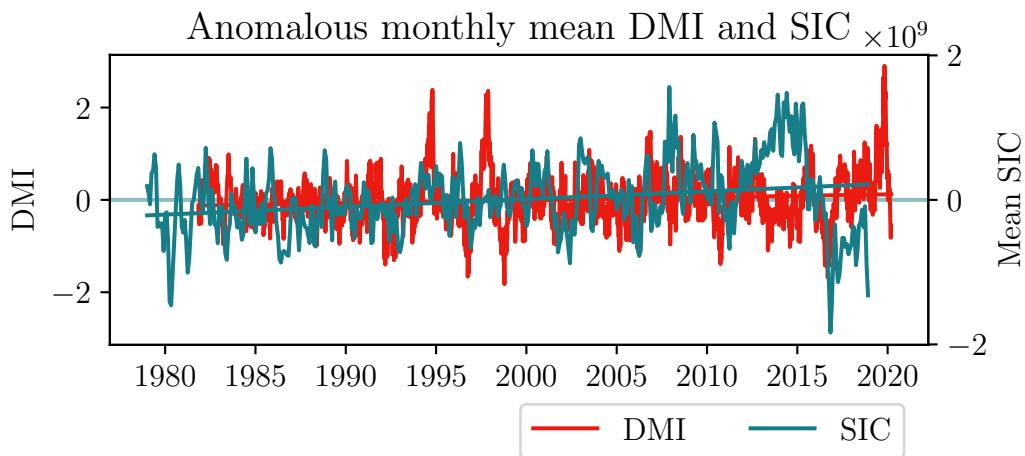


Figure 60: anomalous monthly raw DMI compared with SIC

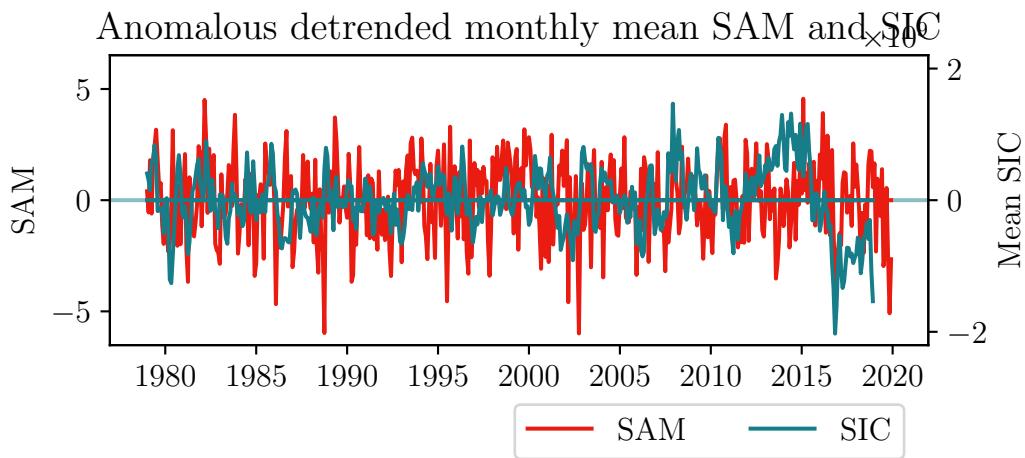


Figure 61: anomalous monthly detrended SAM compared with SIC

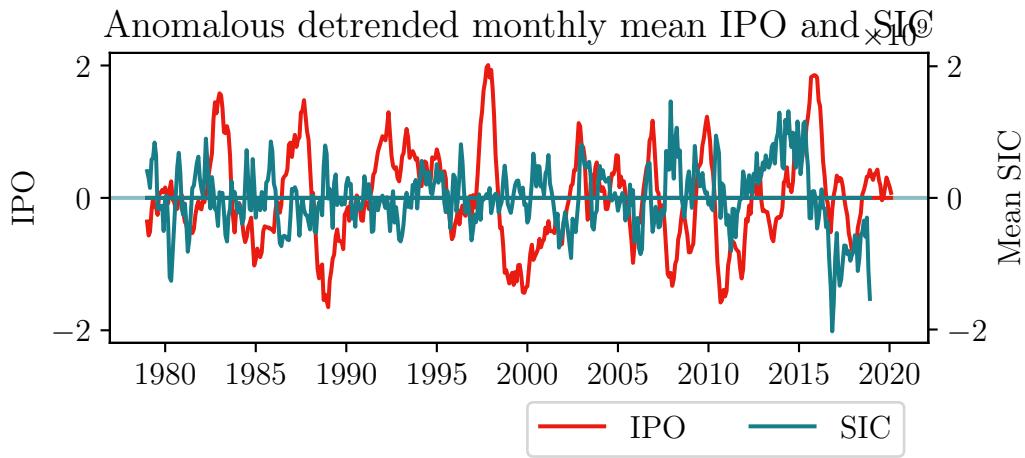


Figure 62: anomalous monthly detrended IPO compared with SIC

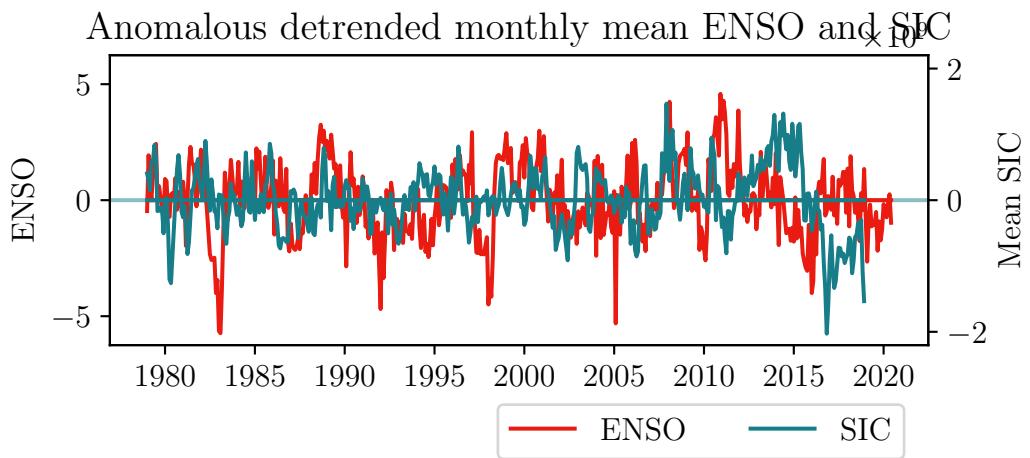


Figure 63: anomalous monthly detrended ENSO compared with SIC

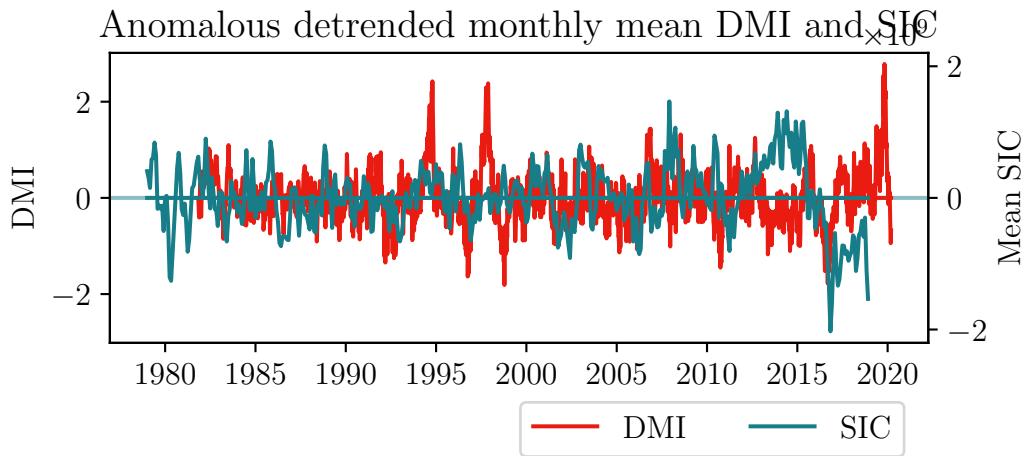


Figure 64: anomalous monthly detrended DMI compared with SIC

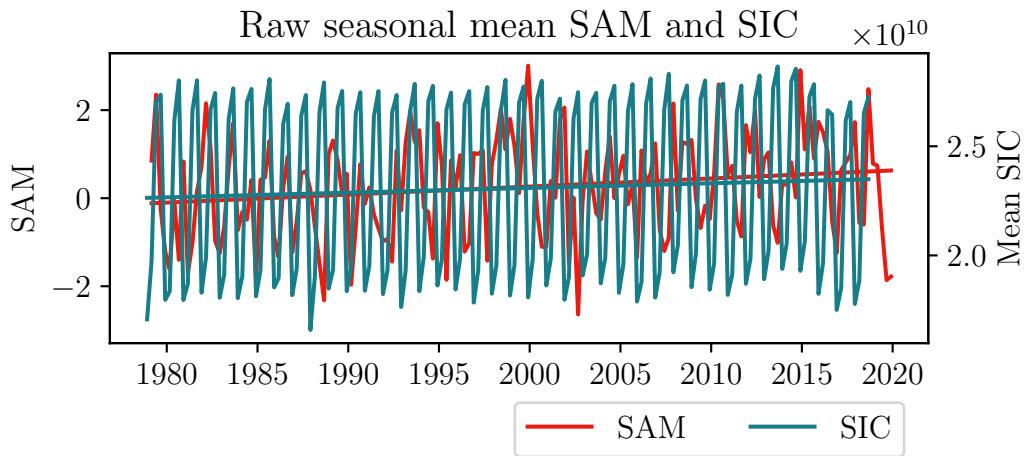


Figure 65: raw seasonal raw SAM compared with SIC

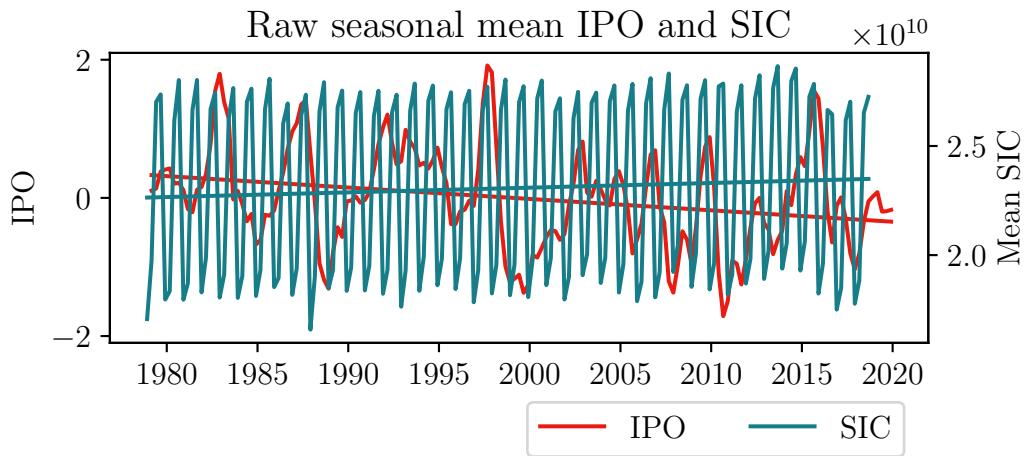


Figure 66: raw seasonal raw IPO compared with SIC

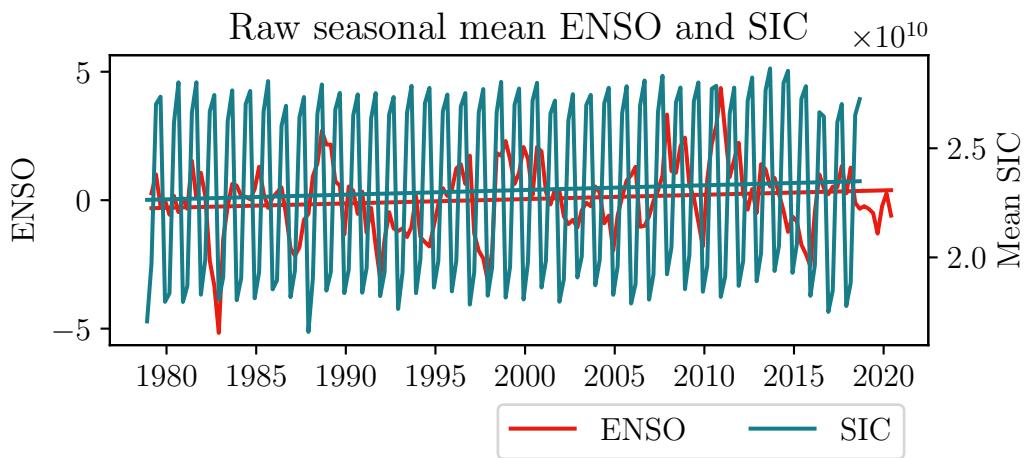


Figure 67: raw seasonal raw ENSO compared with SIC

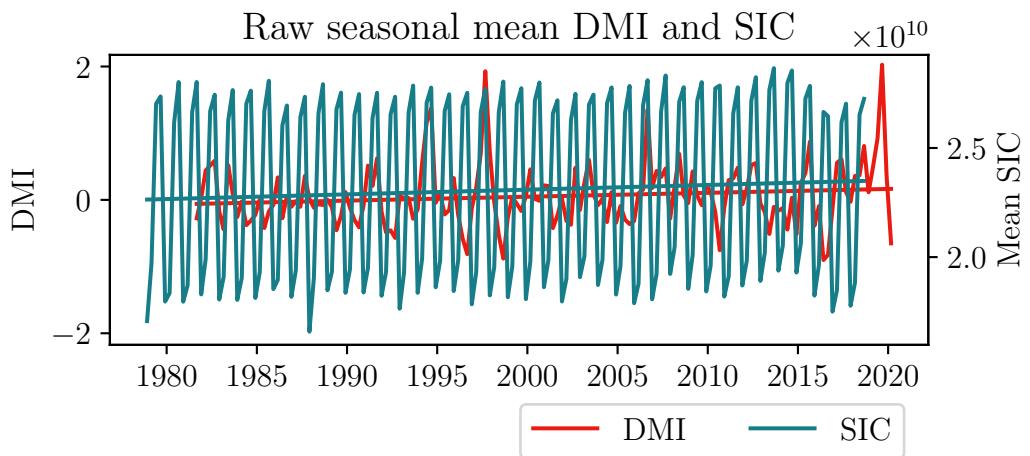


Figure 68: raw seasonal raw DMI compared with SIC

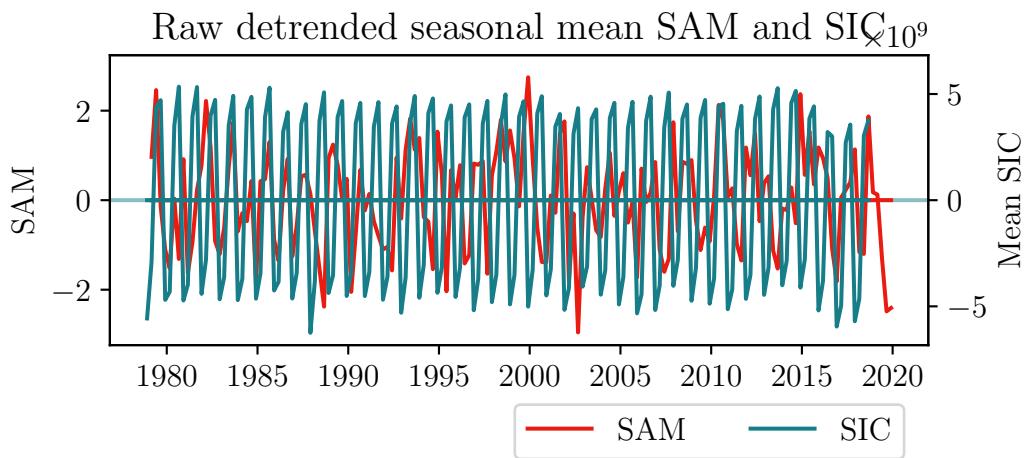


Figure 69: raw seasonal detrended SAM compared with SIC

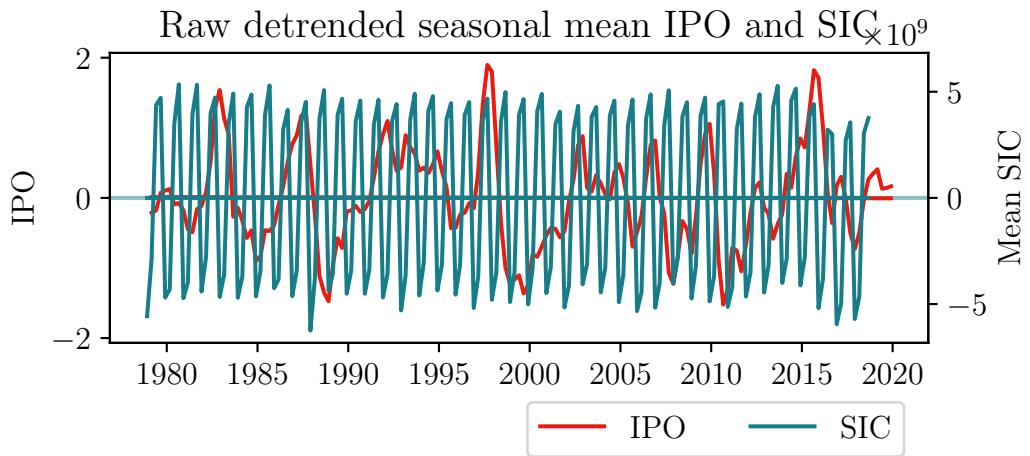


Figure 70: raw seasonal detrended IPO compared with SIC

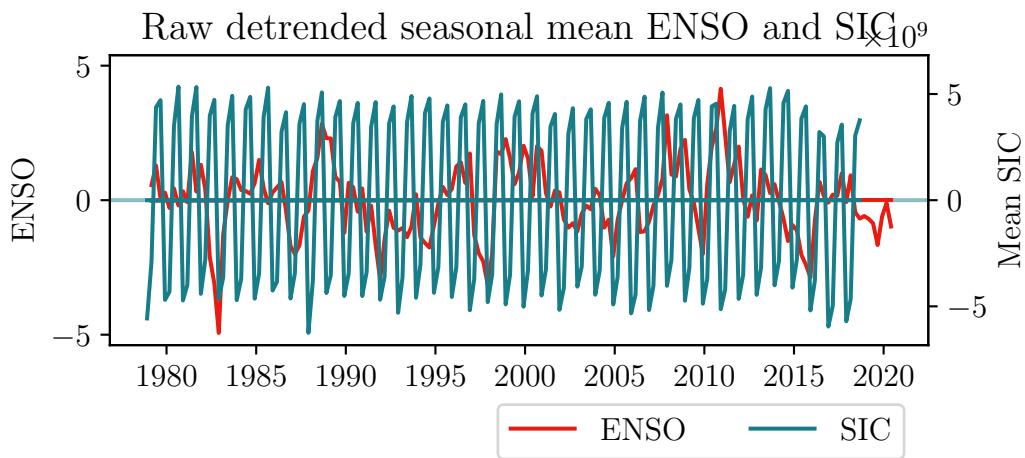


Figure 71: raw seasonal detrended ENSO compared with SIC

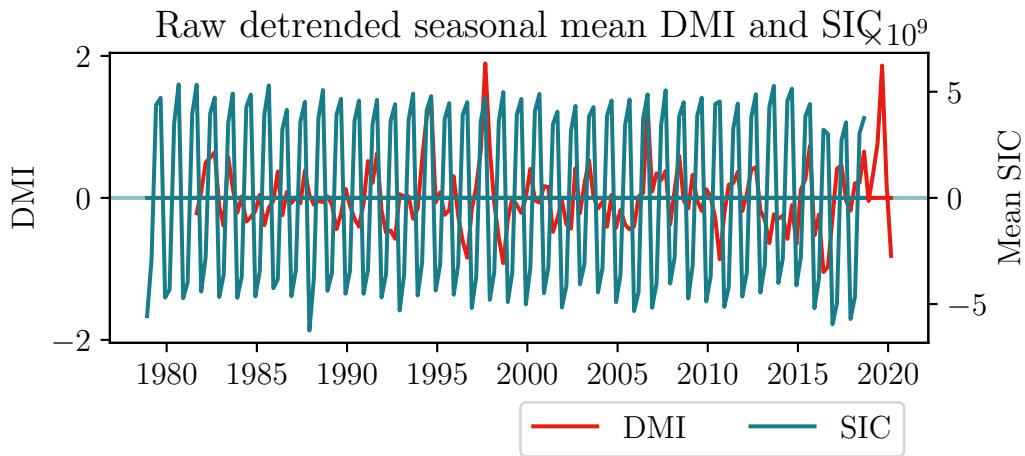


Figure 72: raw seasonal detrended DMI compared with SIC

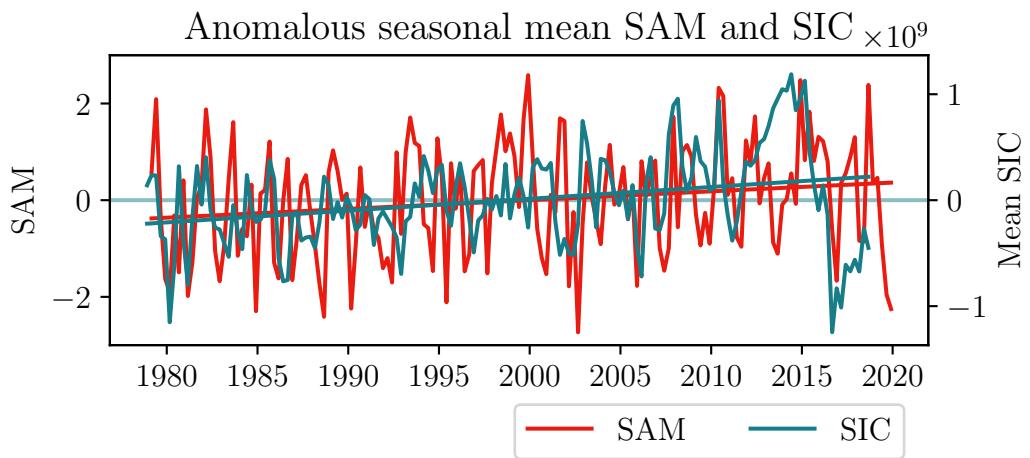


Figure 73: anomalous seasonal raw SAM compared with SIC

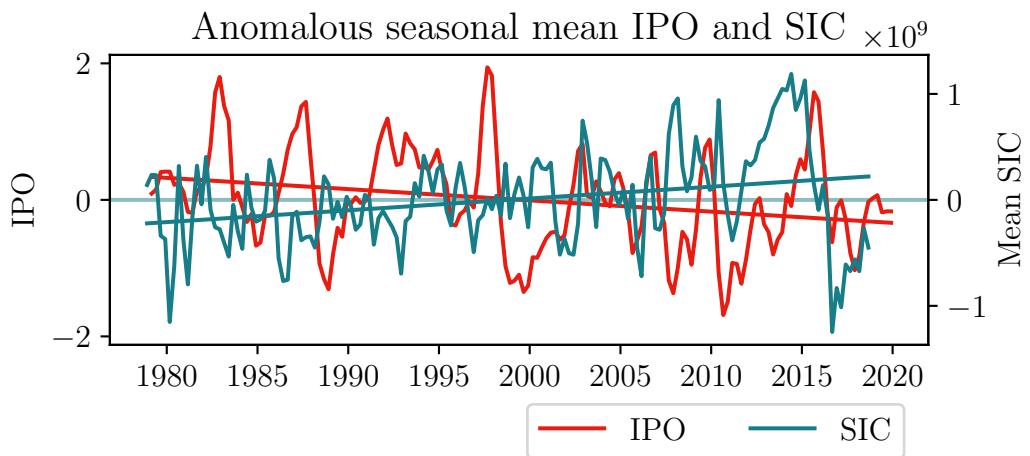


Figure 74: anomalous seasonal raw IPO compared with SIC

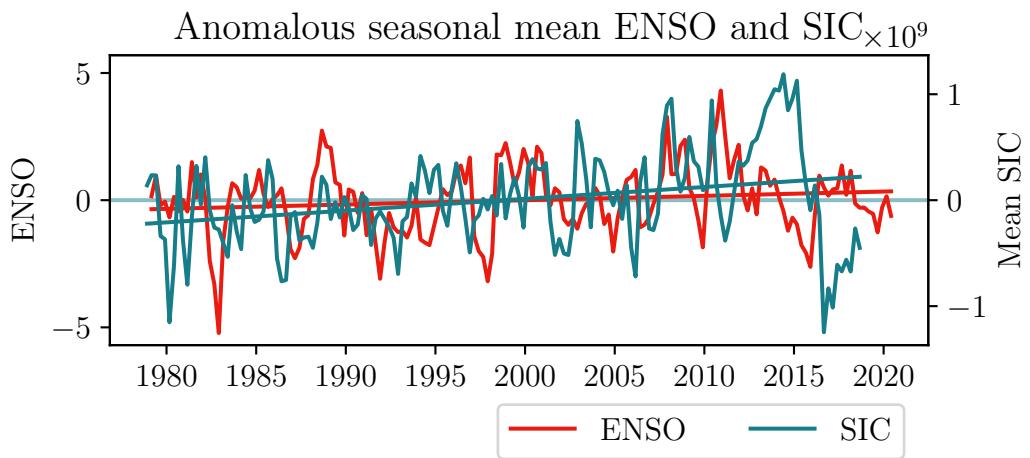


Figure 75: anomalous seasonal raw ENSO compared with SIC

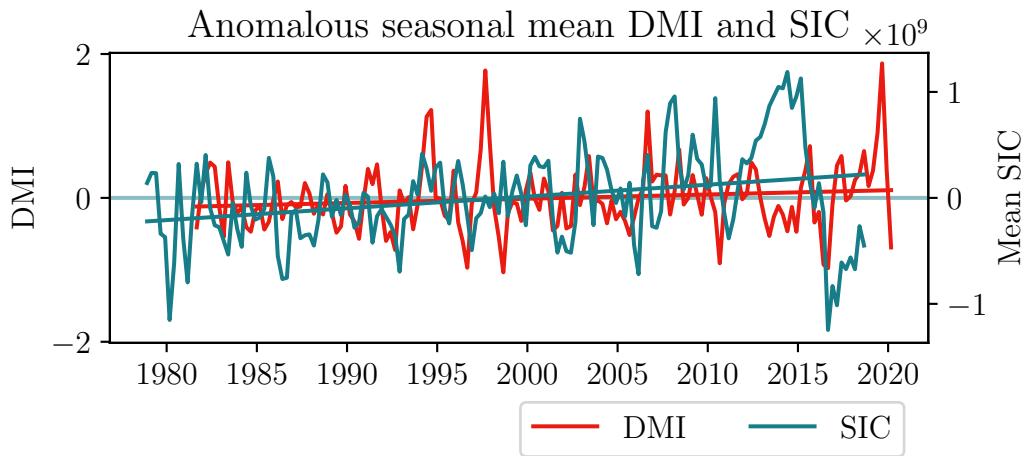


Figure 76: anomalous seasonal raw DMI compared with SIC

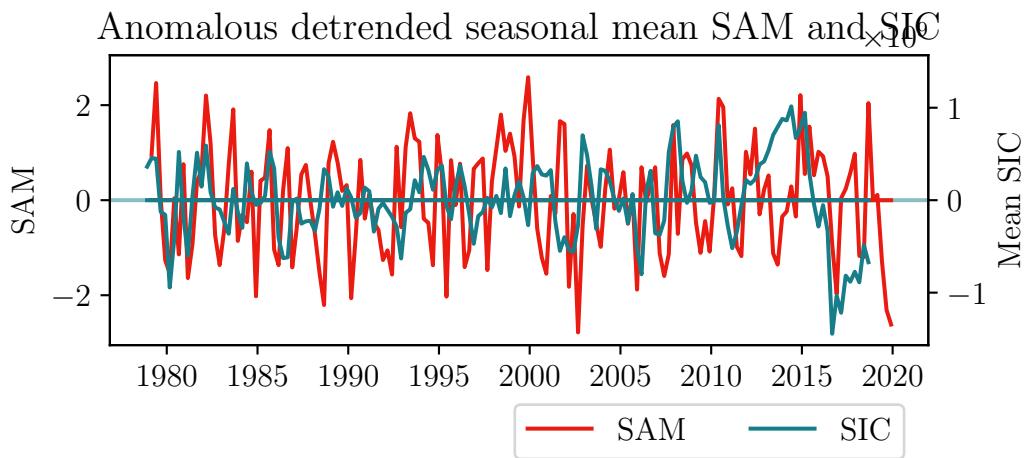


Figure 77: anomalous seasonal detrended SAM compared with SIC

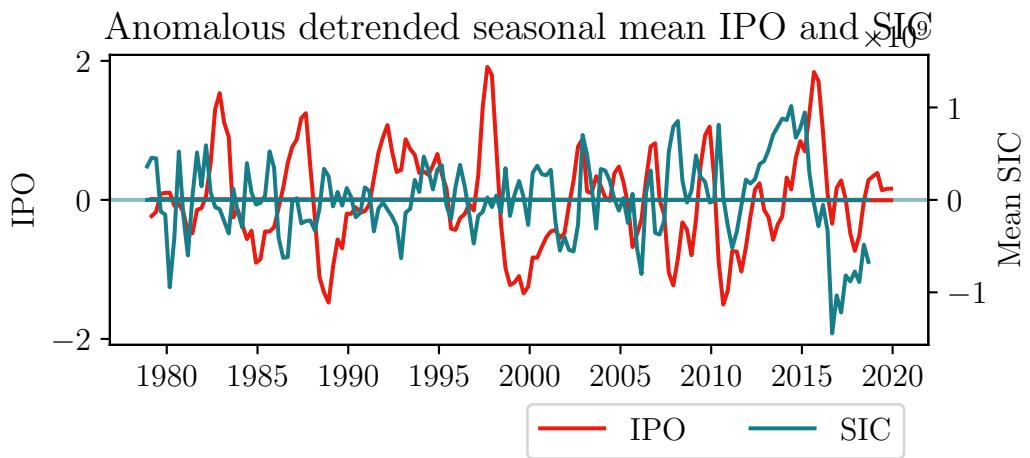


Figure 78: anomalous seasonal detrended IPO compared with SIC

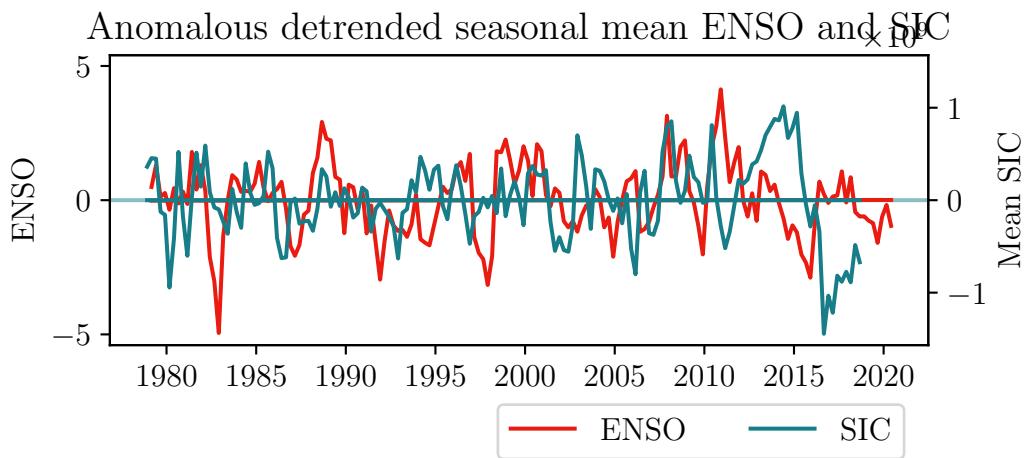


Figure 79: anomalous seasonal detrended ENSO compared with SIC

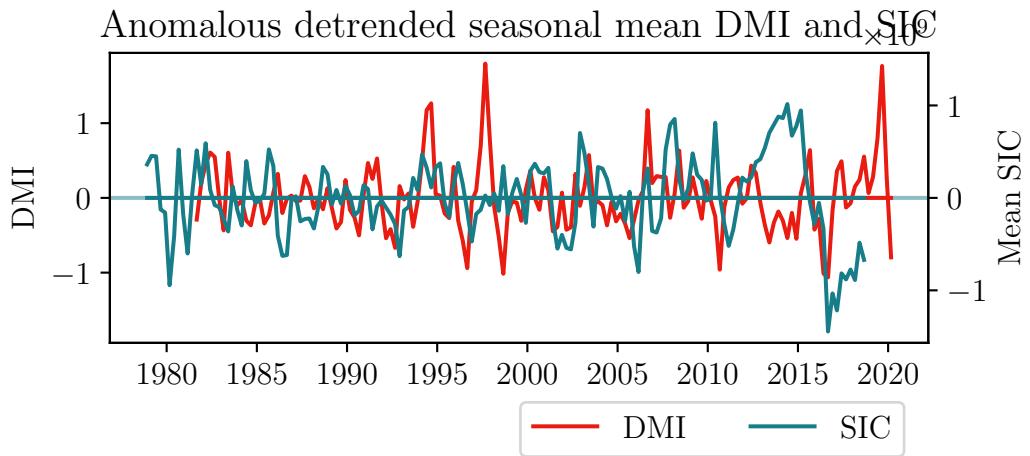


Figure 80: anomalous seasonal detrended DMI compared with SIC

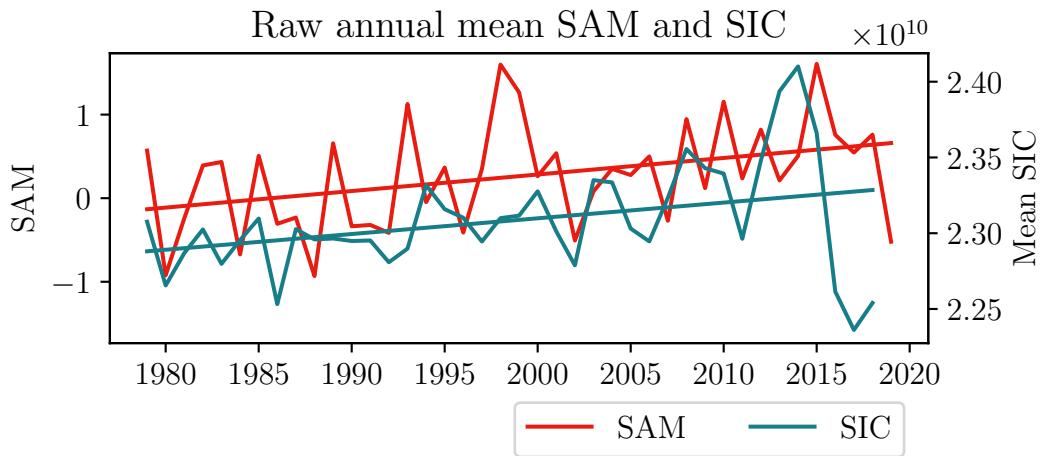


Figure 81: raw annual raw SAM compared with SIC

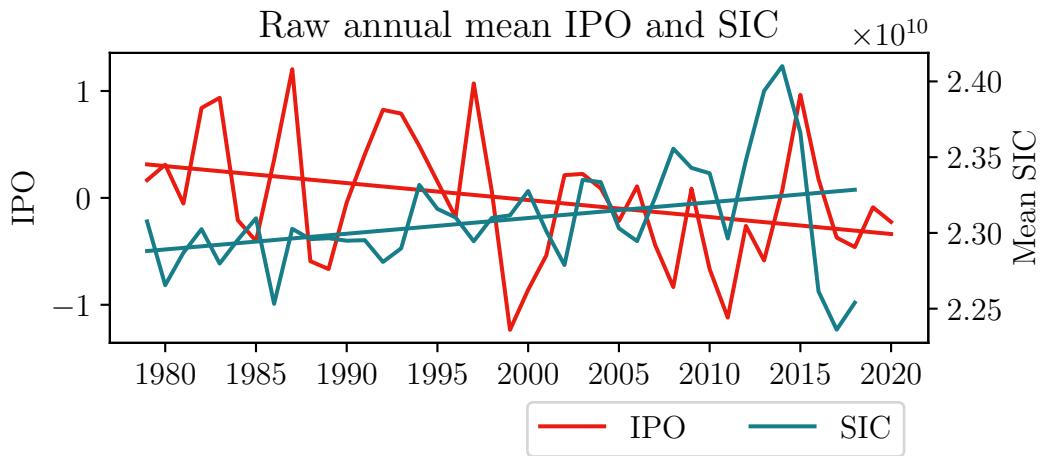


Figure 82: raw annual raw IPO compared with SIC

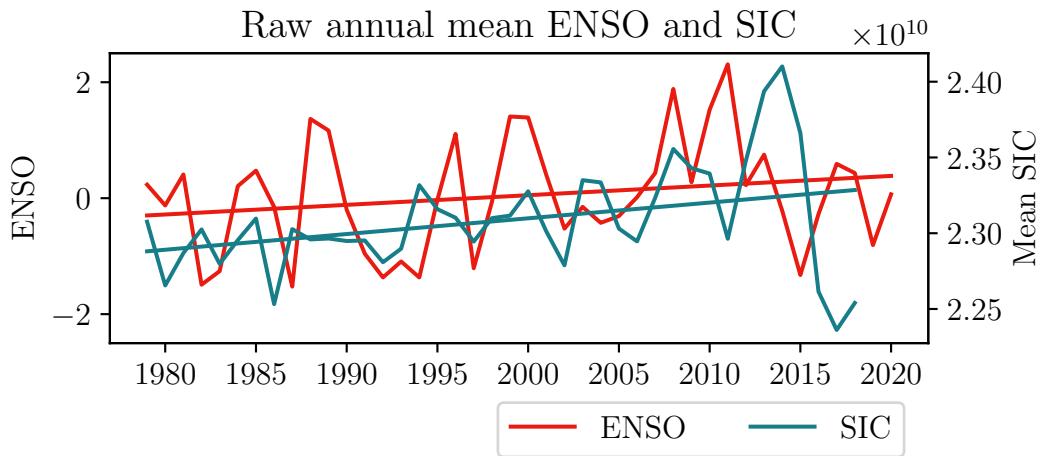


Figure 83: raw annual raw ENSO compared with SIC

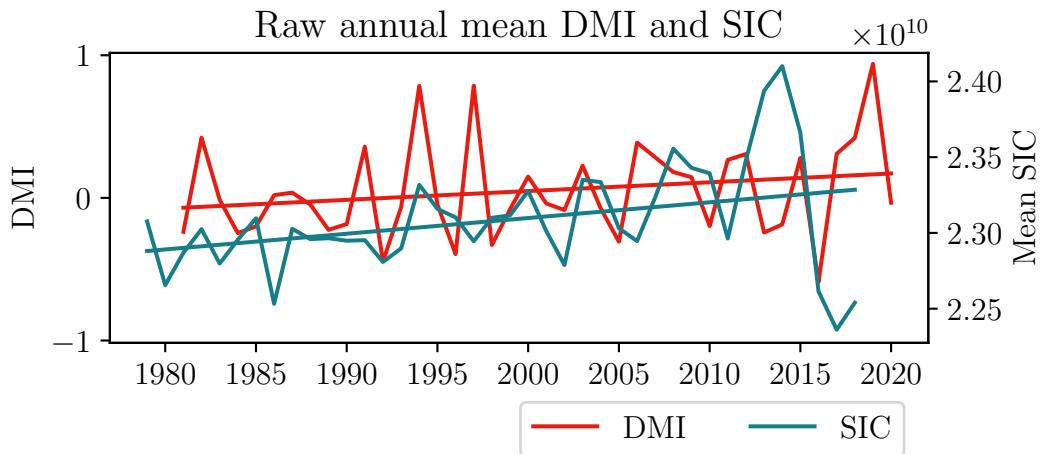


Figure 84: raw annual raw DMI compared with SIC

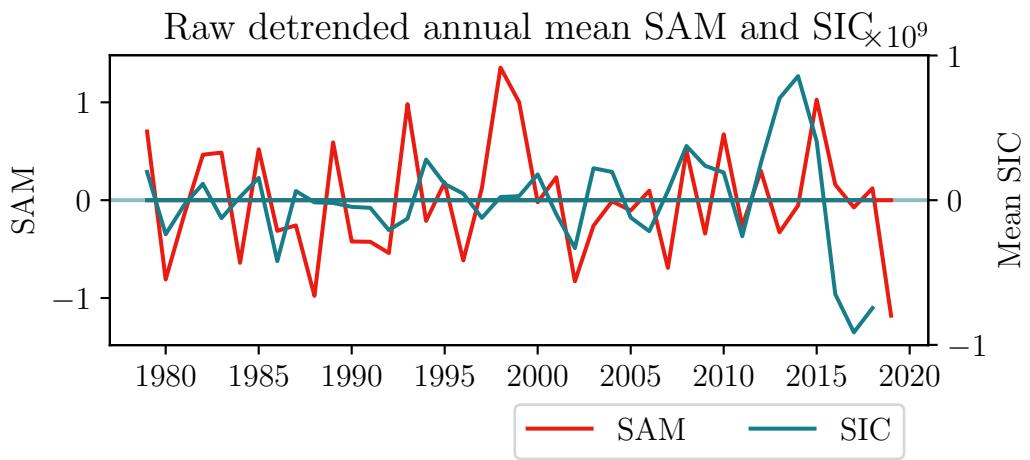


Figure 85: raw annual detrended SAM compared with SIC

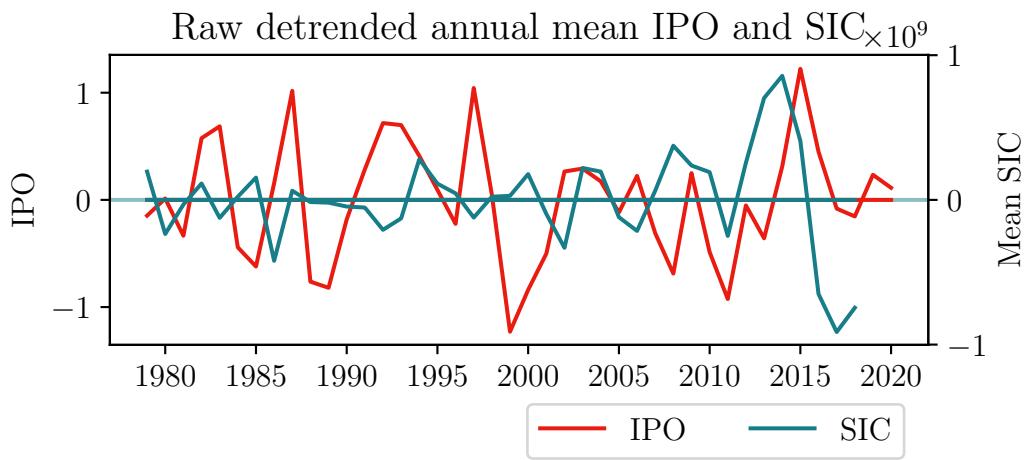


Figure 86: raw annual detrended IPO compared with SIC

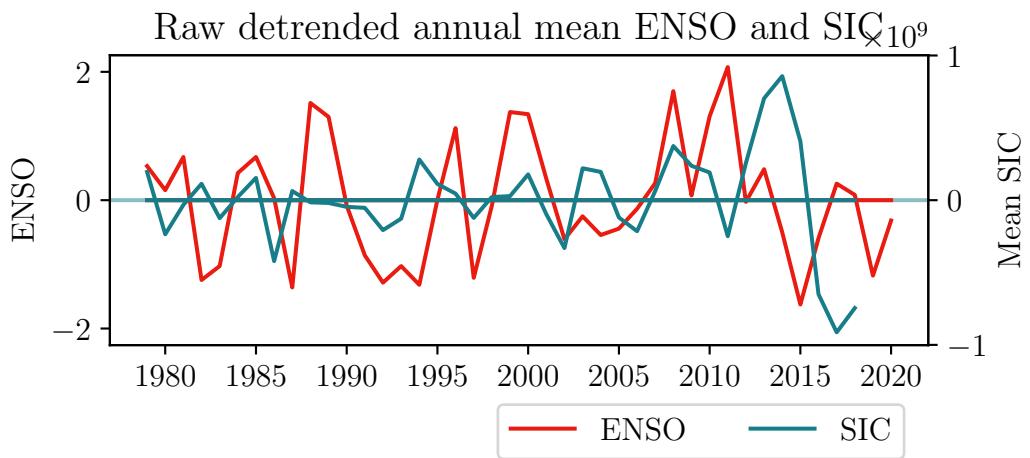


Figure 87: raw annual detrended ENSO compared with SIC

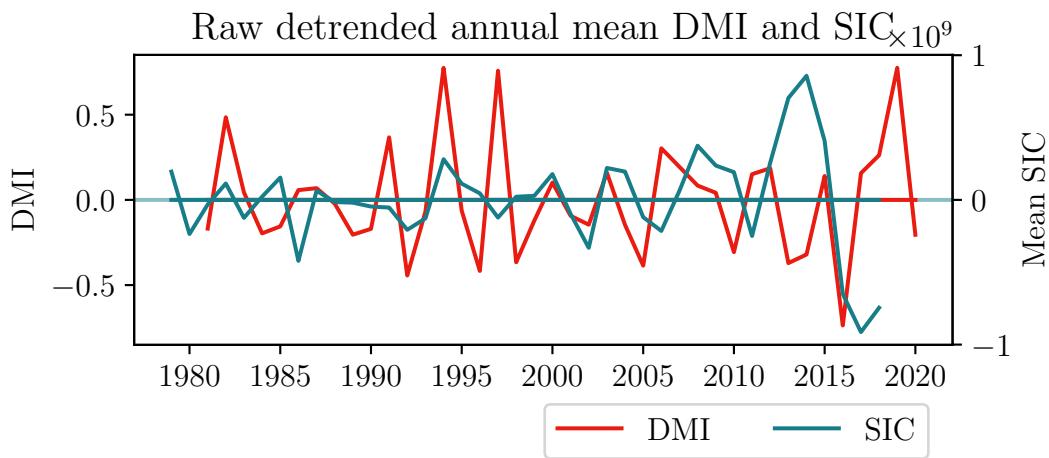


Figure 88: raw annual detrended DMI compared with SIC

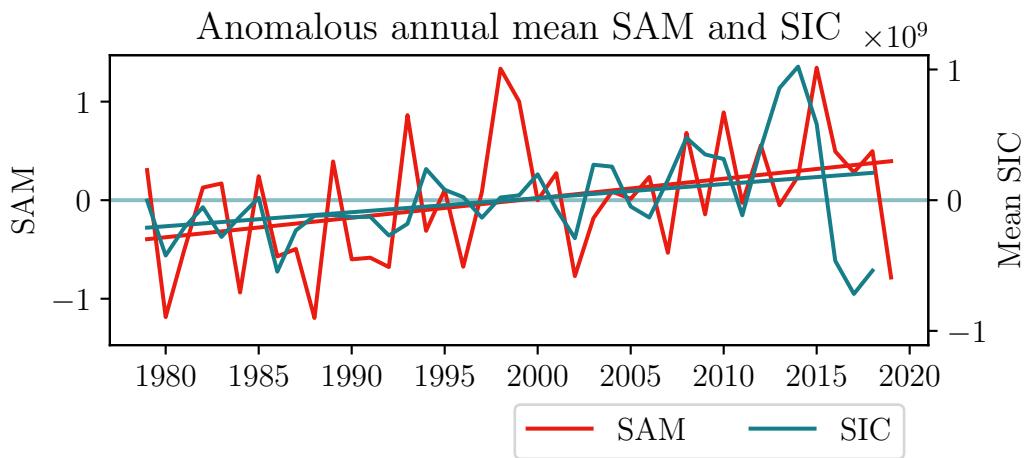


Figure 89: anomalous annual raw SAM compared with SIC

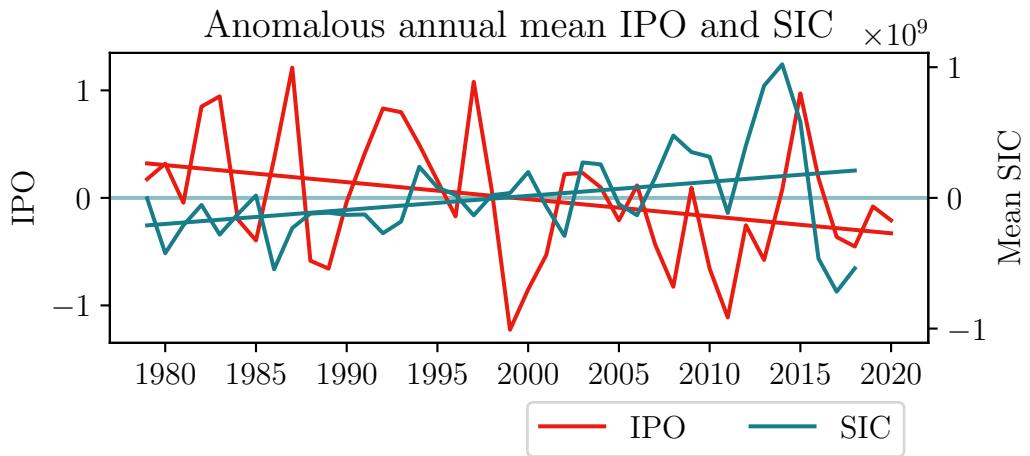


Figure 90: anomalous annual raw IPO compared with SIC

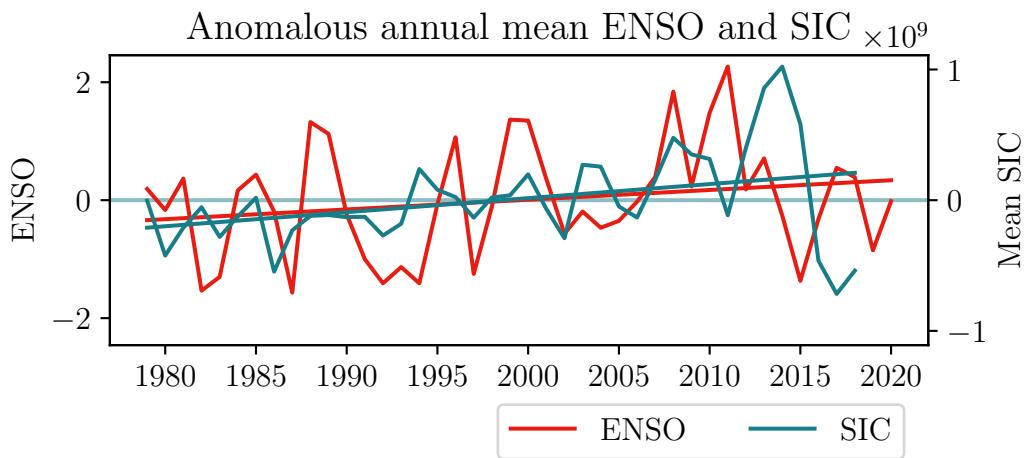


Figure 91: anomalous annual raw ENSO compared with SIC

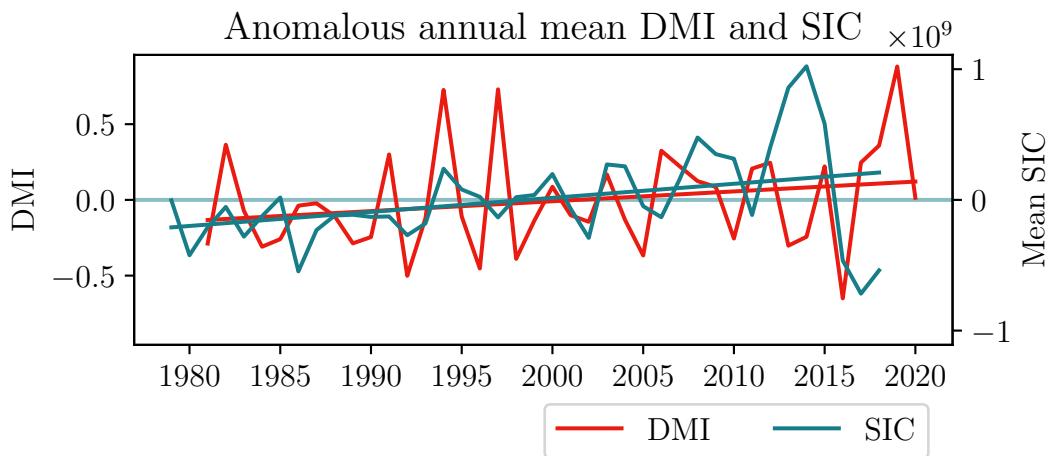


Figure 92: anomalous annual raw DMI compared with SIC

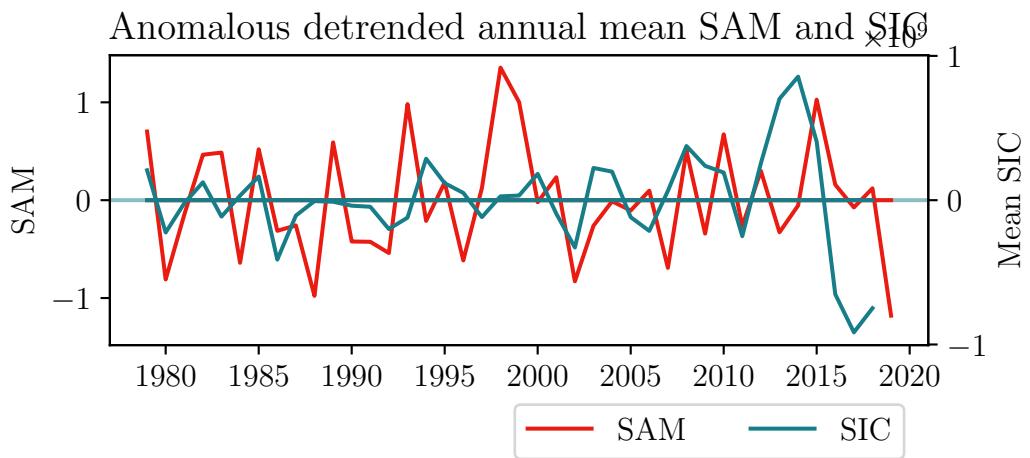


Figure 93: anomalous annual detrended SAM compared with SIC

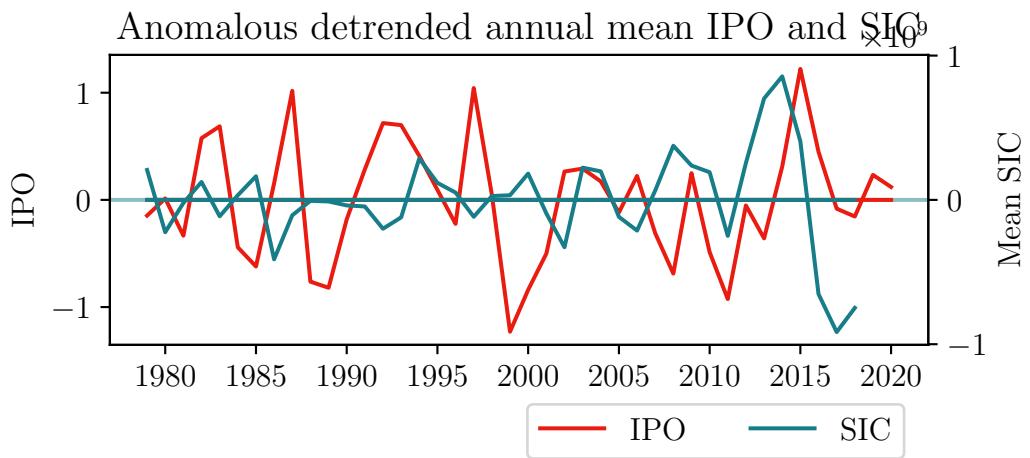


Figure 94: anomalous annual detrended IPO compared with SIC

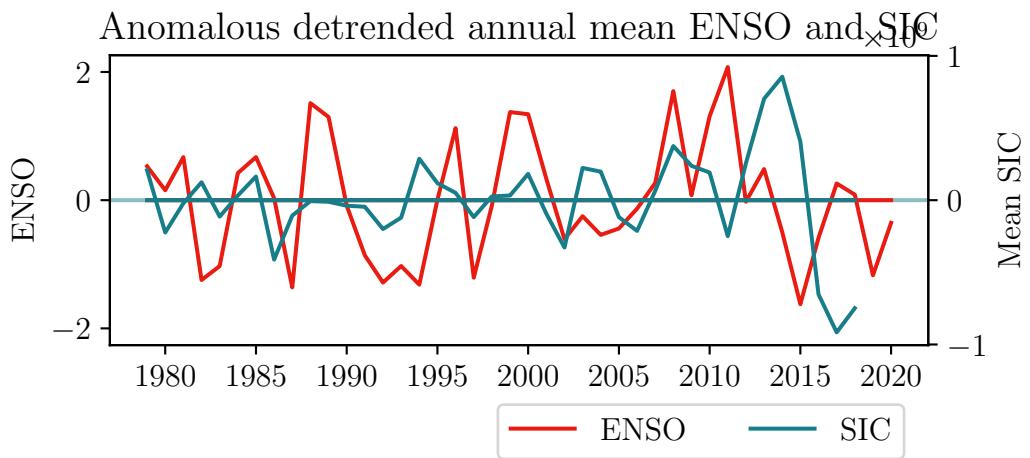


Figure 95: anomalous annual detrended ENSO compared with SIC

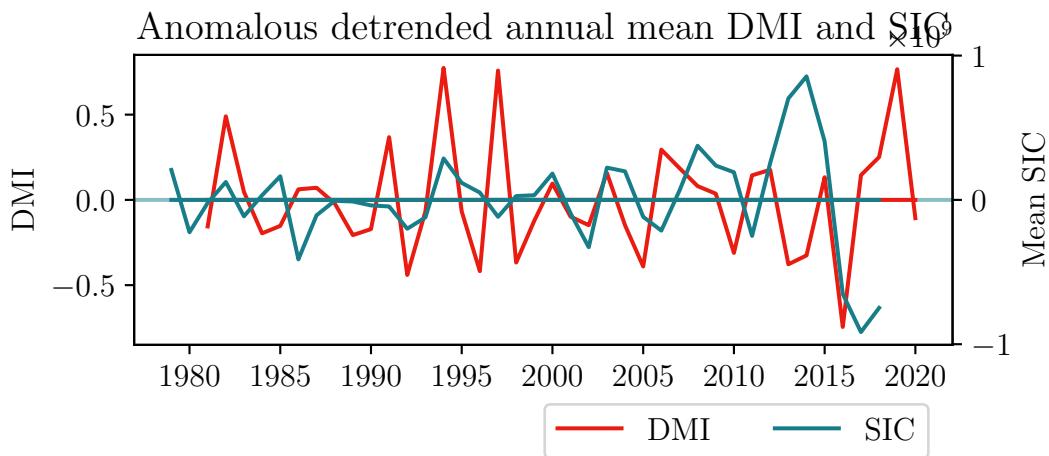


Figure 96: anomalous annual detrended DMI compared with SIC

## 4 Correlations

### 4.1 Single correlations

	SAM	IPO	DMI	ENSO
raw monthly	-0.02765	-0.02345	0.15058	-0.02183
raw monthly detrended	-0.03526	-0.01234	0.145801	-0.0293
anomalous monthly	0.159865	-0.12679	0.112145	0.065557
anomalous monthly detrended	0.12446	-0.06556	0.113758	0.026325
raw seasonal	-0.04435	-0.02979	0.058697	-0.01502
raw seasonal detrended	-0.06027	-0.01462	0.056316	-0.02607
anomalous seasonal	0.199563	-0.13999	0.02738	0.092204
anomalous seasonal detrended	0.13901	-0.06811	0.0077	0.042388
raw annual	0.275374	-0.13953	0.022091	0.118458
raw annual detrended	0.143103	-0.02928	-0.02075	0.030127
anomalous annual	0.28453	-0.16447	0.022655	0.138644
anomalous annual detrended	0.14874	-0.05355	-0.02176	0.049354

Table 1: Correlations

	SAM	IPO	DMI	ENSO
raw monthly	0.545995	0.608632	0.238801	0.633648
raw monthly detrended	0.441316	0.787607	0.254207	0.522291
anomalous monthly	0.000444	0.005454	0.381538	0.151976
anomalous monthly detrended	0.006383	0.151966	0.374686	0.565468
raw seasonal	0.57764	0.708405	0.47704	0.85048
raw seasonal detrended	0.449018	0.85444	0.495128	0.743489
anomalous seasonal	0.011406	0.077458	0.740297	0.246199
anomalous seasonal detrended	0.079587	0.392155	0.925742	0.594586
raw annual	0.085466	0.390525	0.895264	0.46661
raw annual detrended	0.378368	0.857683	0.901609	0.853588
anomalous annual	0.075166	0.310509	0.892604	0.393556
anomalous annual detrended	0.359672	0.742791	0.896833	0.762327

Table 2: P-values

## 4.2 Spatial Correlations

Raw monthly indices correlated with SIC

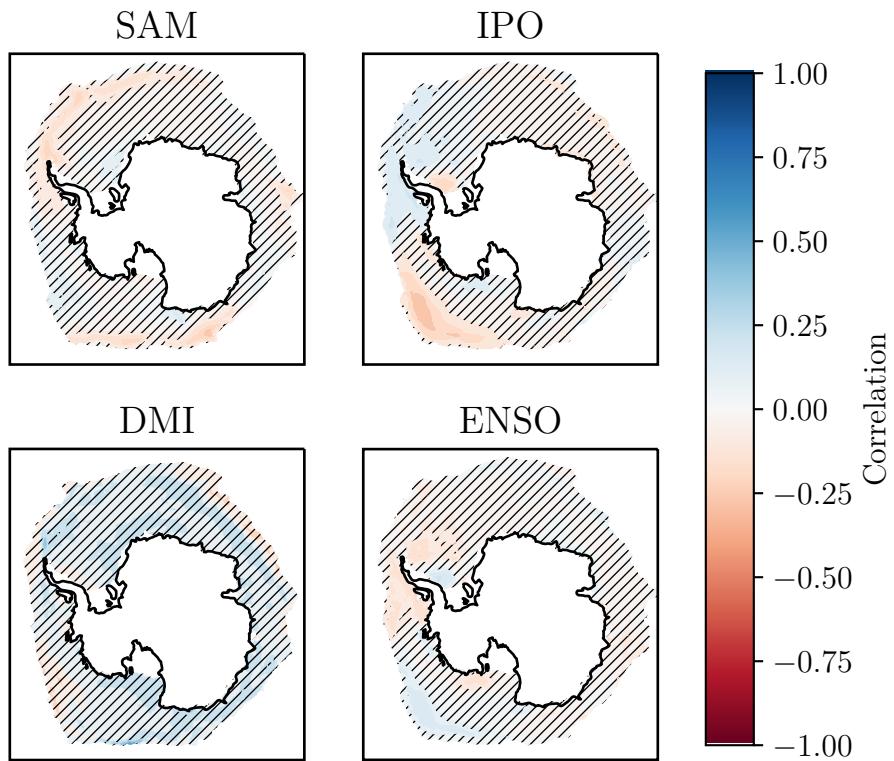


Figure 97: Correlations with raw monthly raw SIE in Antarctica from the NSIDC dataset.

Raw detrended monthly indices correlated with SIC

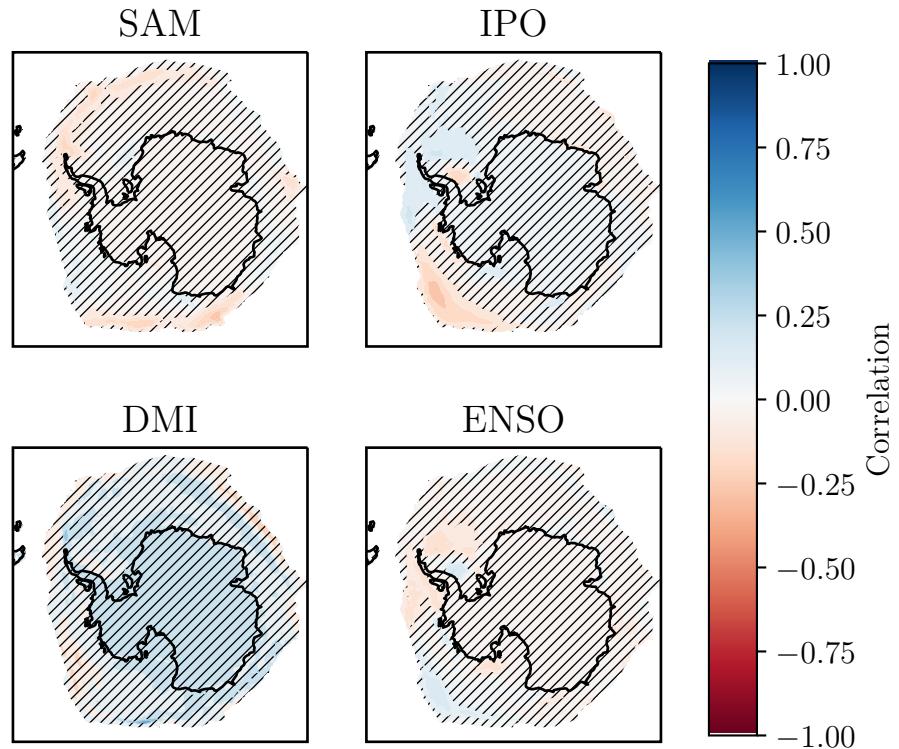


Figure 98: Correlations with raw monthly detrended SIE in Antarctica from the NSIDC dataset.

Anomalous monthly indices correlated with SIC

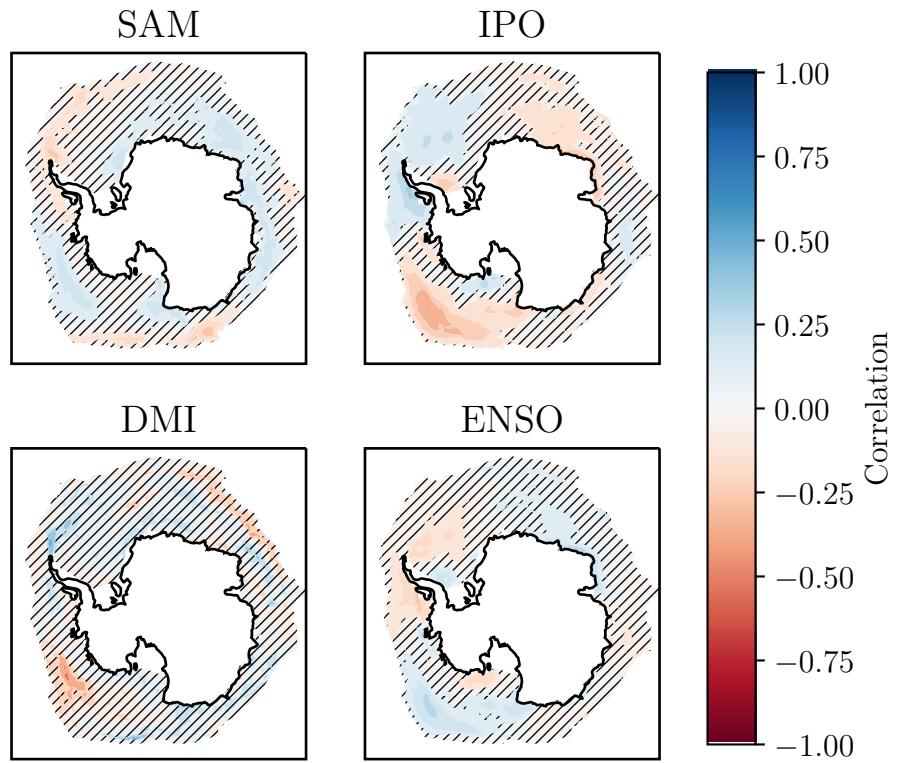


Figure 99: Correlations with anomalous monthly raw SIE in Antarctica from the NSIDC dataset.

Anomalous detrended monthly indices correlated with SIC

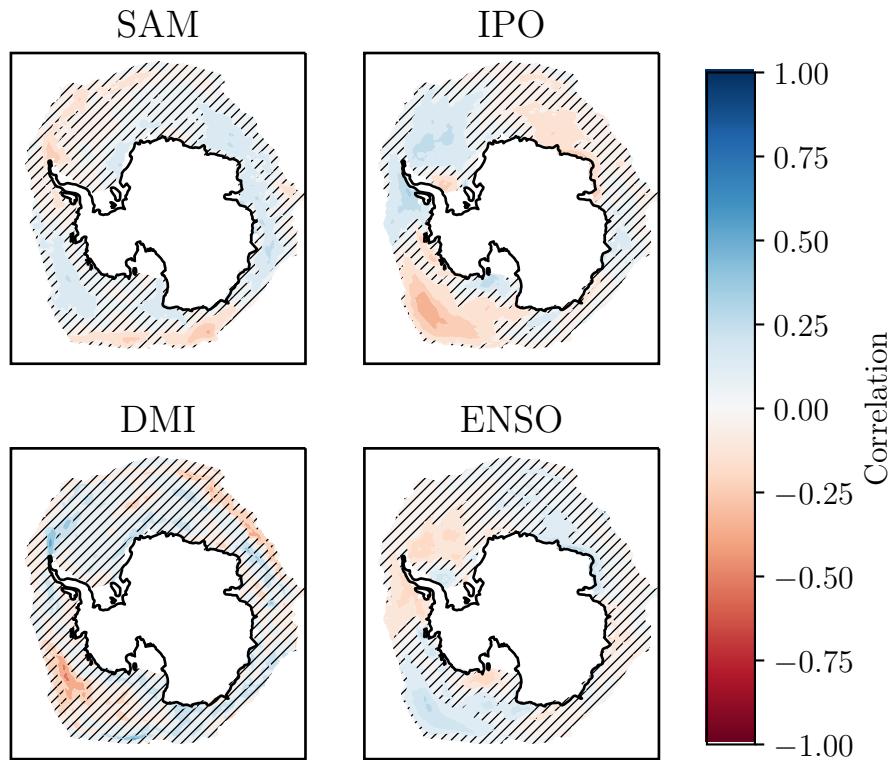


Figure 100: Correlations with anomalous monthly detrended SIE in Antarctica from the NSIDC dataset.

Raw seasonal indices correlated with SIC

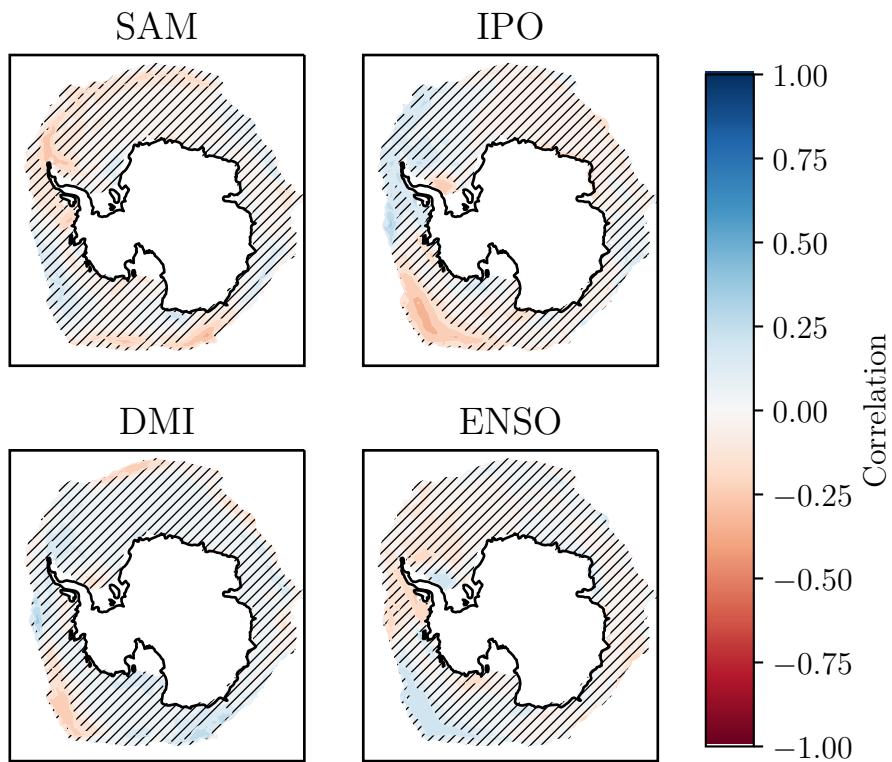


Figure 101: Correlations with raw seasonal raw SIE in Antarctica from the NSIDC dataset.

Raw detrended seasonal indices correlated with SIC

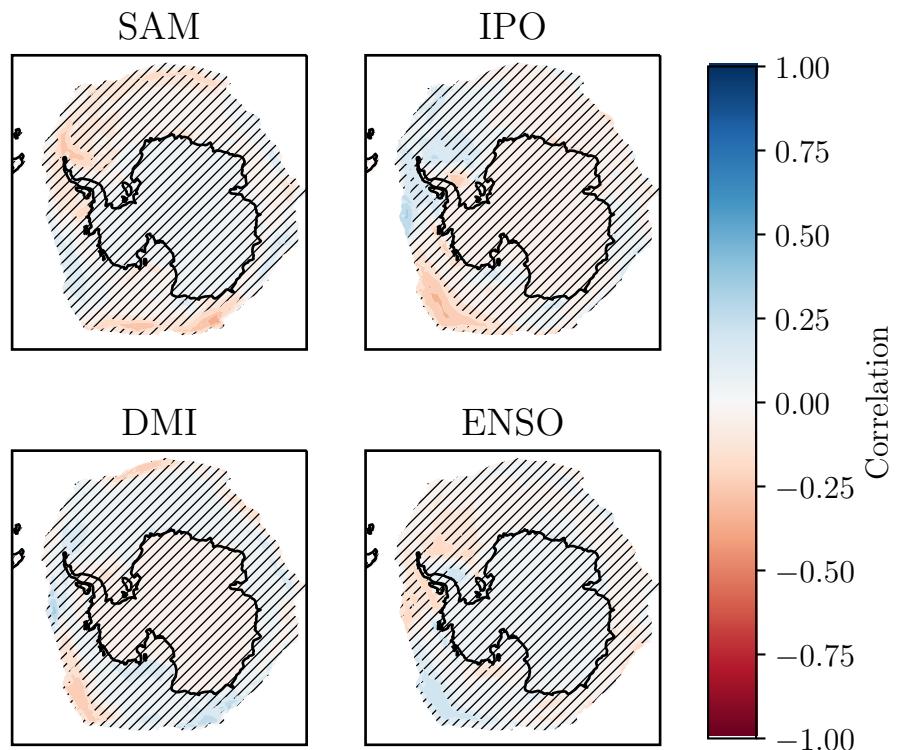


Figure 102: Correlations with raw seasonal detrended SIE in Antarctica from the NSIDC dataset.

### Anomalous seasonal indices correlated with SIC

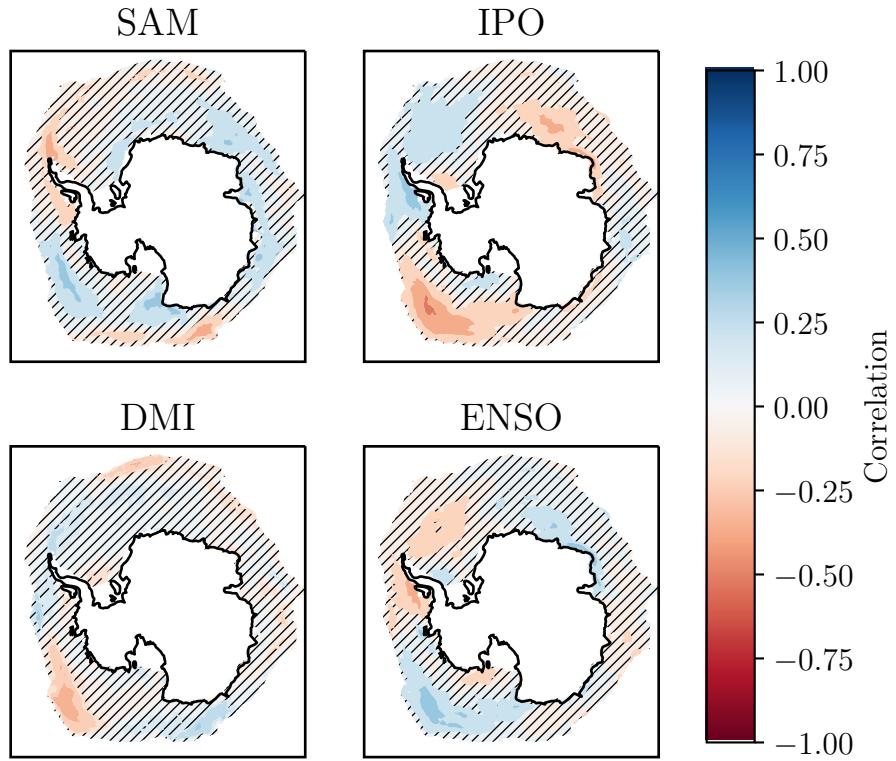


Figure 103: Correlations with anomalous seasonal raw SIE in Antarctica from the NSIDC dataset.

Anomalous detrended seasonal indices correlated with SIC

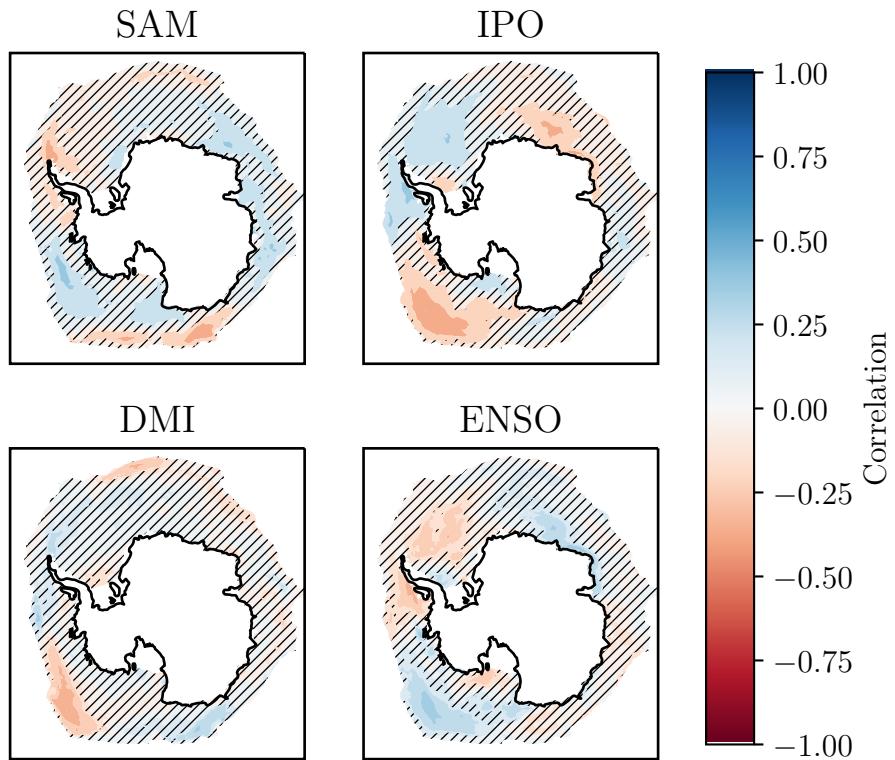


Figure 104: Correlations with anomalous seasonal detrended SIE in Antarctica from the NSIDC dataset.

Raw annual indices correlated with SIC

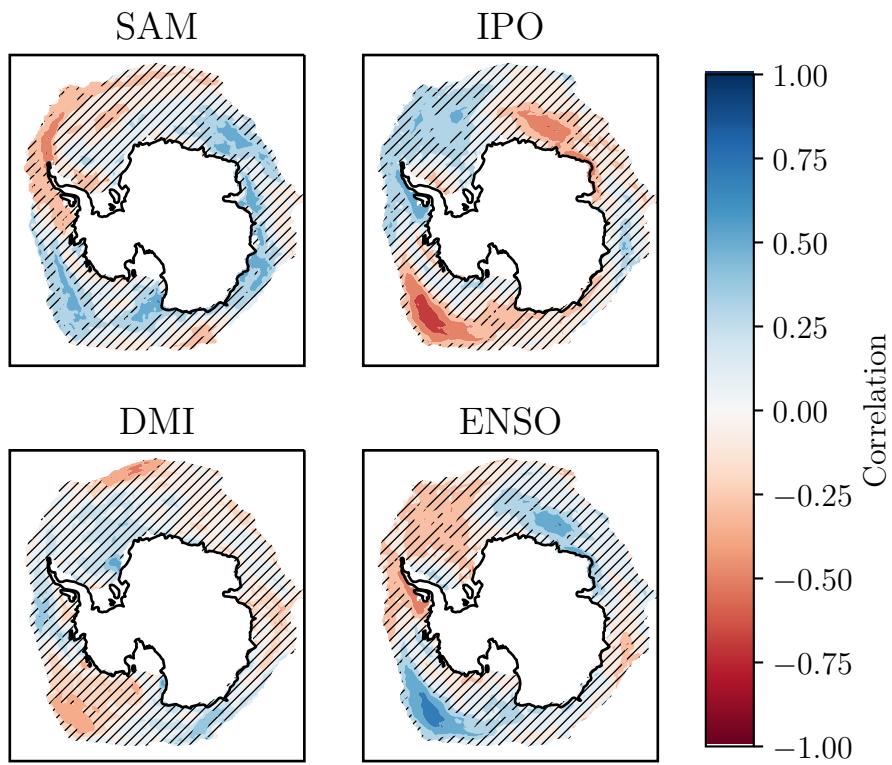


Figure 105: Correlations with raw annual raw SIE in Antarctica from the NSIDC dataset.

Raw detrended annual indices correlated with SIC

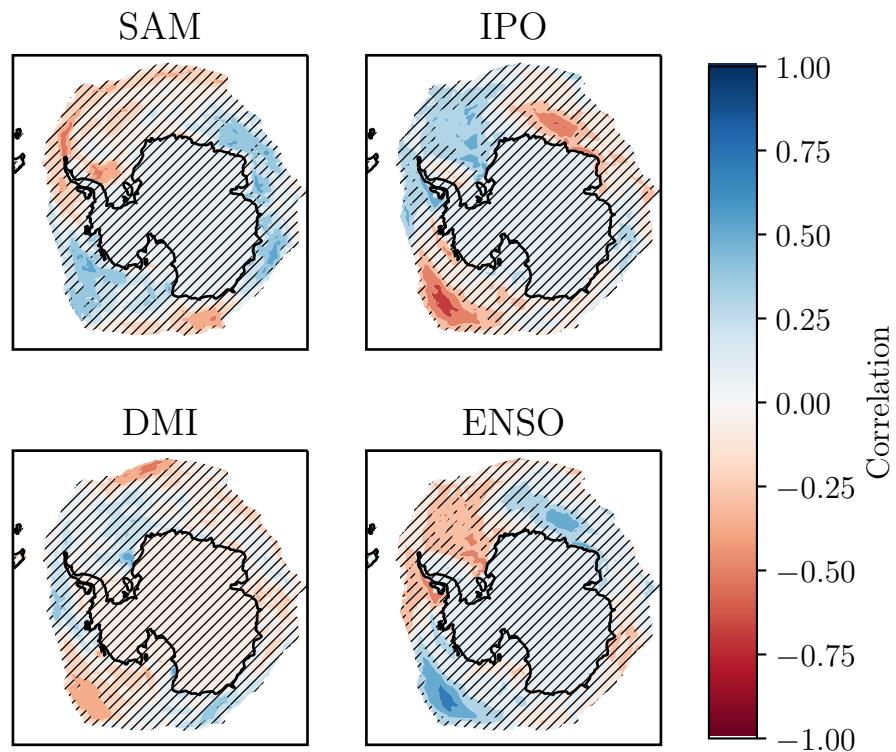


Figure 106: Correlations with raw annual detrended SIE in Antarctica from the NSIDC dataset.

Anomalous annual indices correlated with SIC

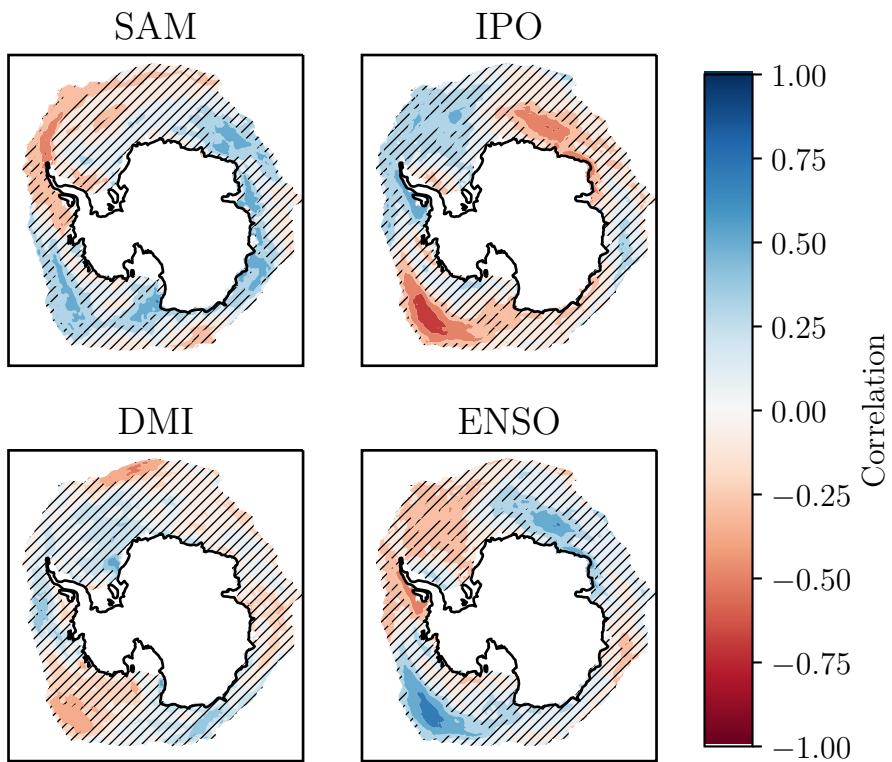


Figure 107: Correlations with anomalous annual raw SIE in Antarctica from the NSIDC dataset.

Anomalous detrended annual indices correlated with SIC

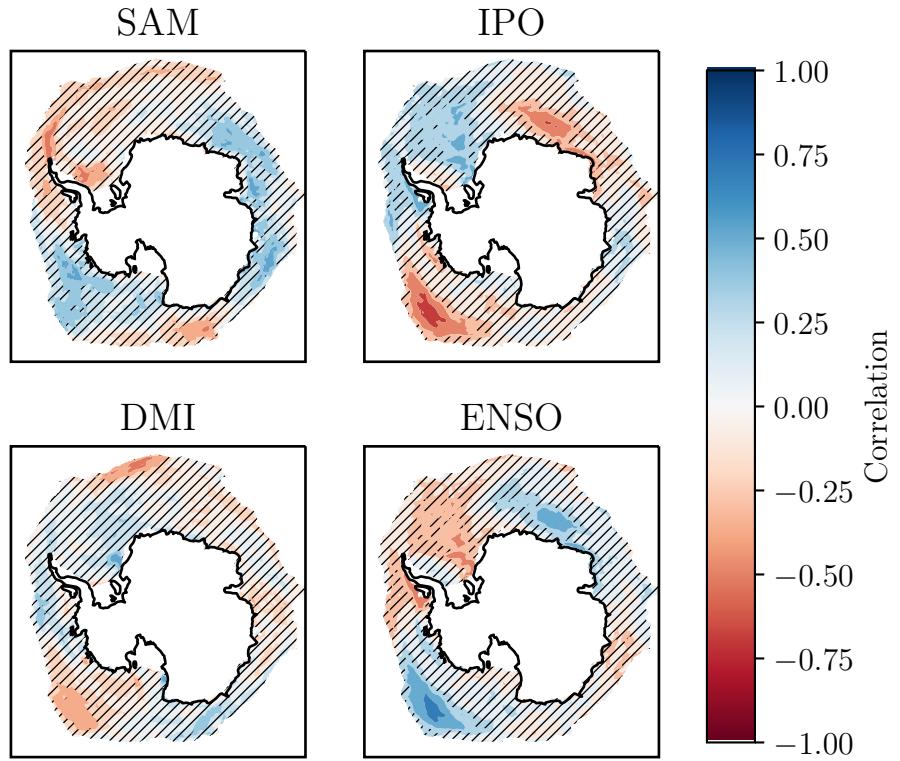


Figure 108: Correlations with anomalous annual detrended SIE in Antarctica from the NSIDC dataset.

## 5 Regressions

### 5.1 Scatter

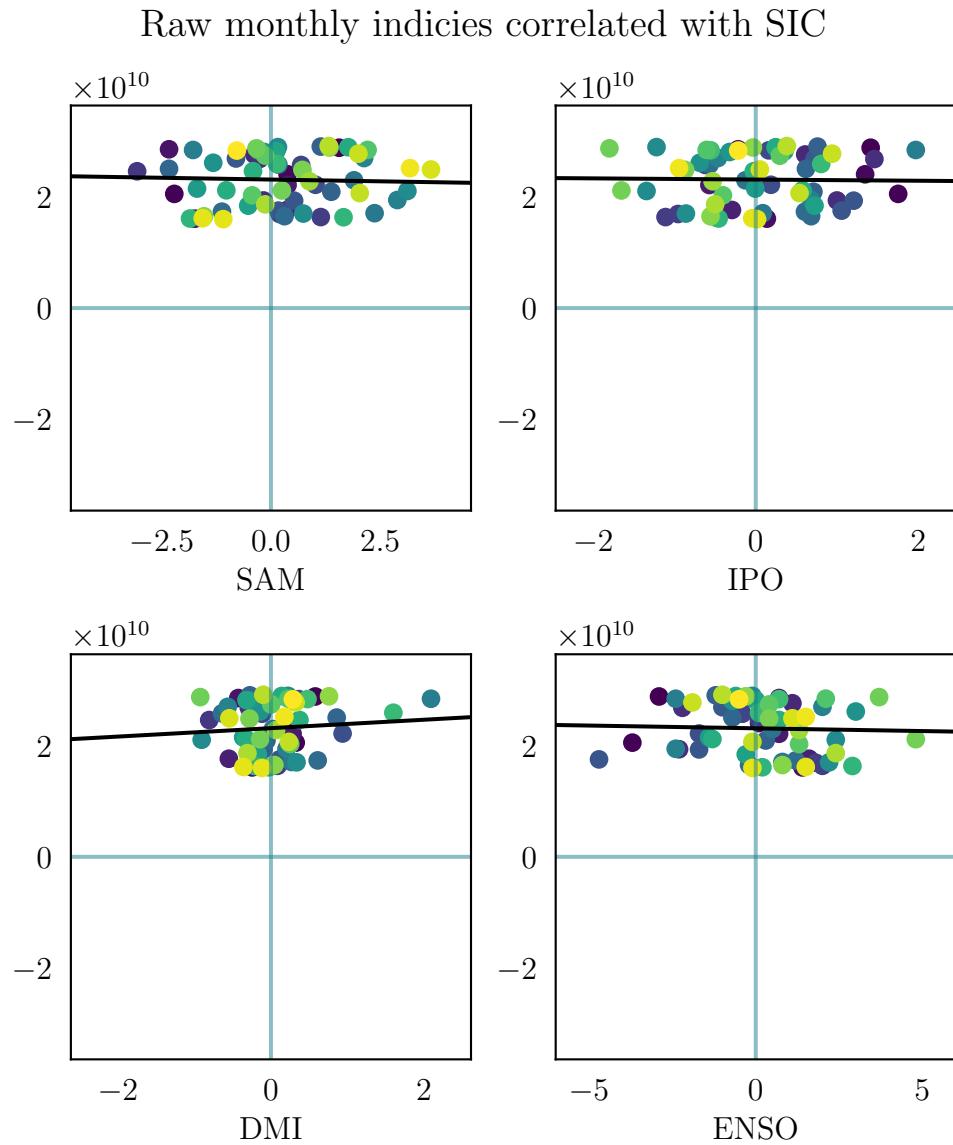


Figure 109: Correlations with raw monthly raw SIE in Antarctica from the NSIDC dataset.

### Raw detrended monthly indicies correlated with SIC

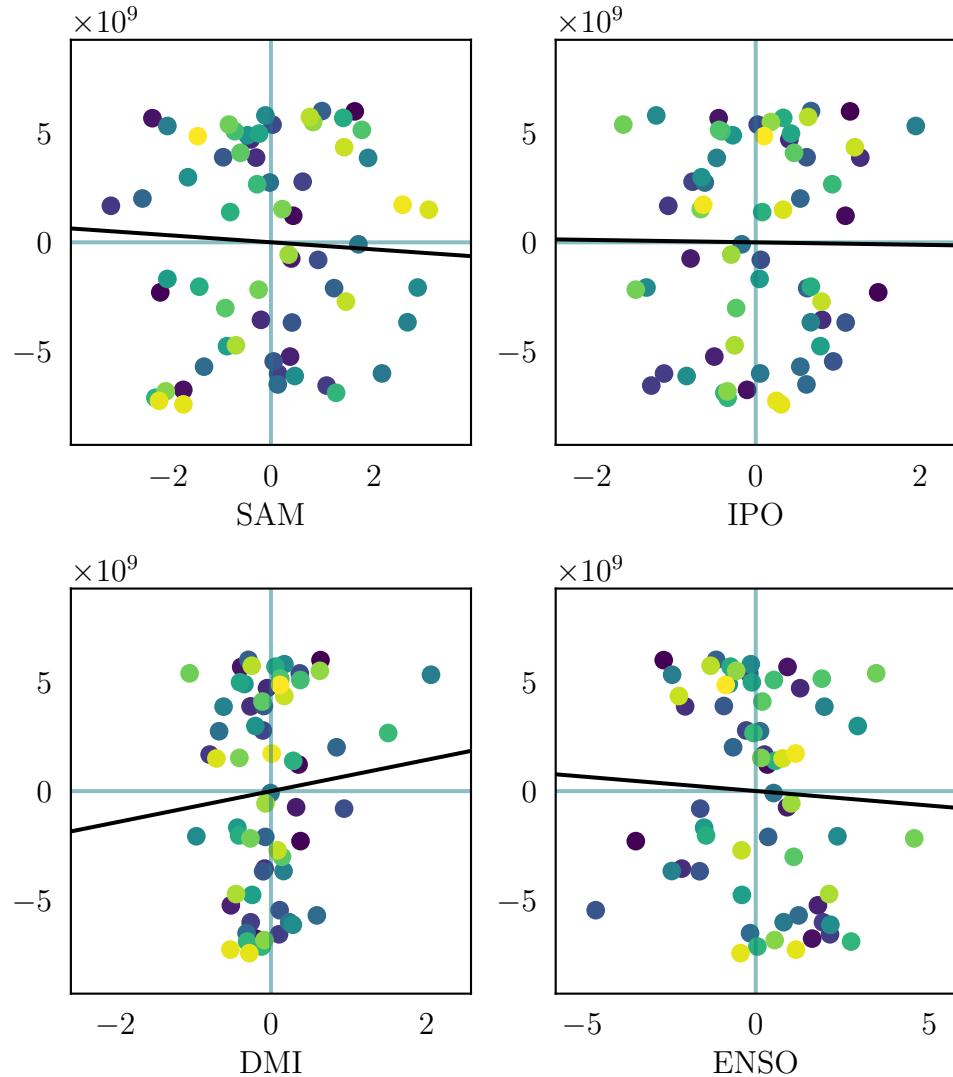


Figure 110: Correlations with raw monthly detrended SIE in Antarctica from the NSIDC dataset.

### Anomalous monthly indicies correlated with SIC

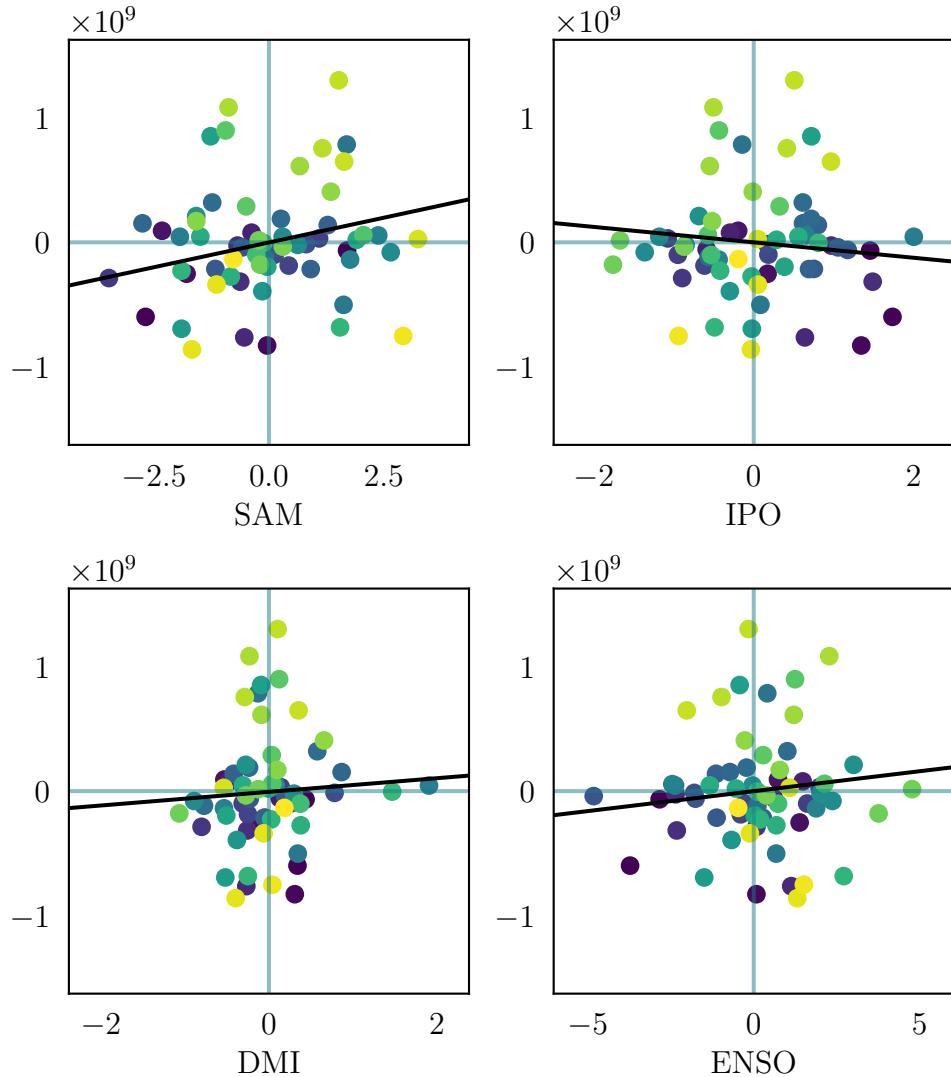


Figure 111: Correlations with anomalous monthly raw SIE in Antarctica from the NSIDC dataset.

### Anomalous detrended monthly indices correlated with SIC

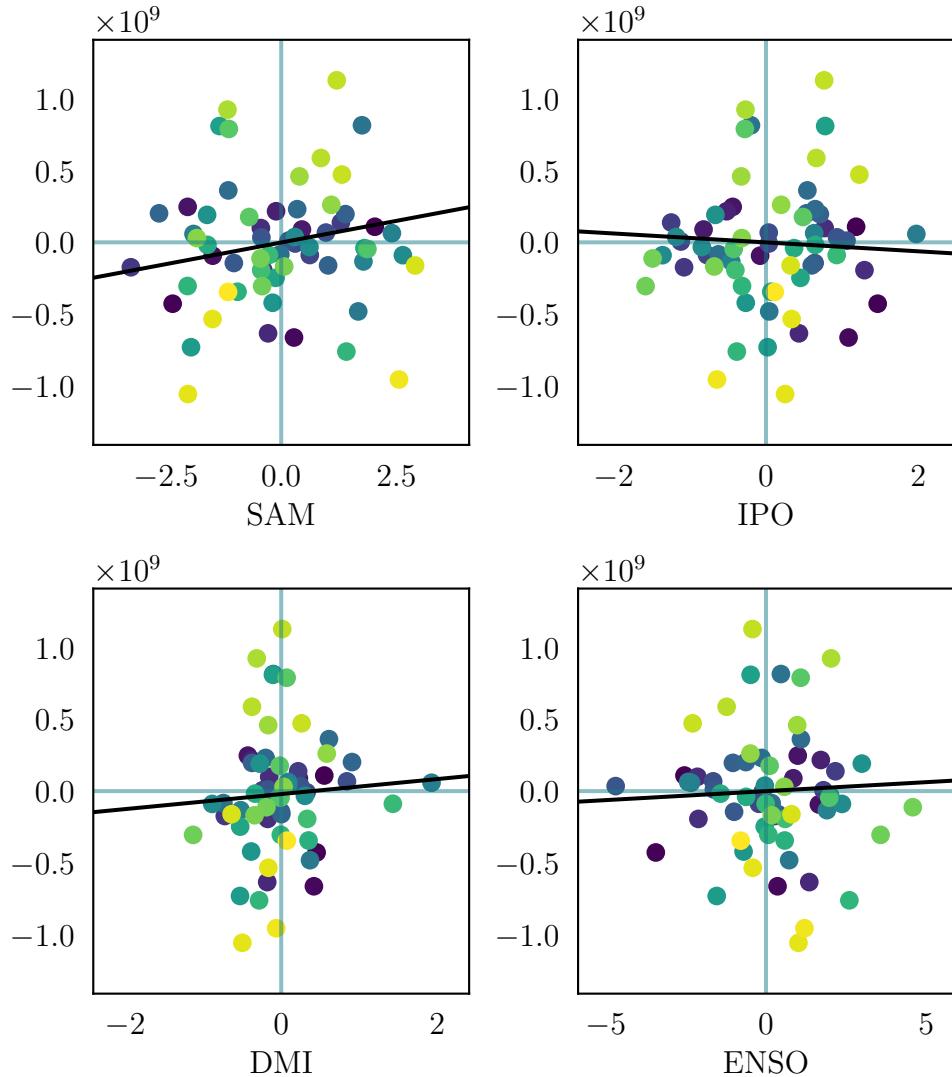


Figure 112: Correlations with anomalous monthly detrended SIE in Antarctica from the NSIDC dataset.

### Raw seasonal indices correlated with SIC

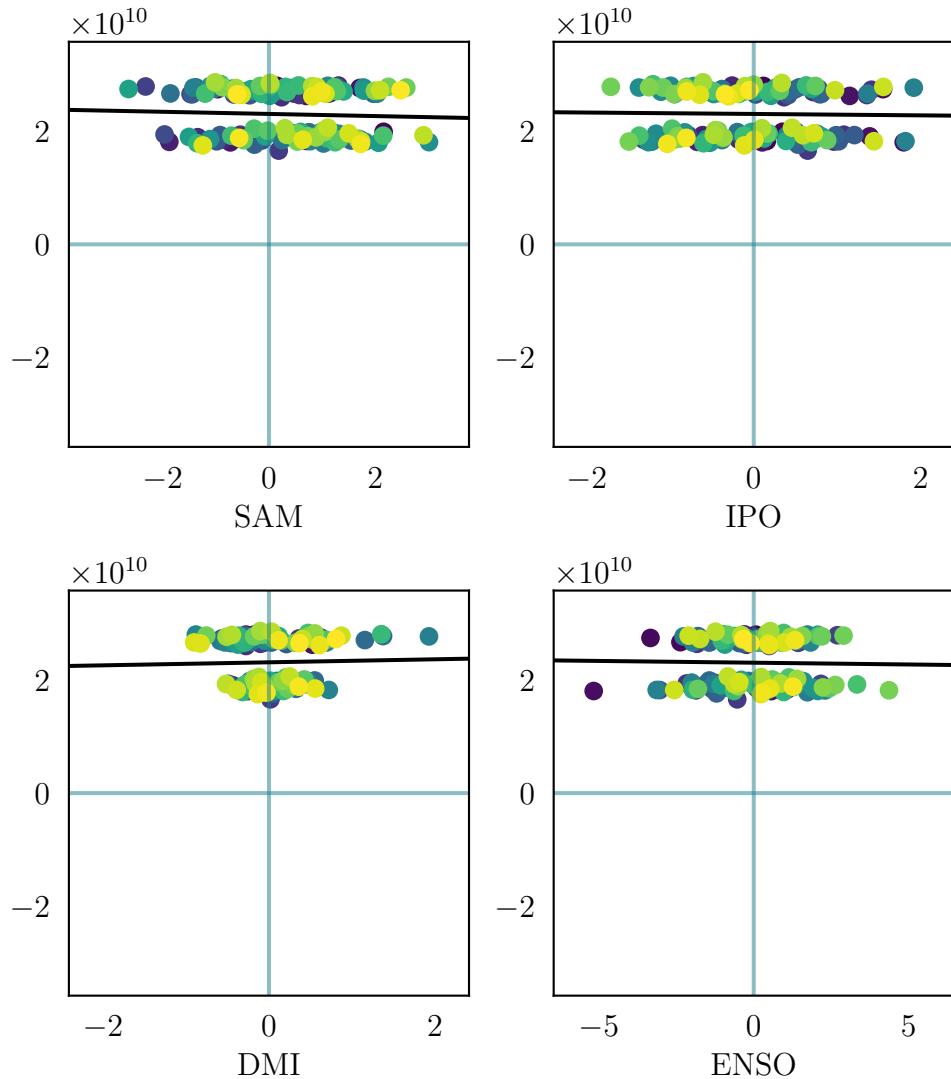


Figure 113: Correlations with raw seasonal raw SIE in Antarctica from the NSIDC dataset.

### Raw detrended seasonal indices correlated with SIC

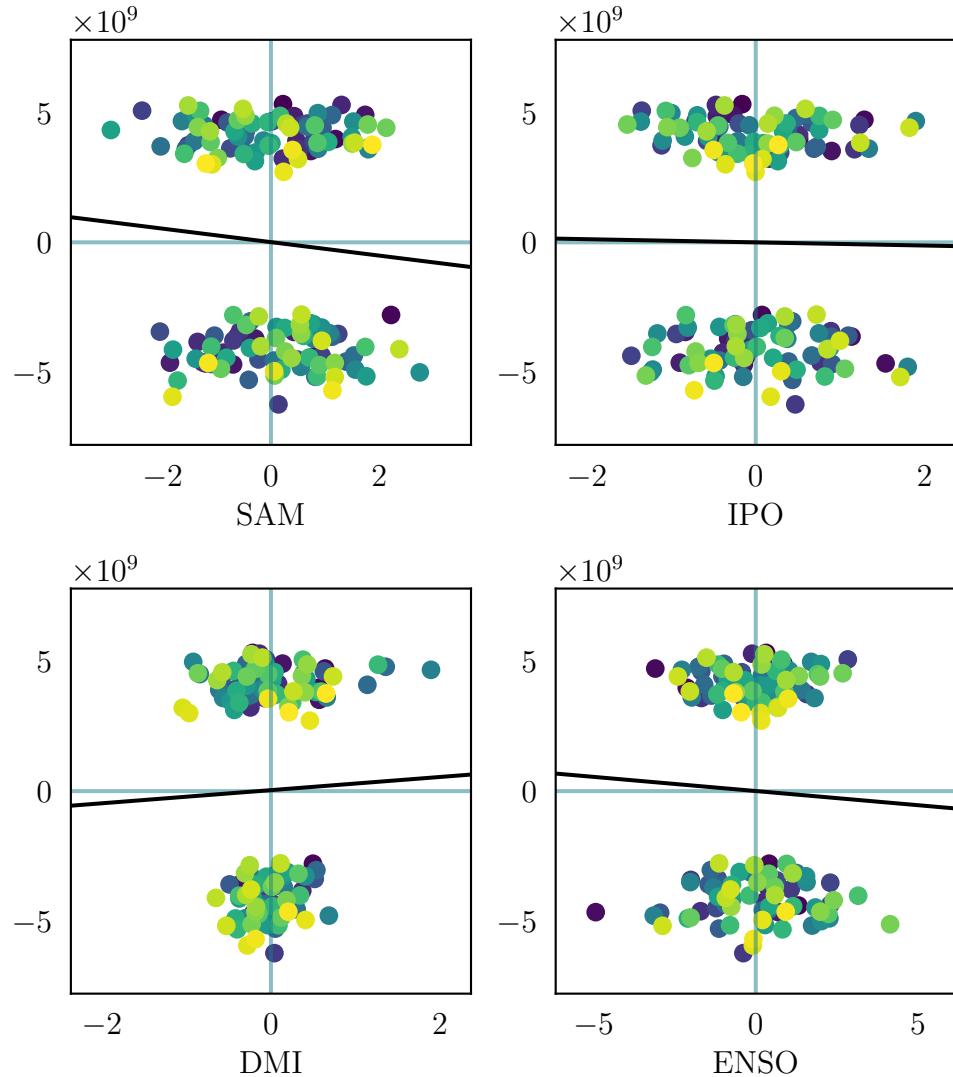


Figure 114: Correlations with raw seasonal detrended SIE in Antarctica from the NSIDC dataset.

### Anomalous seasonal indices correlated with SIC

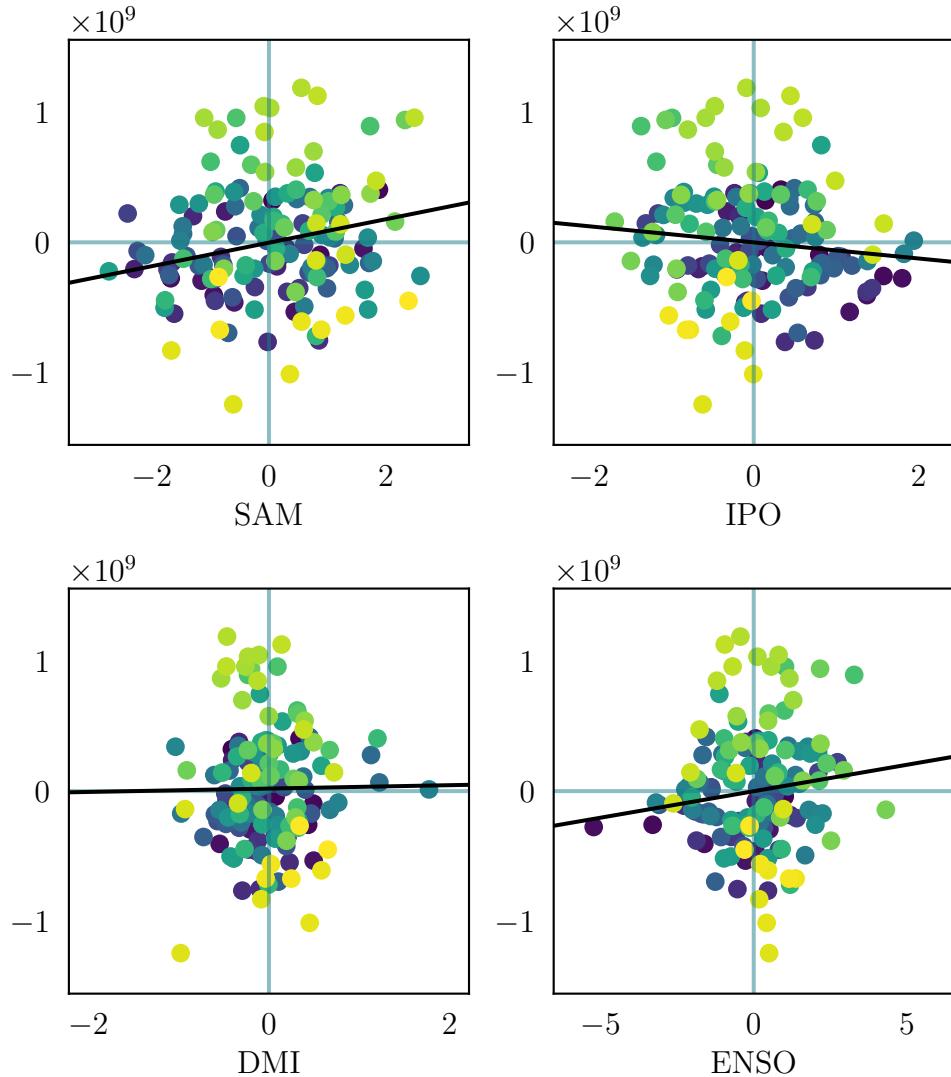


Figure 115: Correlations with anomalous seasonal raw SIE in Antarctica from the NSIDC dataset.

### Anomalous detrended seasonal indices correlated with SIC

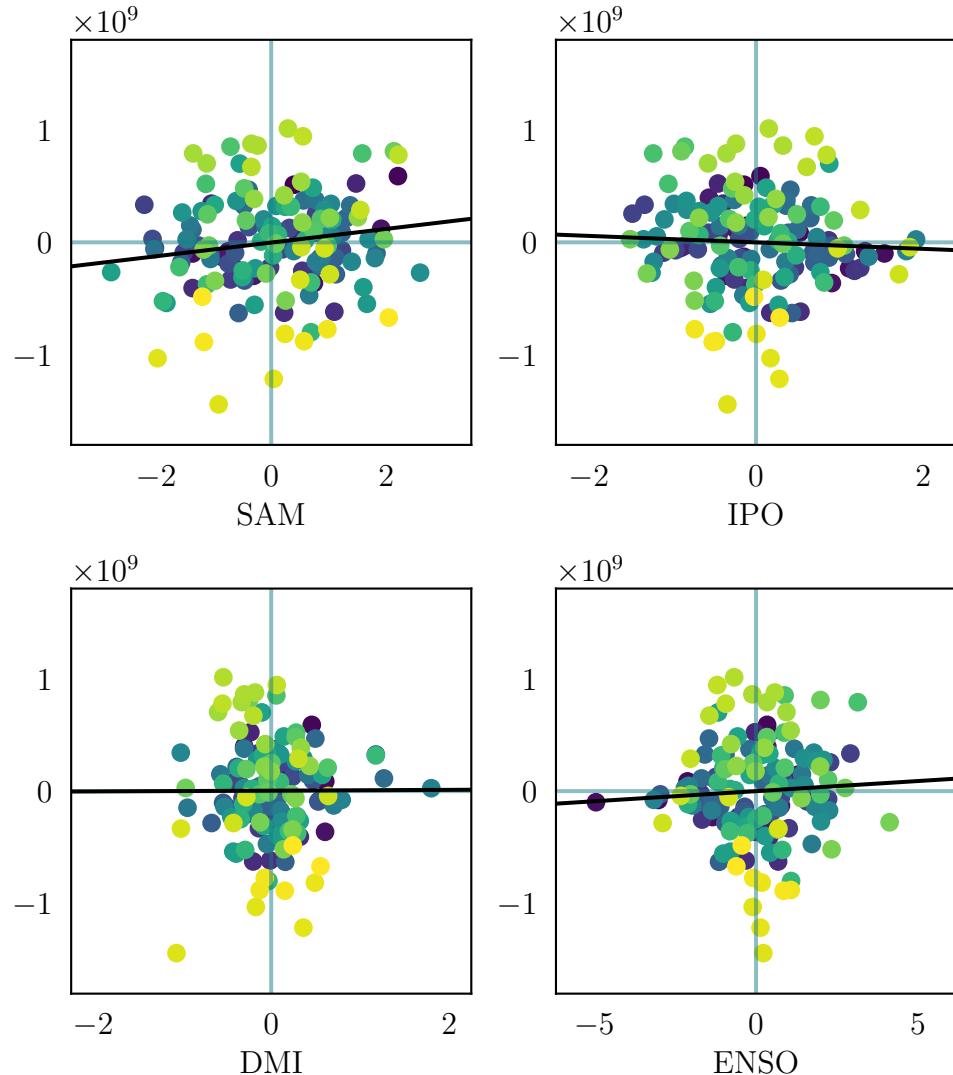


Figure 116: Correlations with anomalous seasonal detrended SIE in Antarctica from the NSIDC dataset.

### Raw annual indices correlated with SIC

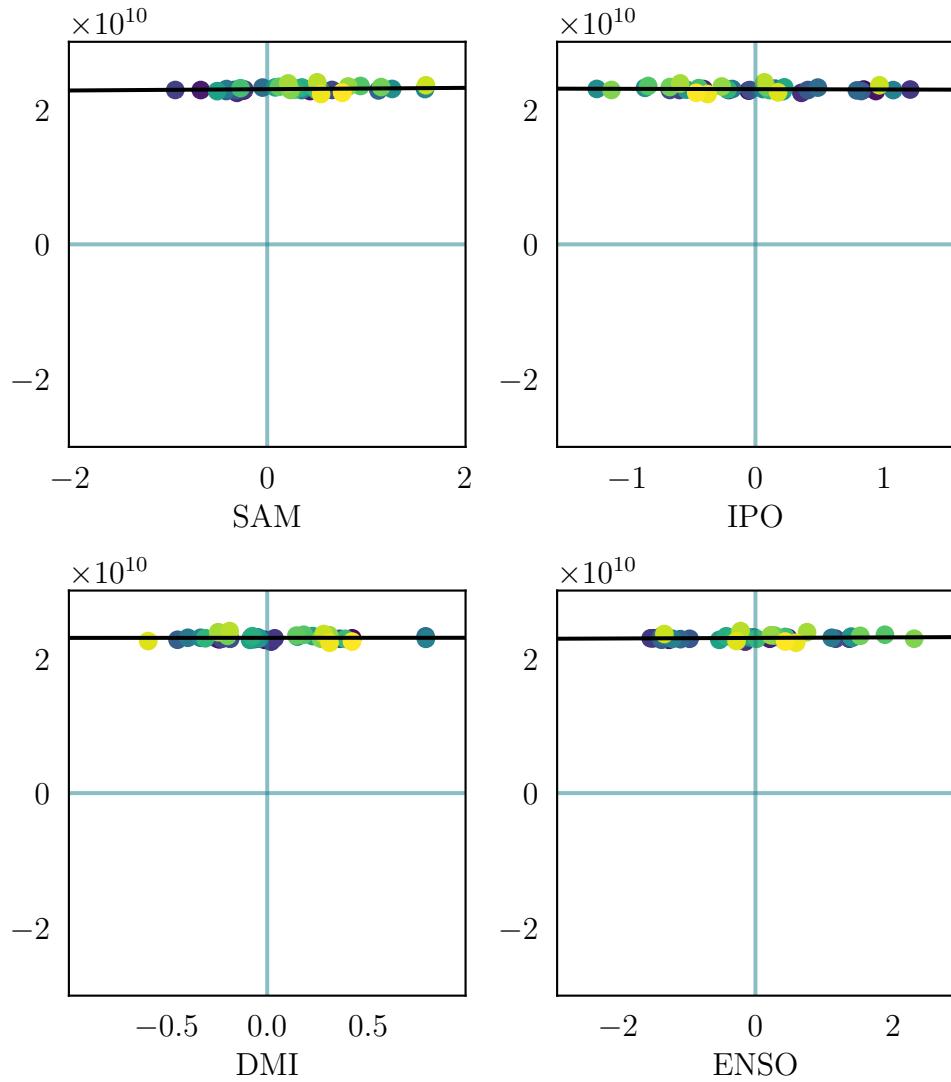


Figure 117: Correlations with raw annual raw SIE in Antarctica from the NSIDC dataset.

### Raw detrended annual indices correlated with SIC

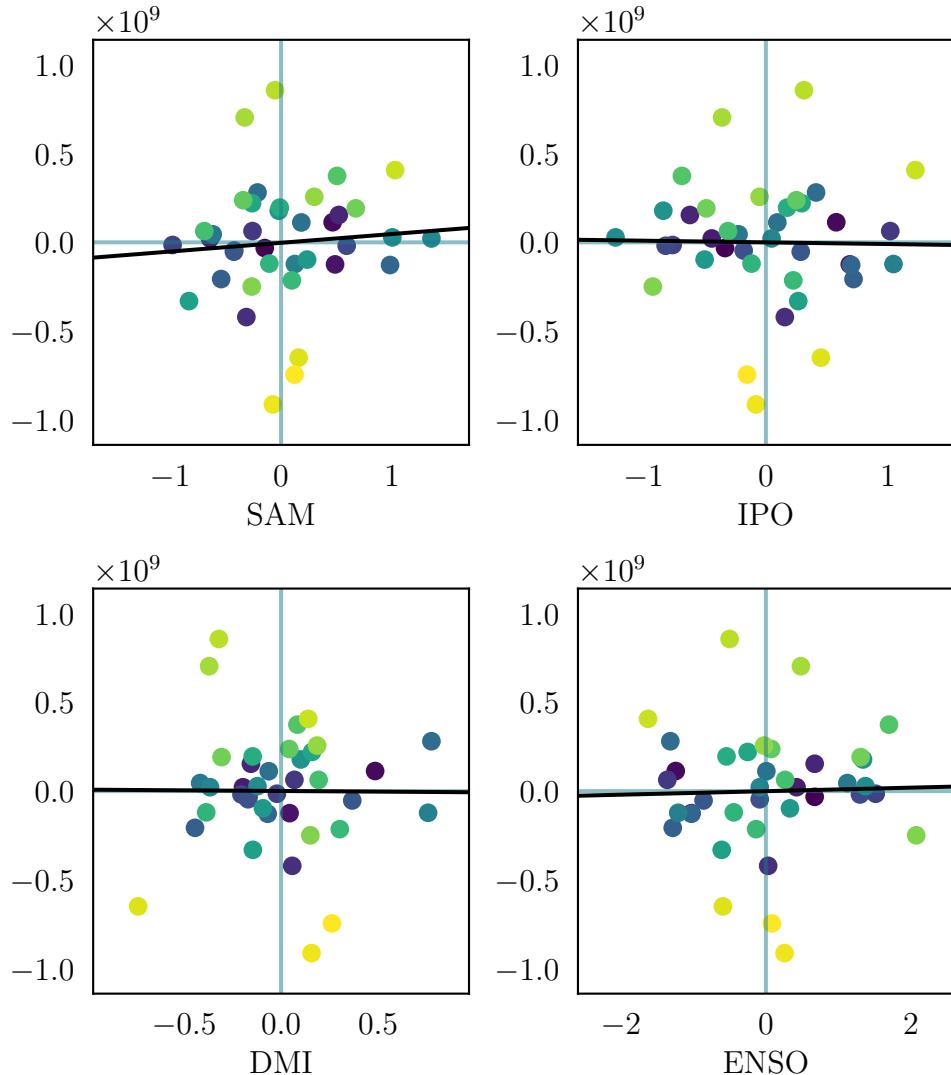


Figure 118: Correlations with raw annual detrended SIE in Antarctica from the NSIDC dataset.

### Anomalous annual indices correlated with SIC

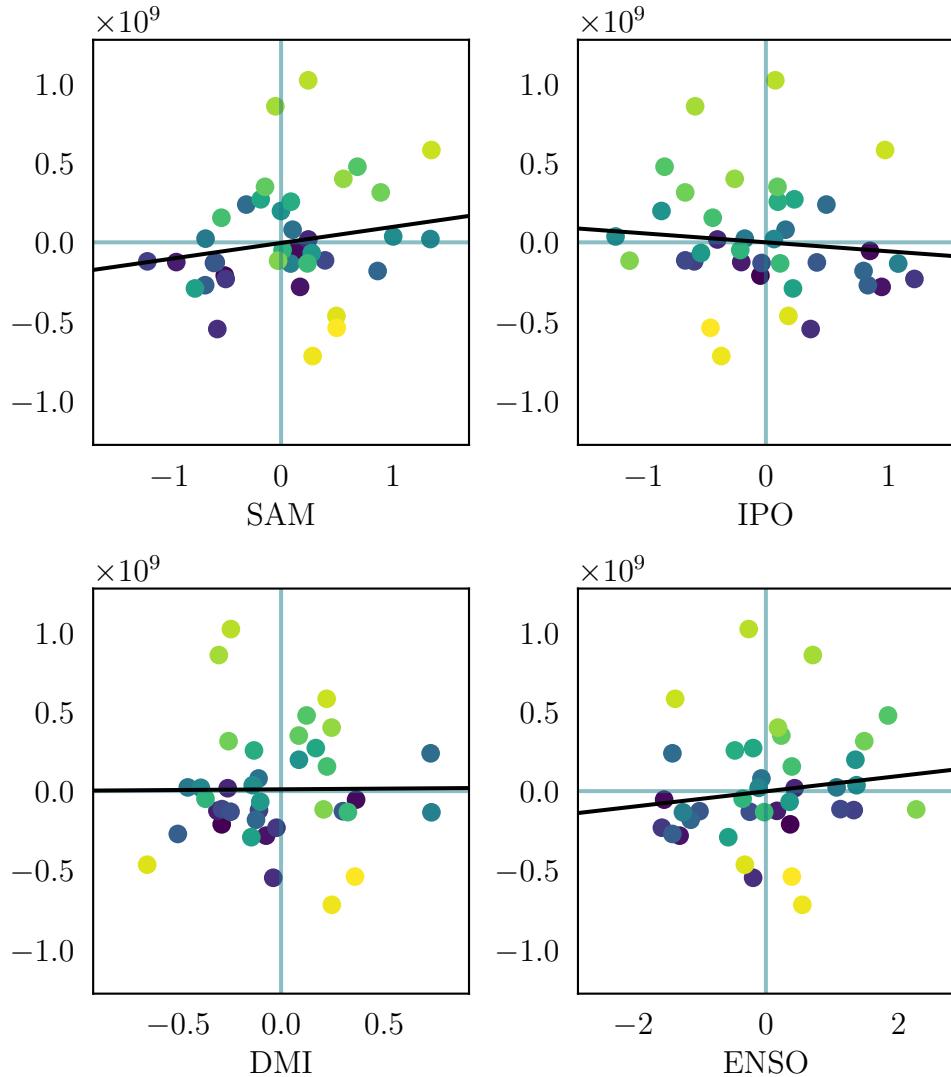


Figure 119: Correlations with anomalous annual raw SIE in Antarctica from the NSIDC dataset.

### Anomalous detrended annual indices correlated with SIC

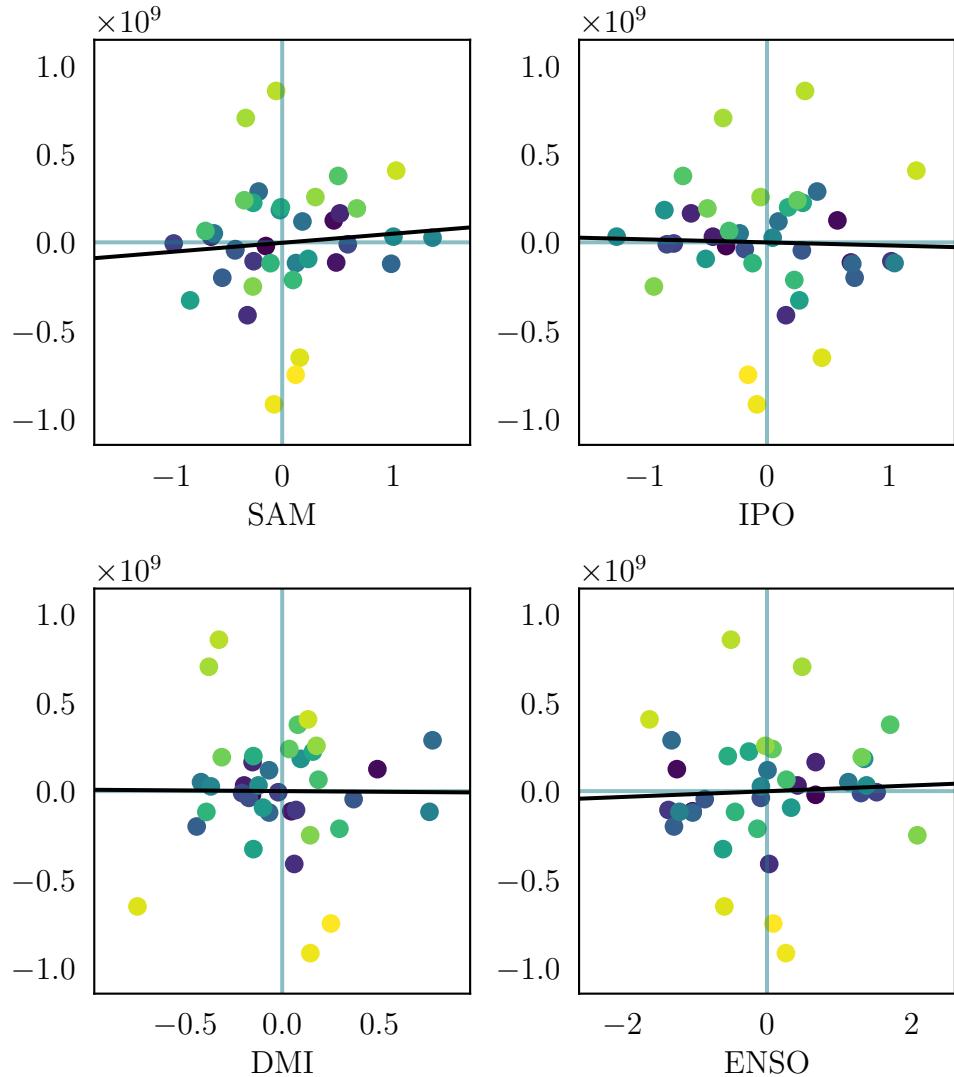


Figure 120: Correlations with anomalous annual detrended SIE in Antarctica from the NSIDC dataset.