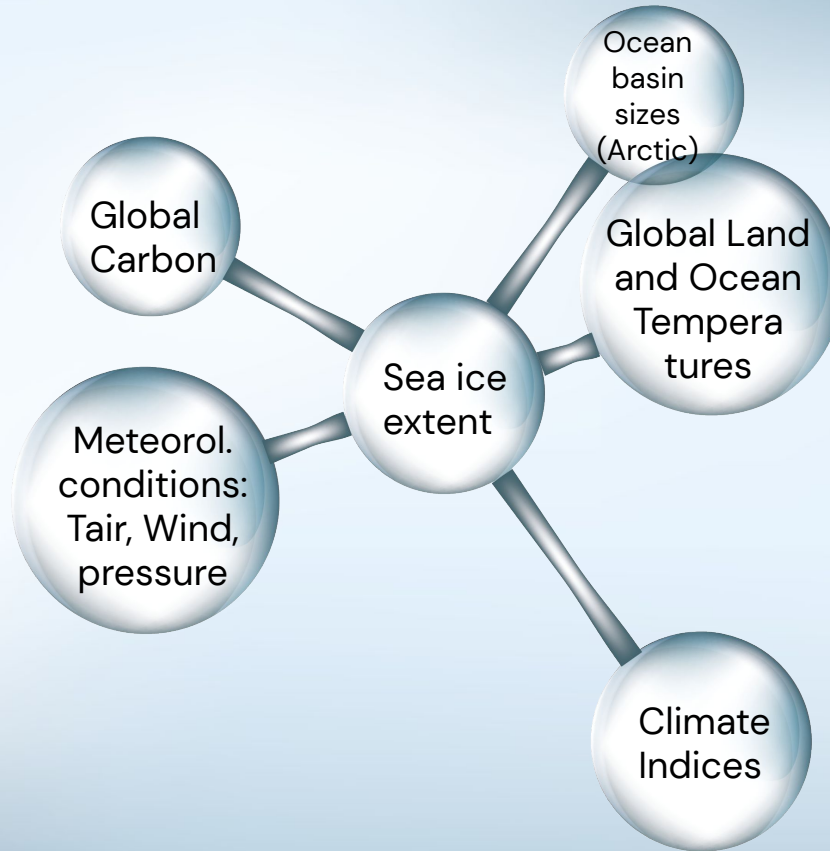




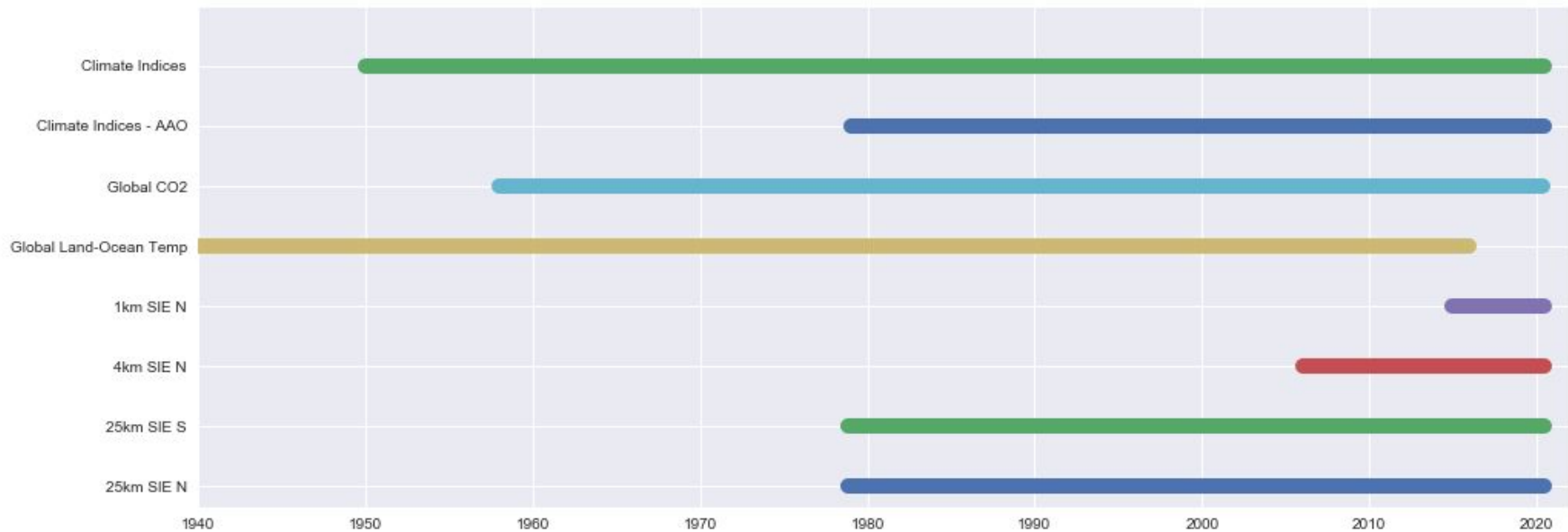
Sea ice

EDA PArt II

Data



Data availability





Some Abbreviations



SIE/Extent

Sea ice extent – Area in which
at least partly ice occurs

ICA/Area

Ice covered area – Actual area
which is covered by ice

Some Abbreviations

A/AA

Arctic/Antarctic

T_{air}

Air
temperature

AOI/AAO

Arctic/Antarctic
Oscillation Index

PNA

Pacific North
American
Oscillation

NH/SH

Northern Hemisphere/
Southern Hemisphere

SLP

Sea level (air)
pressure

NAO

North Atlantic
Oscillation

SCAND

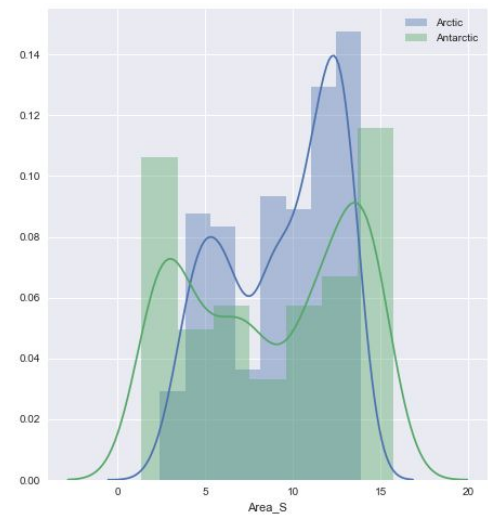
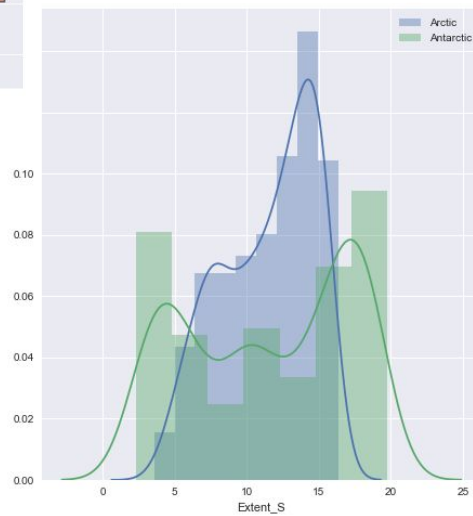
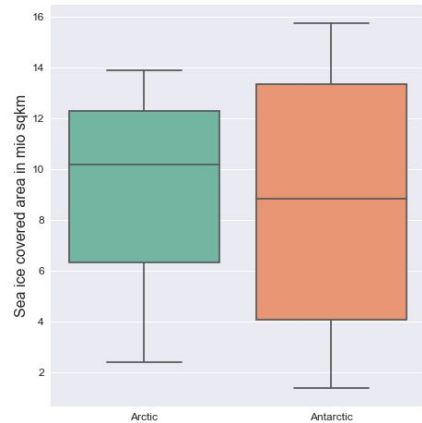
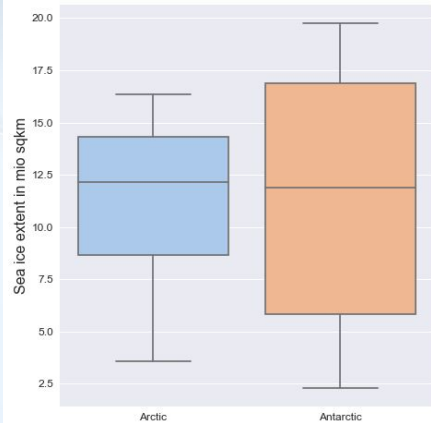
Scandinavian
Pattern

The background of the slide features a light blue gradient with several stylized water molecules and bubbles. The water molecules are depicted as two small blue spheres connected by a thin grey rod, while the bubbles are larger, translucent blue spheres. These elements are scattered across the slide, with some appearing in sharp focus and others blurred, creating a sense of depth and movement.

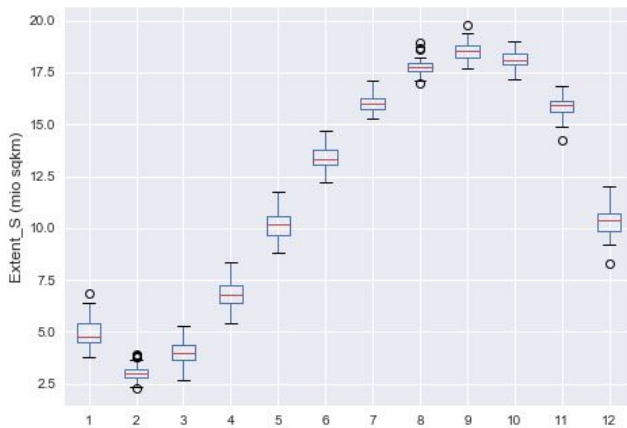
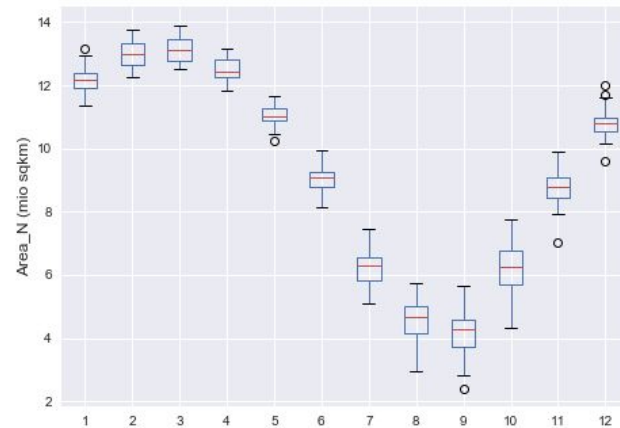
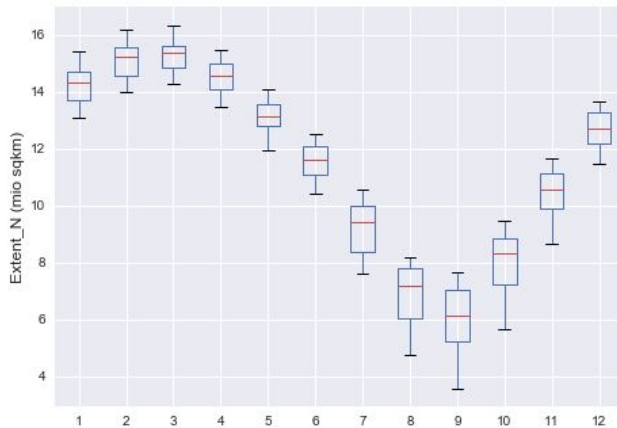
01

Sea ice extent in both hemispheres

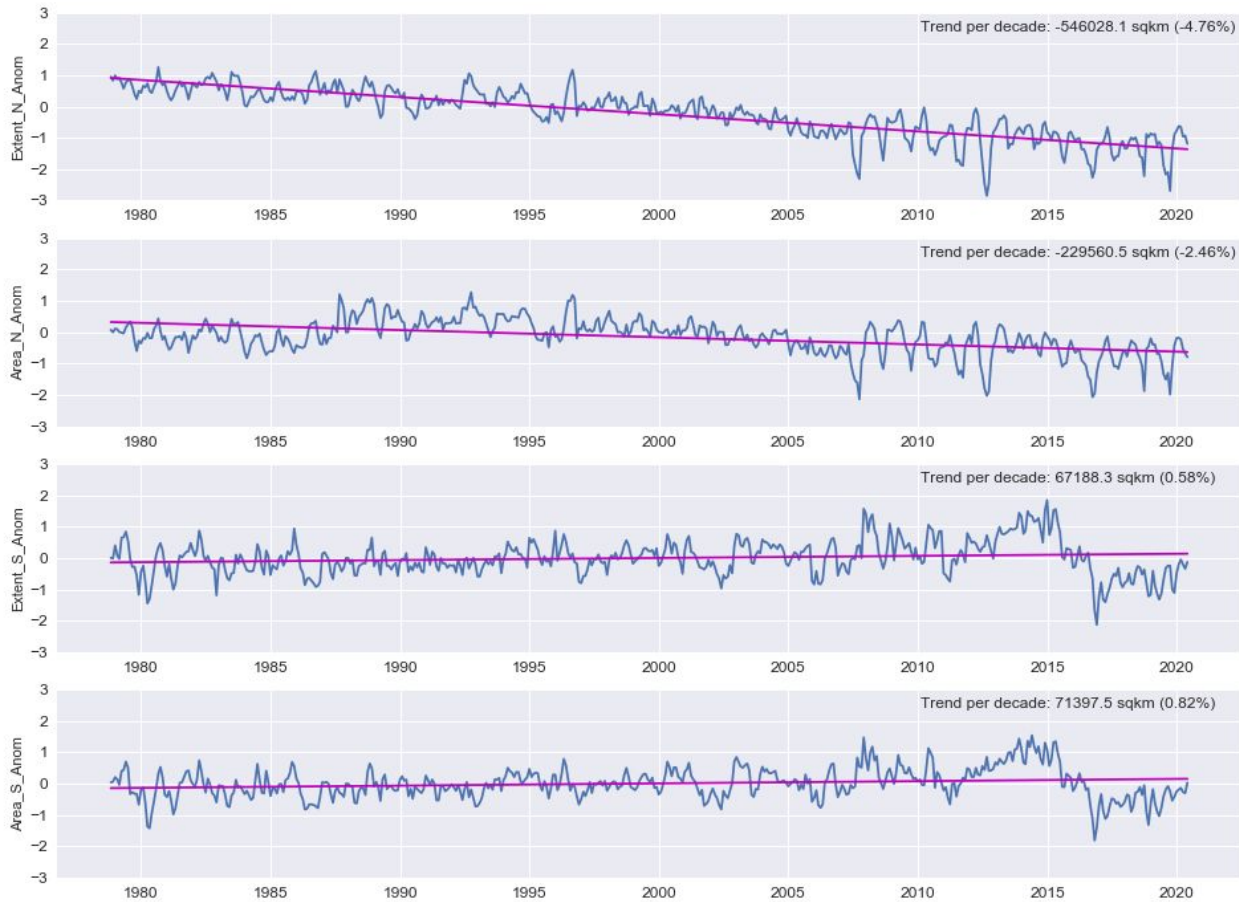
SIE 25 km distribution



Outliers and Seasonal cycle

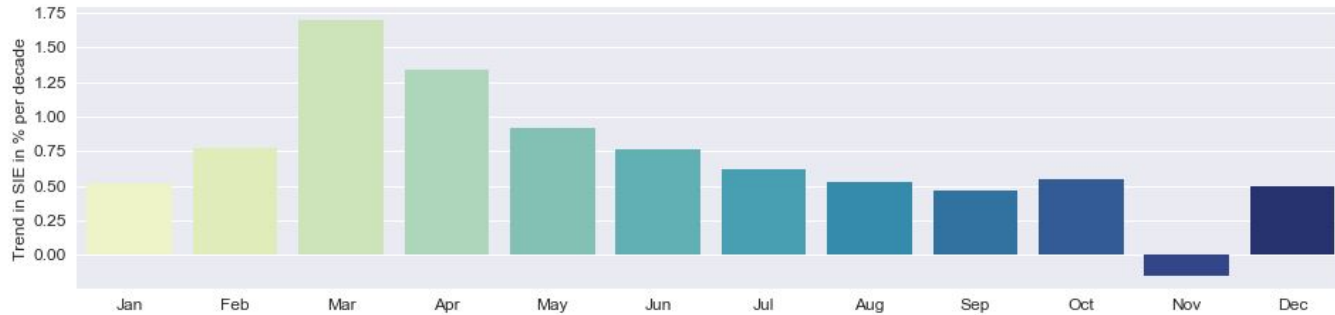
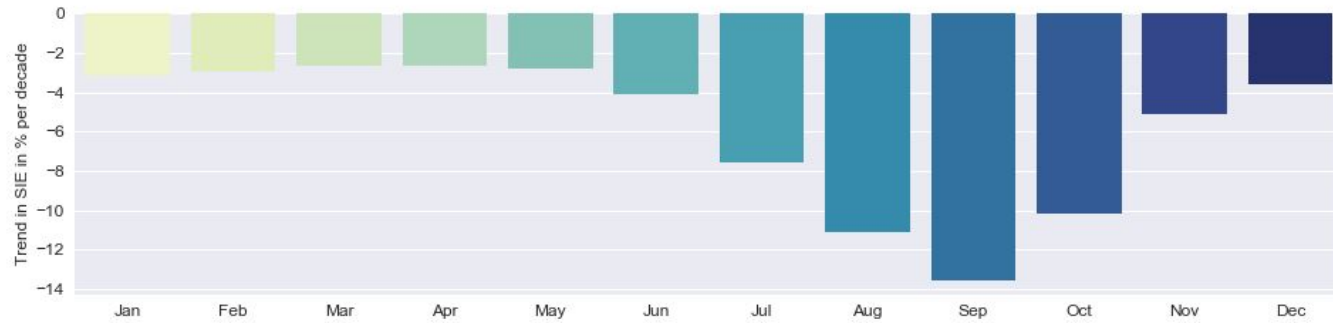


Temporal evolution



Seasonal Trends

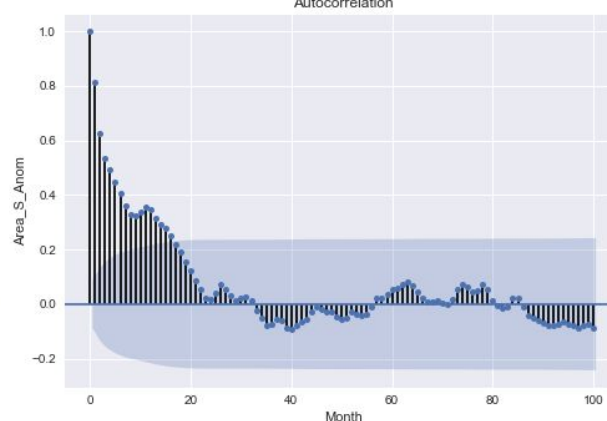
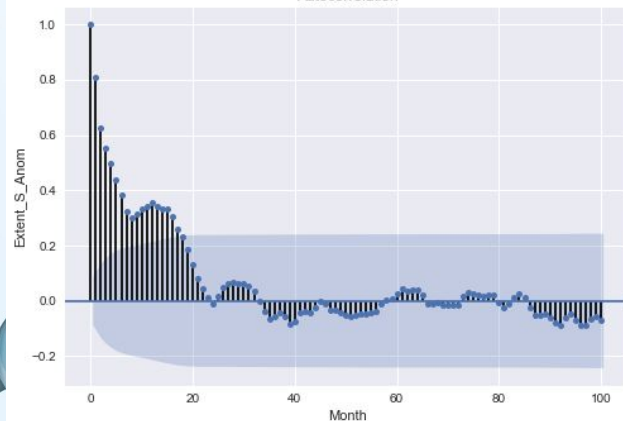
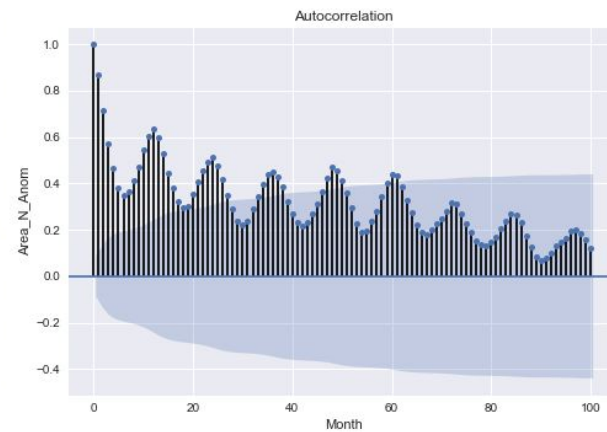
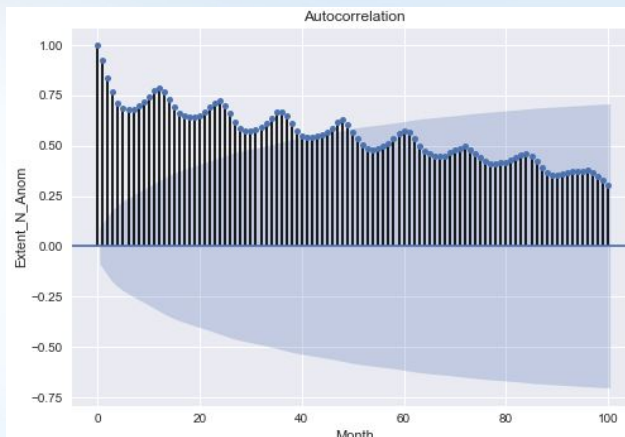
Arctic



Antarctic

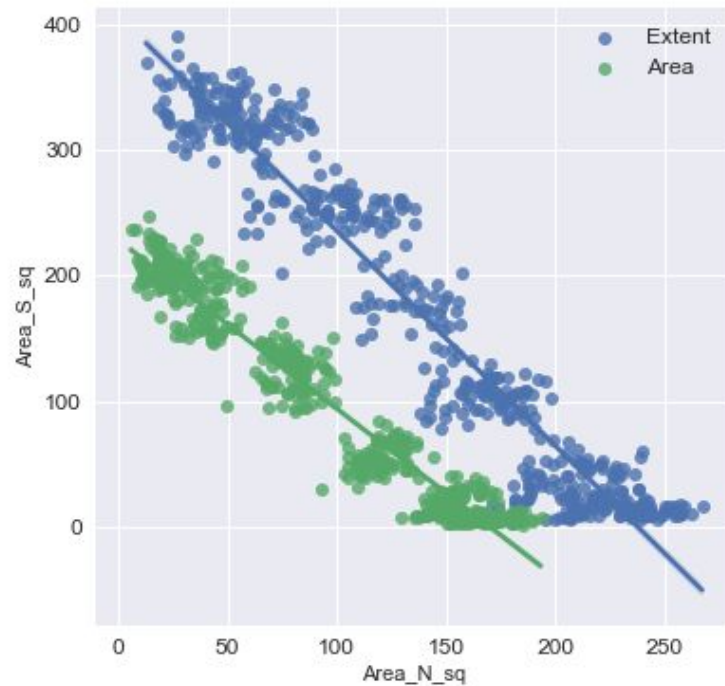
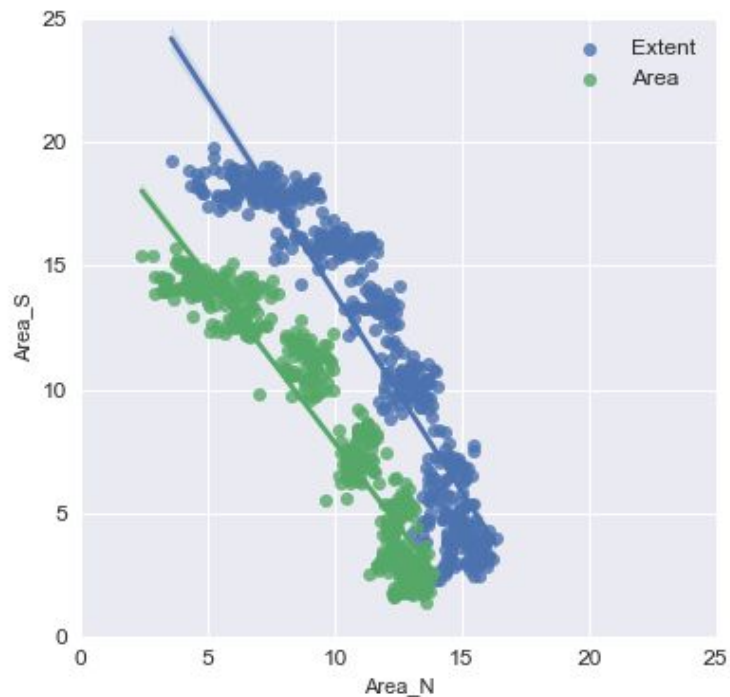
Autocorrelation

Arctic



Antarctic

Arctic vs Antarctic SIE and ICA

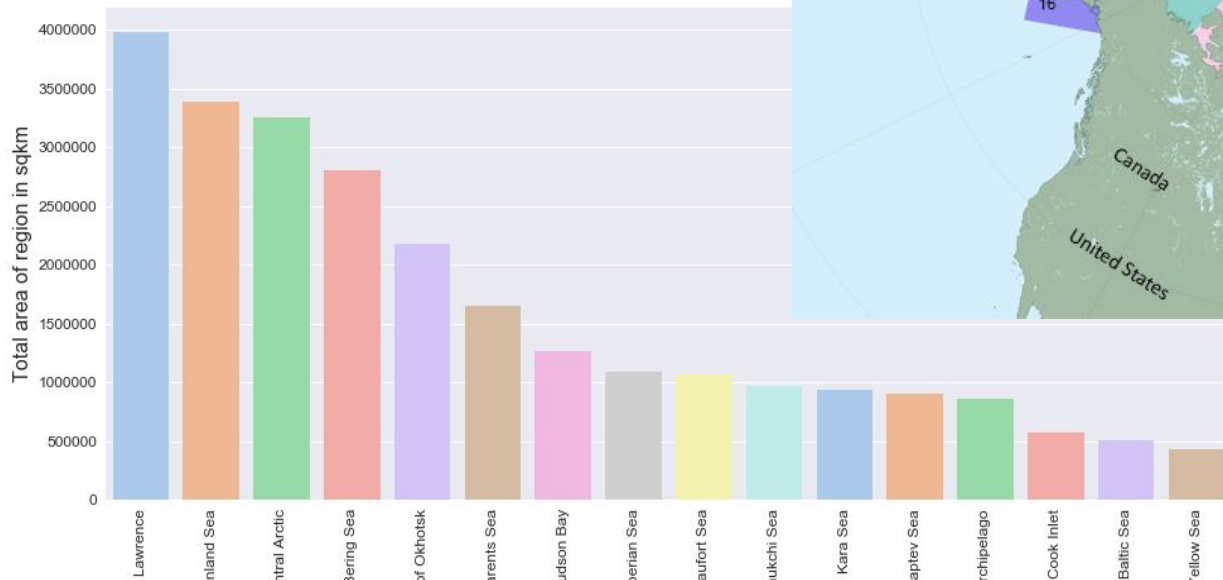




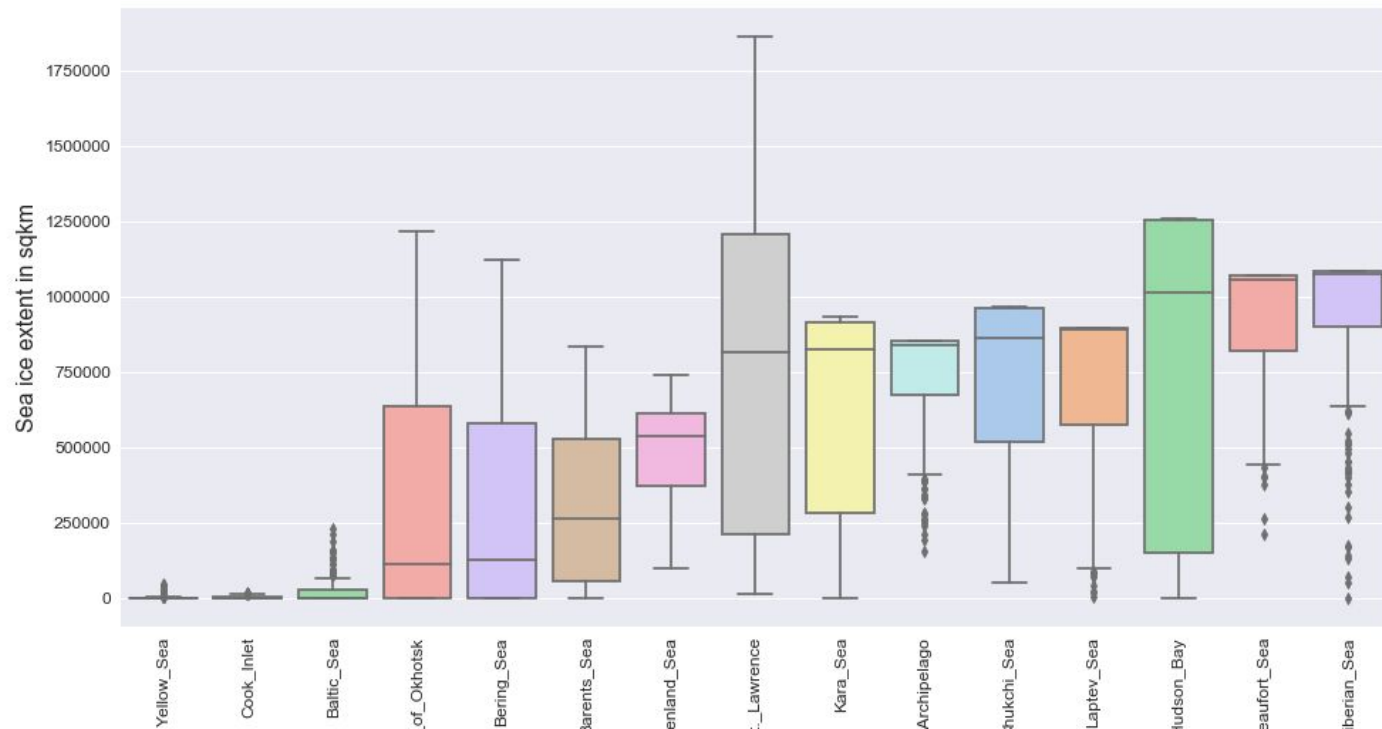
02

A deeper look to Arctic sea ice extent

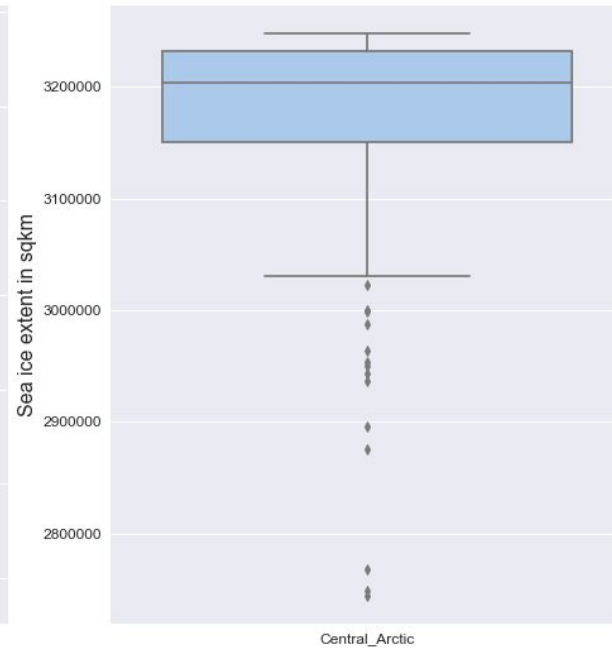
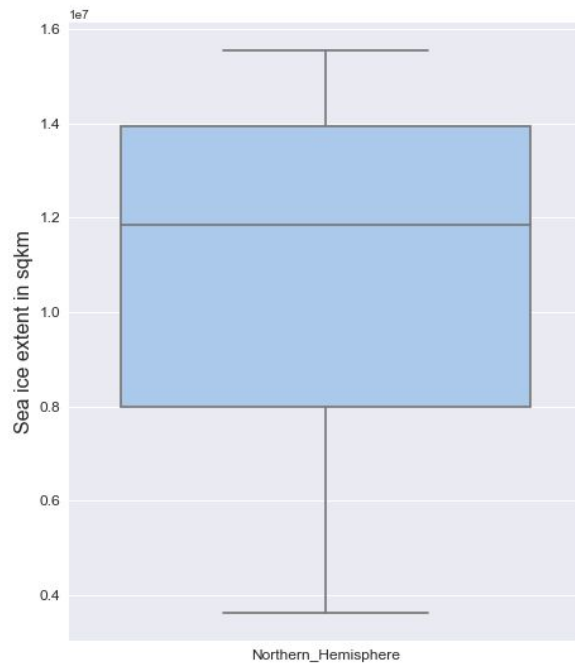
Arctic Subregions



Regional sea ice extent



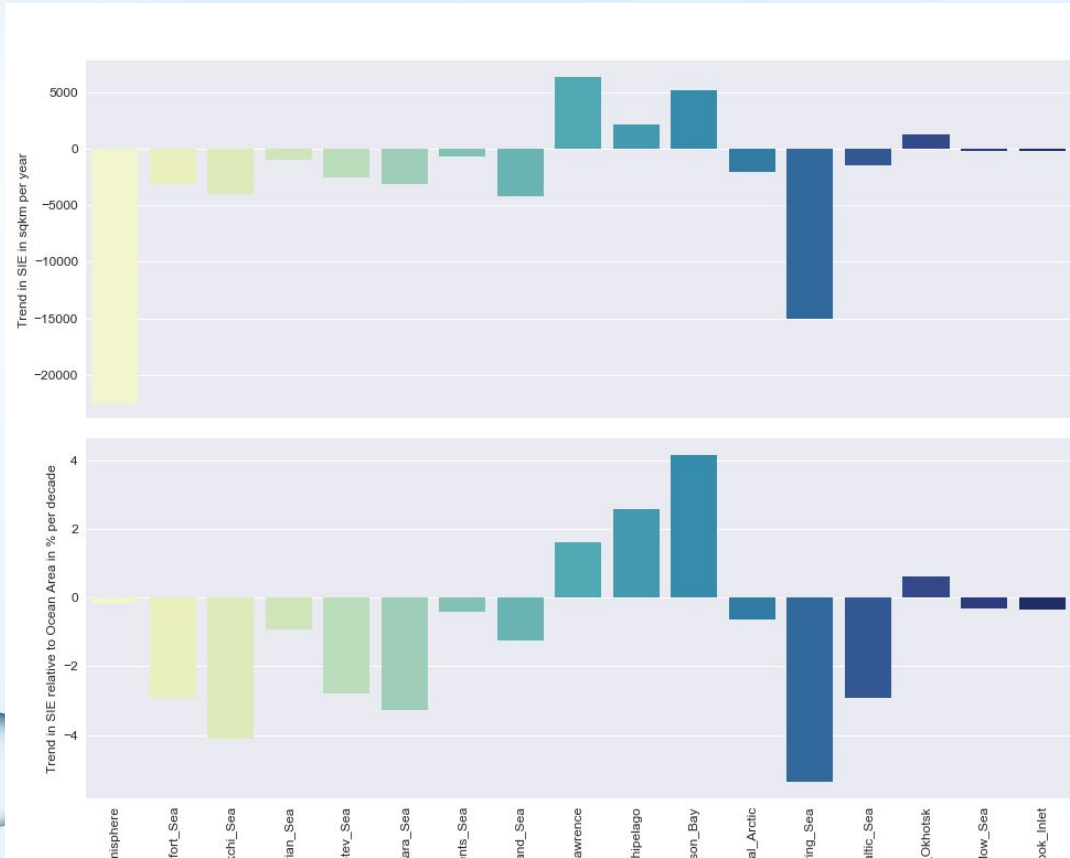
Regional sea ice extent



Distribution



Trends



Regional dependencies

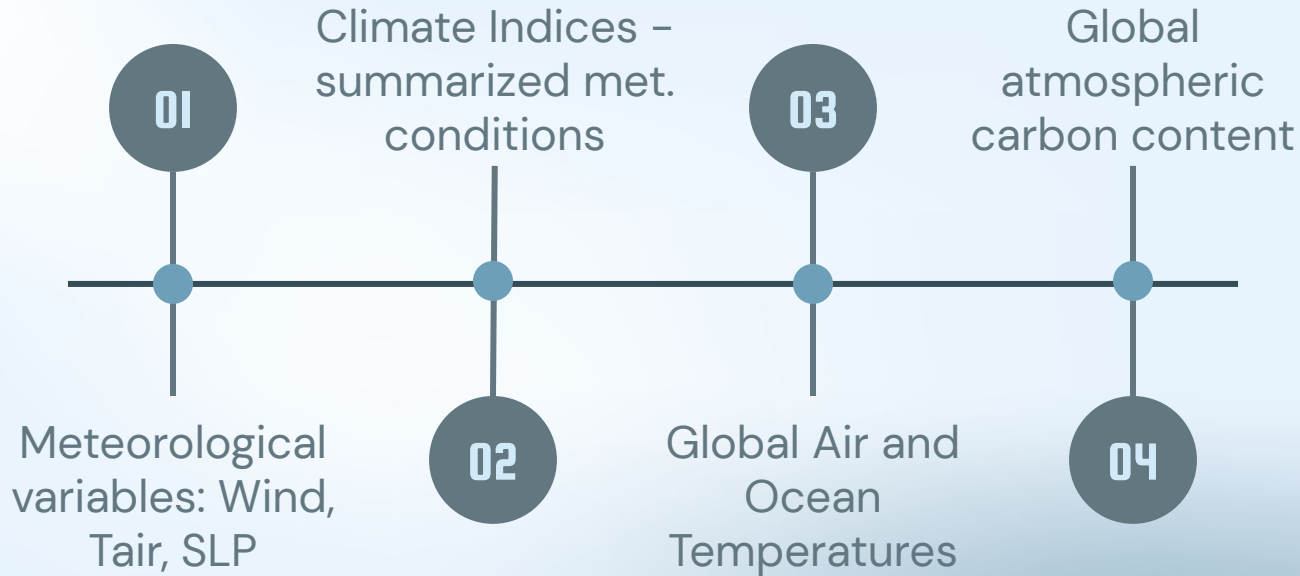


The background is a light blue gradient with several 3D-rendered blue spheres of varying sizes. Some spheres are connected by thin grey rods, resembling molecular structures. The spheres have a glossy, reflective surface.

03

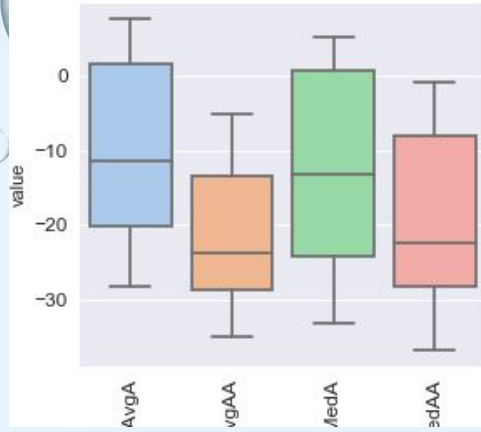
Driving climate variables

Variables to be analysed

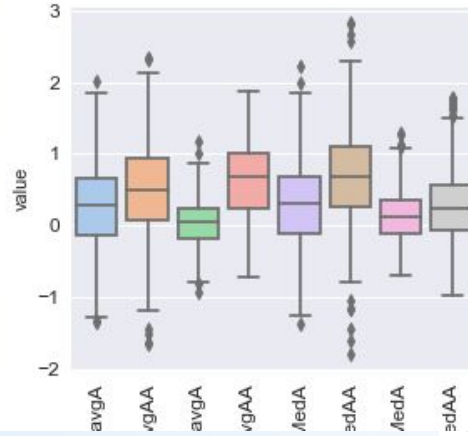


Meteorological Variables

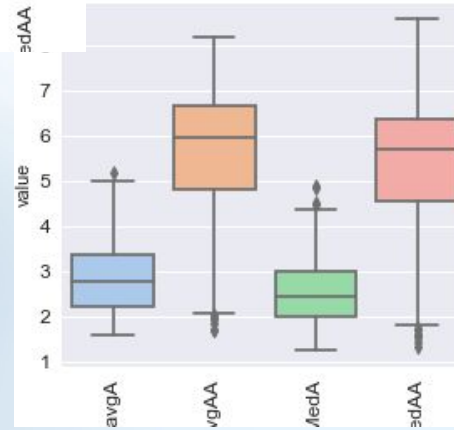
Tair



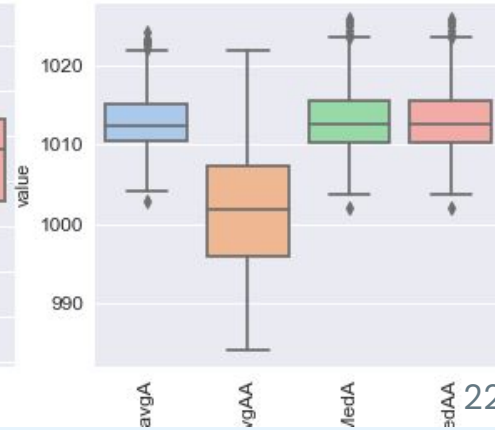
Zonal&Meridional Wind



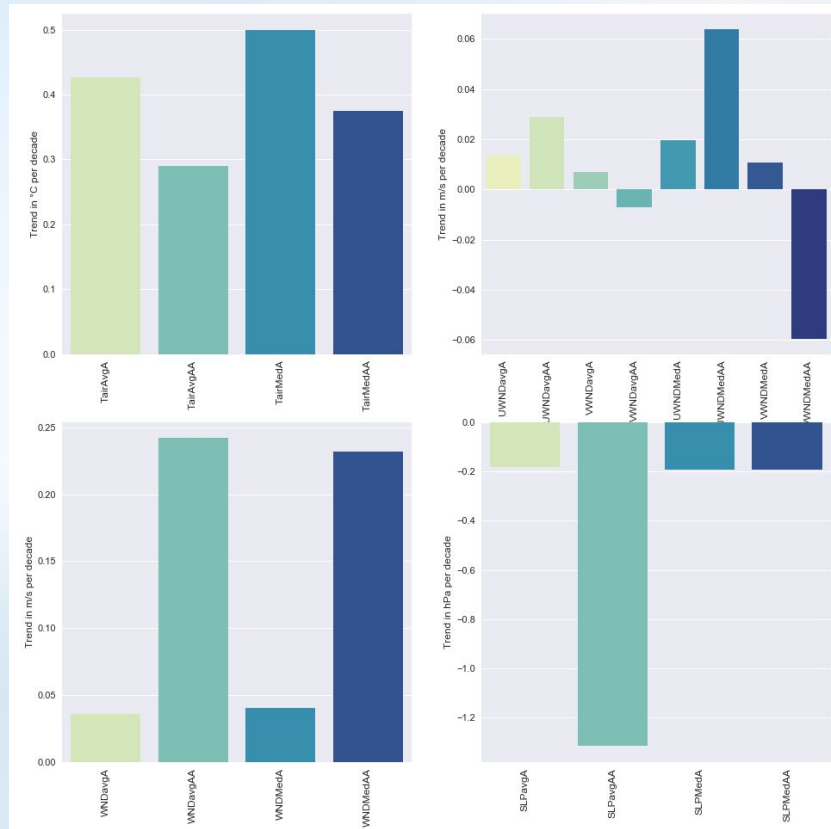
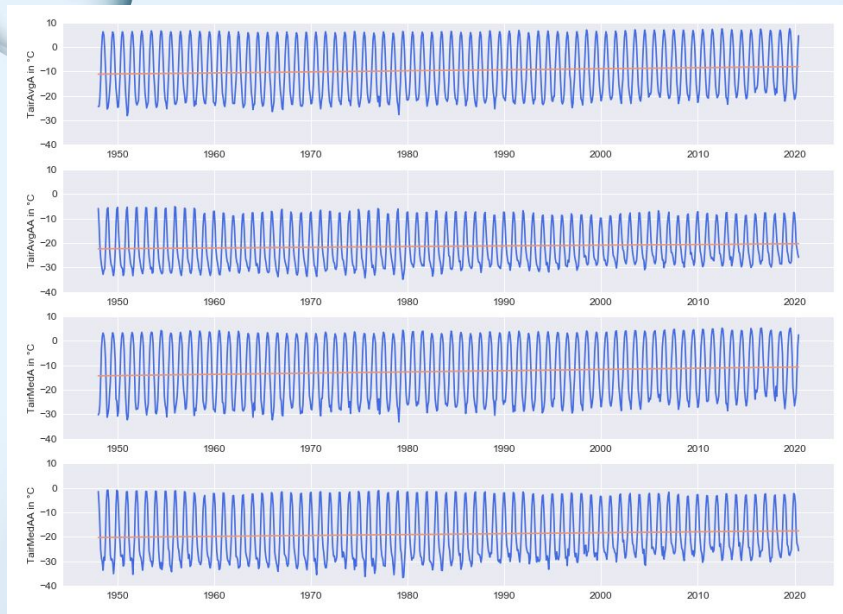
Wind speed



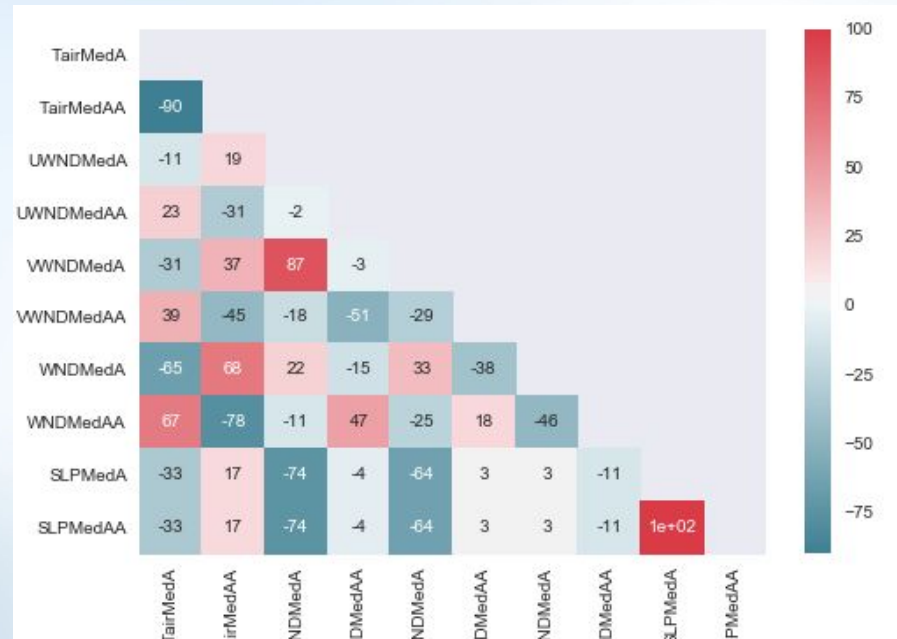
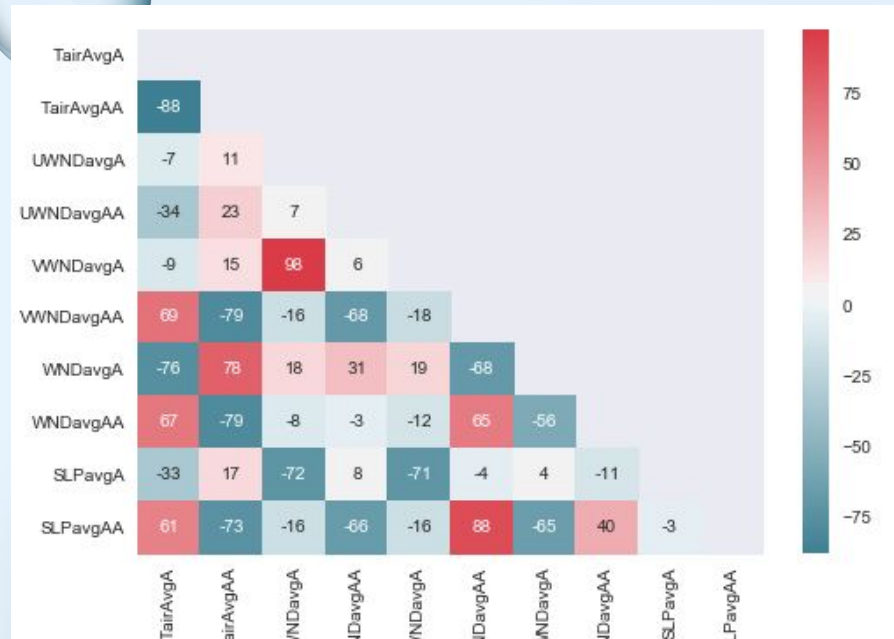
SLP



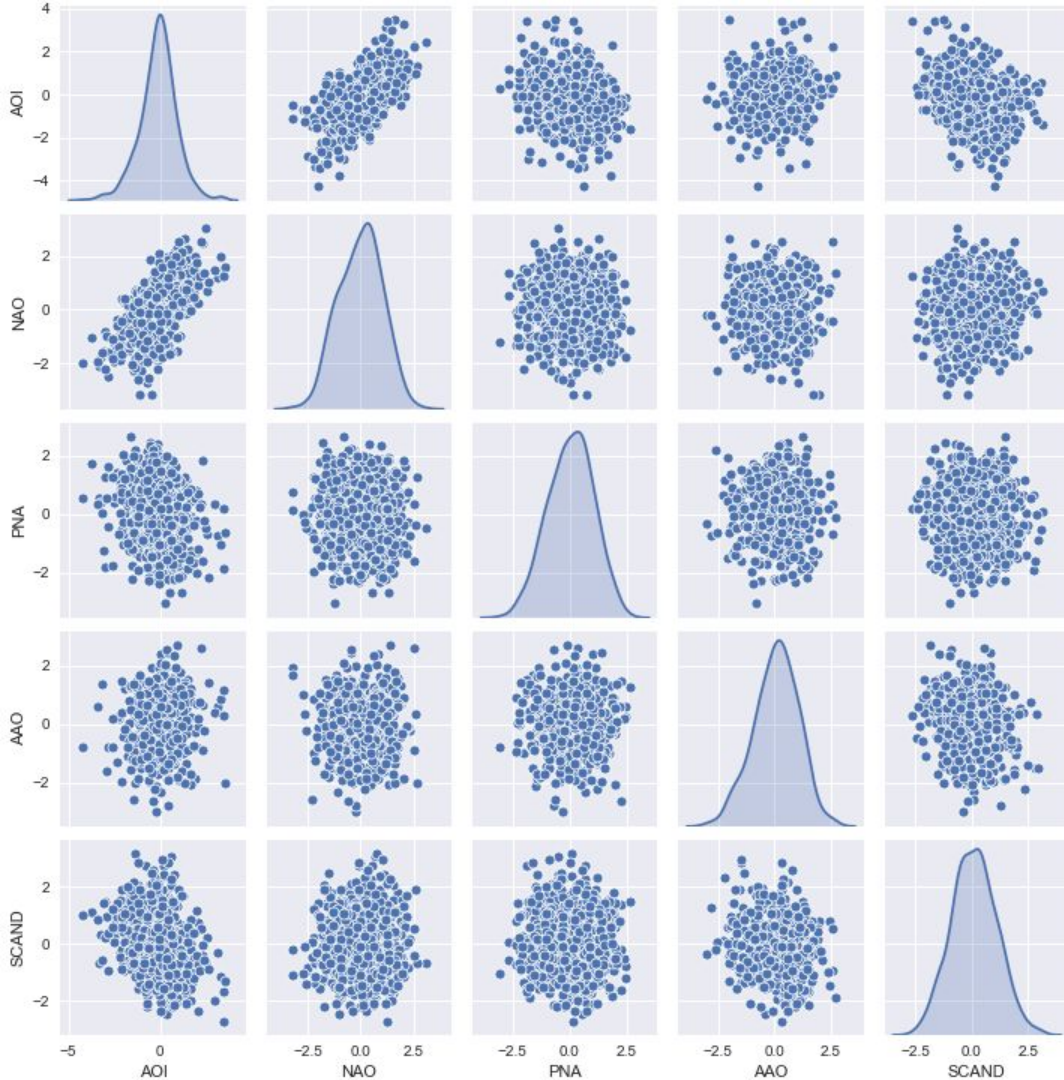
Seasonal cycle and trends



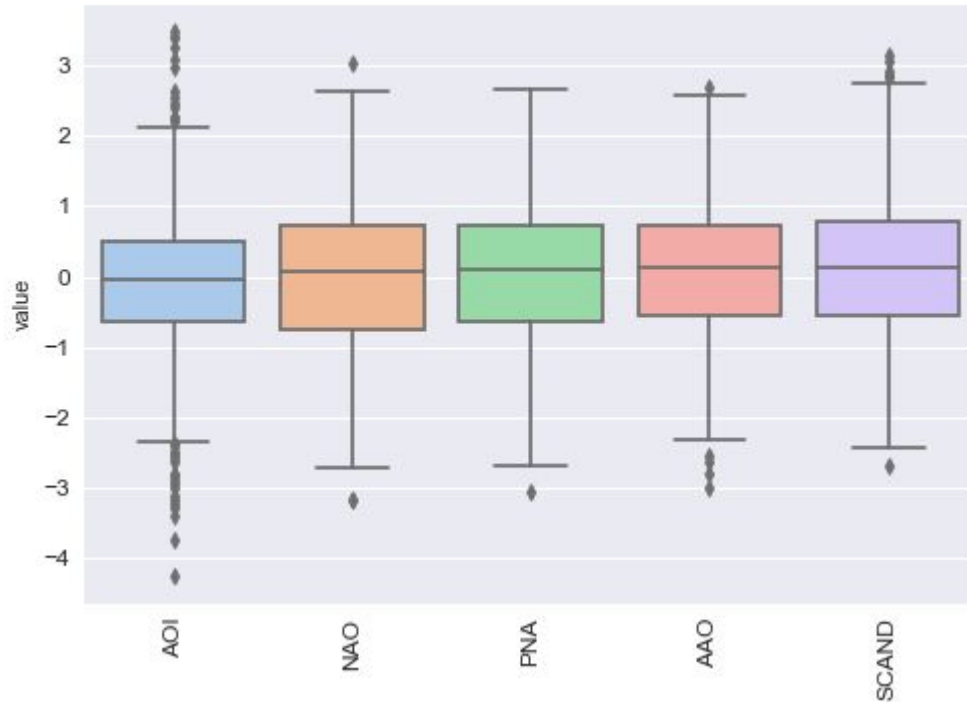
Dependencies



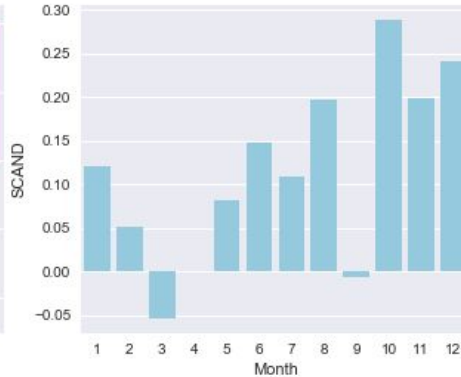
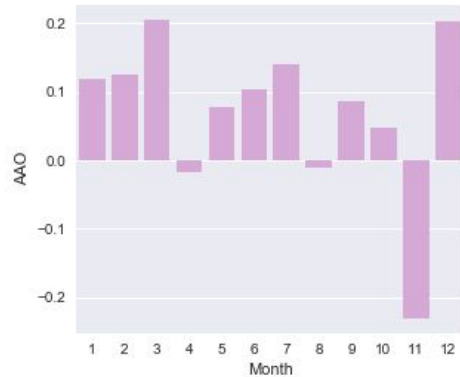
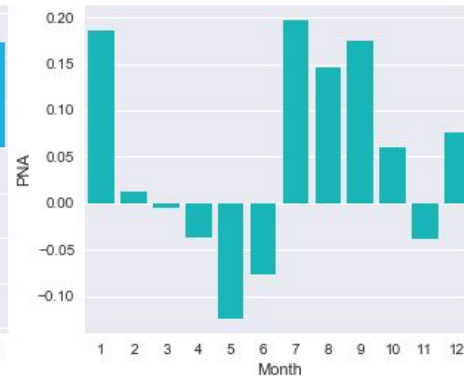
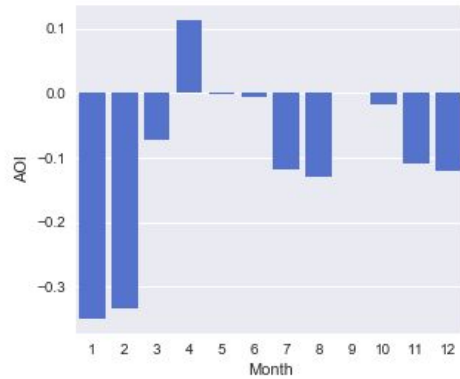
Climate Indices



Distribution

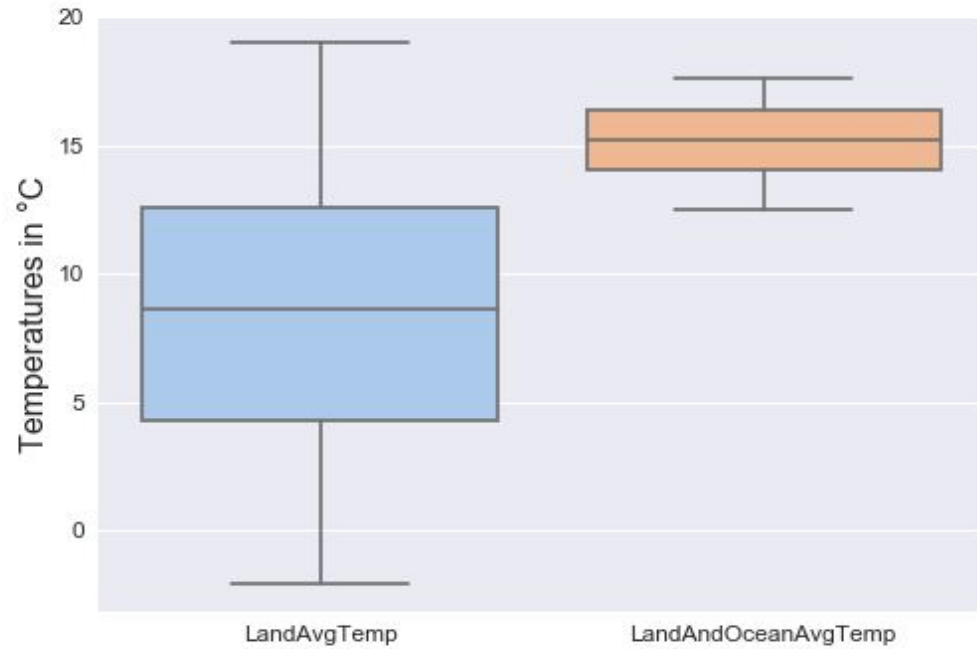


Seasonal cycle

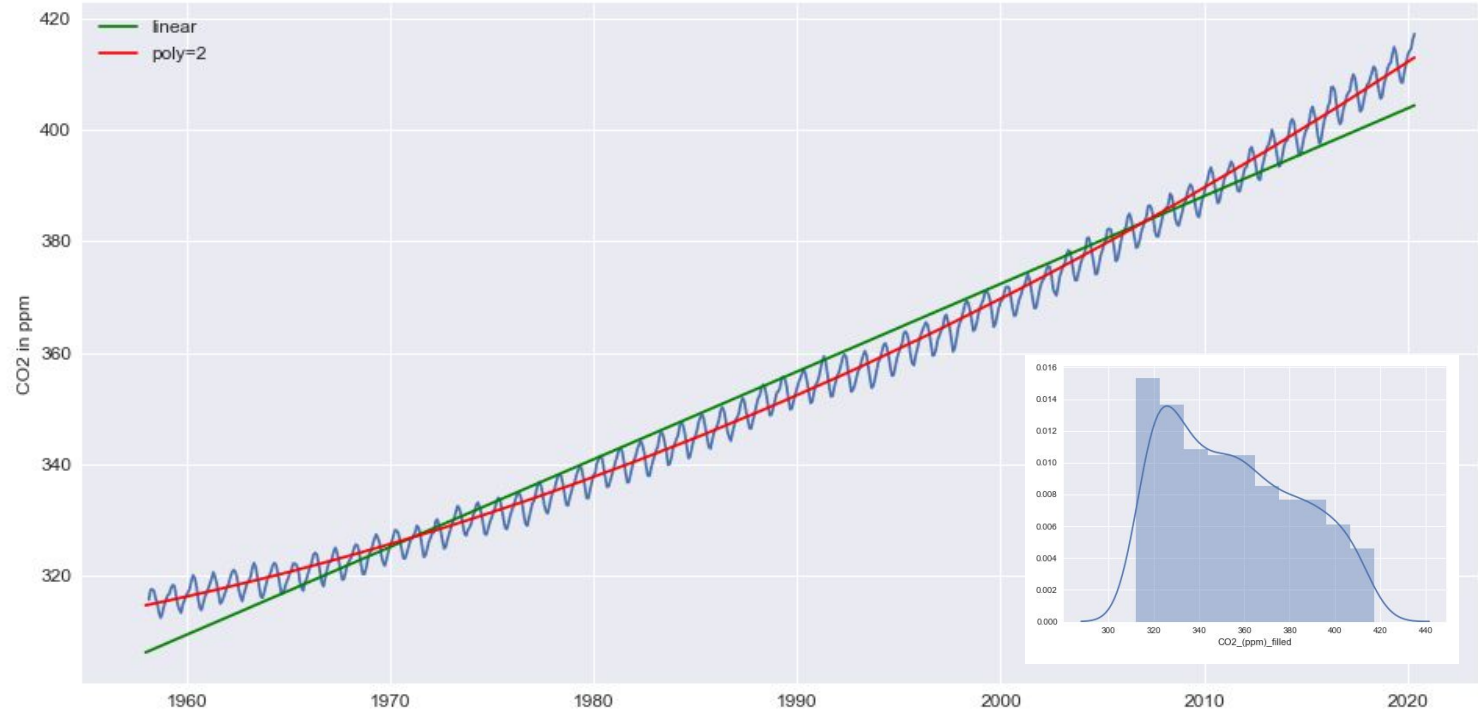


AOI	0.07
NAO	0.04
PNA	0.05
AAO	0.11
SCAND	-0.06

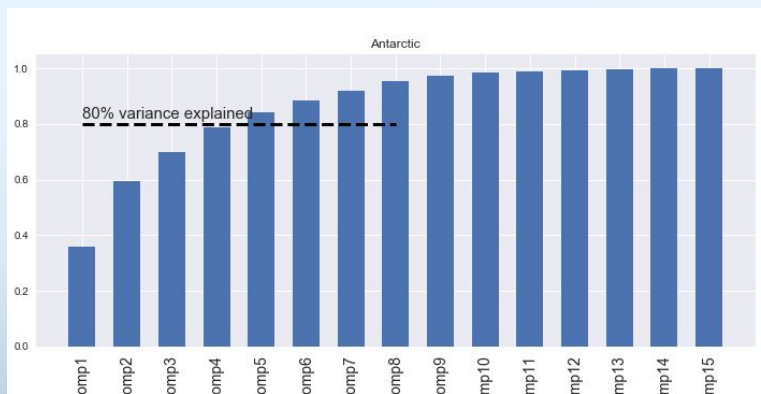
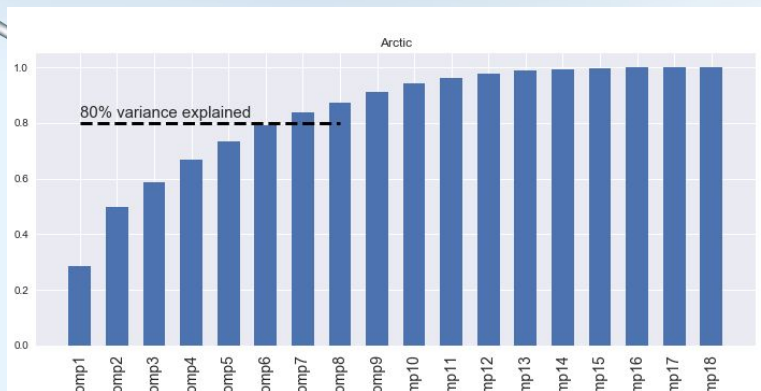
Global Temperatures



Global Carbon Dioxide



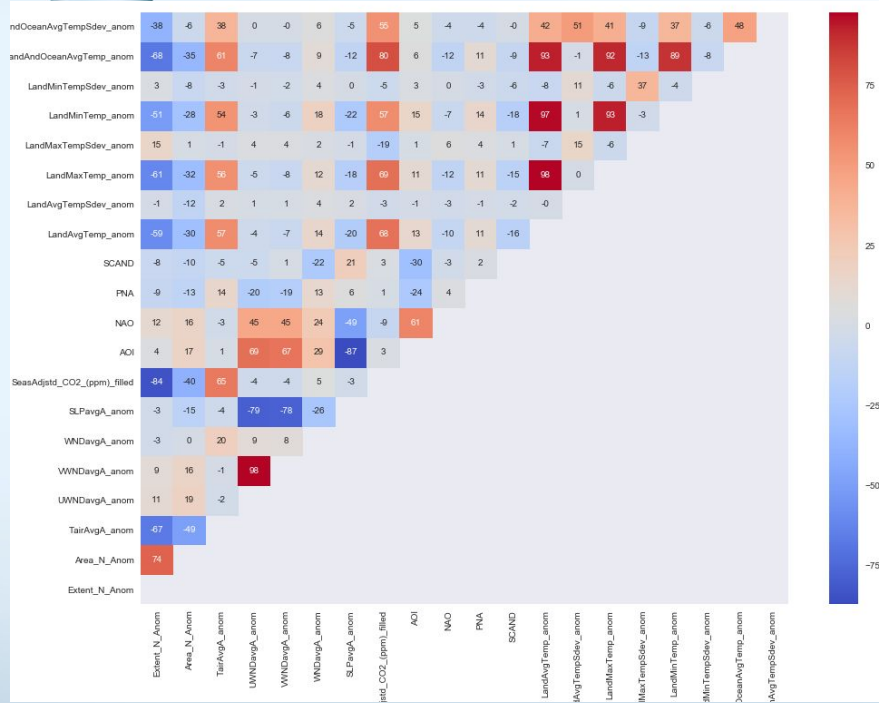
PCA



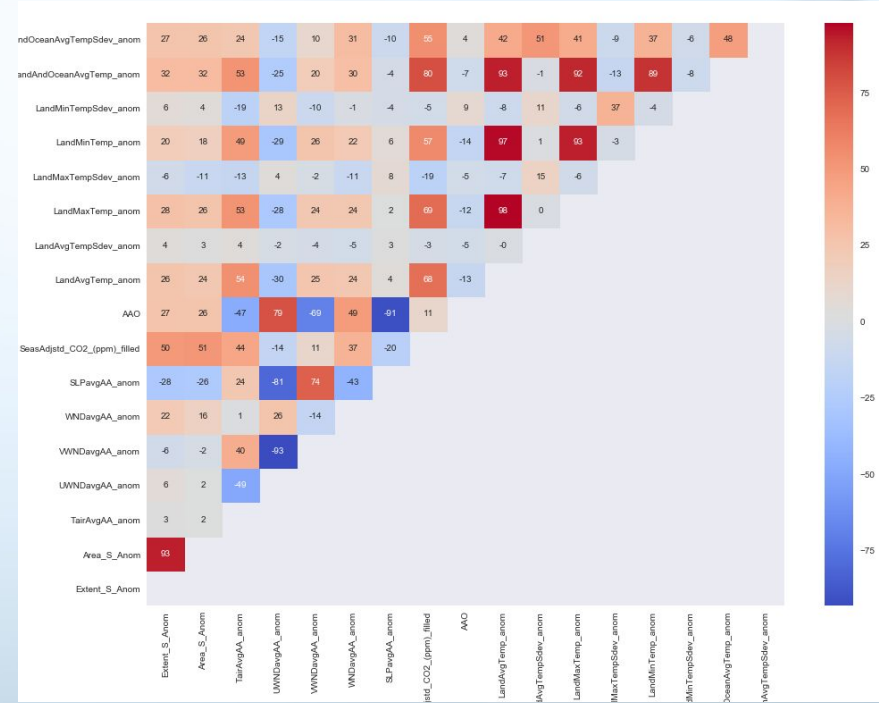
	PrComp1	PrComp2	PrComp3	PrComp4
TairAvgA_anom	-0.299392	0.062275	0.072730	-0.063658
UWNDavgA_anom	0.007900	-0.454016	-0.445417	-0.154279
VWNDavgA_anom	0.045300	-0.108828	-0.131225	0.269291
WNDavgA_anom	0.012644	0.132079	0.148692	-0.221080
SLPavgA_anom	-0.024586	0.164785	0.175618	-0.507688
SeasAdjstd_CO2_(ppm)_filled	-0.278558	-0.098207	-0.152327	-0.115527
AOI	-0.382531	0.082677	0.061781	-0.444186
NAO	-0.453361	-0.265471	-0.273916	-0.162647
PNA	-0.306235	0.033315	0.036411	0.535604
SCAND	0.132248	-0.116446	-0.125428	-0.108536
LandAvgTemp_anom	0.537549	-0.008338	0.004352	-0.217344
LandAvgTempSdev_anom	-0.209144	0.368744	0.283332	0.084562
LandMaxTemp_anom	0.168286	0.015012	-0.022647	-0.031642
LandMaxTempSdev_anom	0.035264	-0.040794	-0.053020	0.010516
LandMinTemp_anom	0.018466	-0.149415	-0.047657	0.025805
LandMinTempSdev_anom	0.056909	0.028250	0.063707	0.032878
LandAndOceanAvgTemp_anom	-0.030107	-0.684677	0.718010	0.001958
LandAndOceanAvgTempSdev_anom	-0.002474	-0.045697	0.039327	0.000416

Dependencies

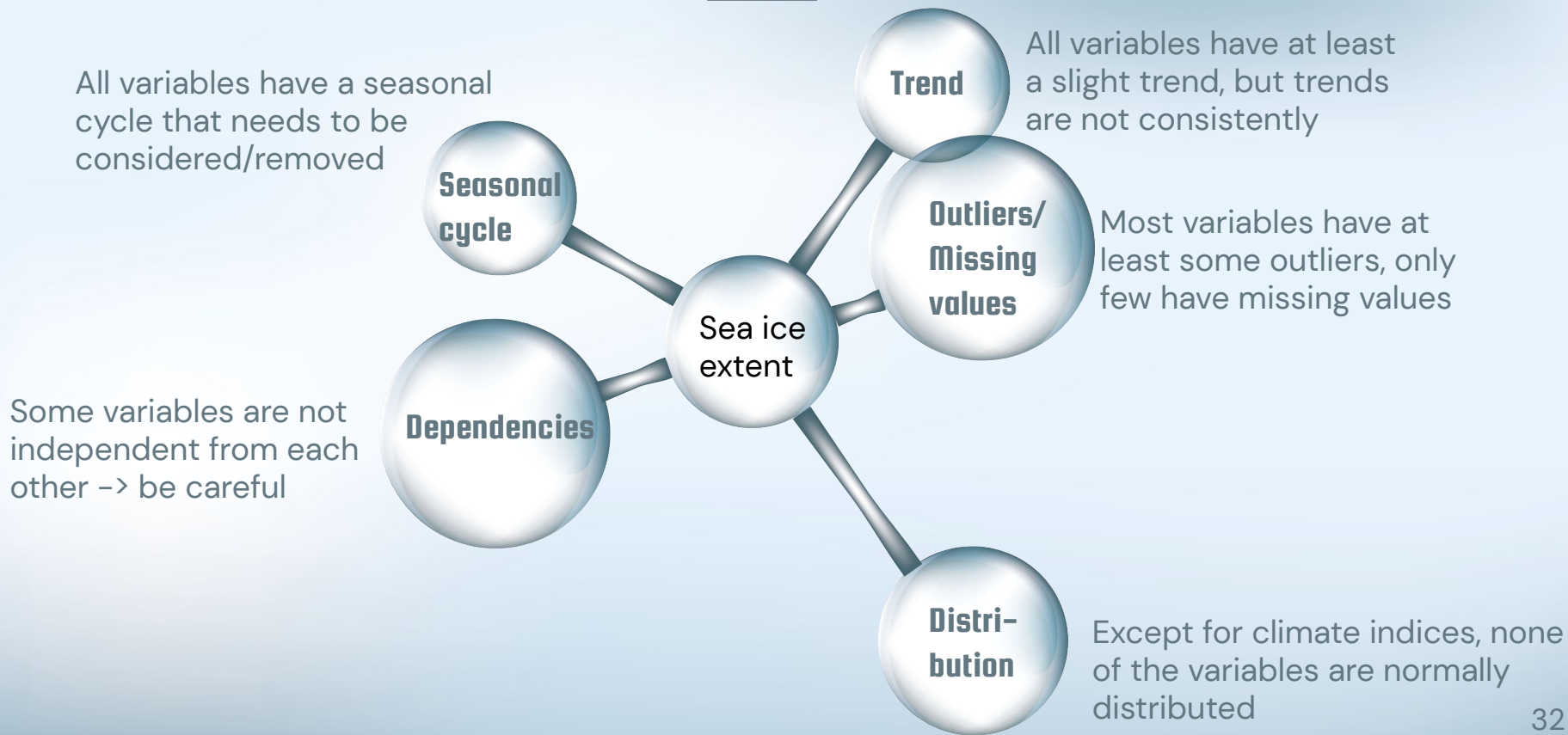
Arctic



Antarctic



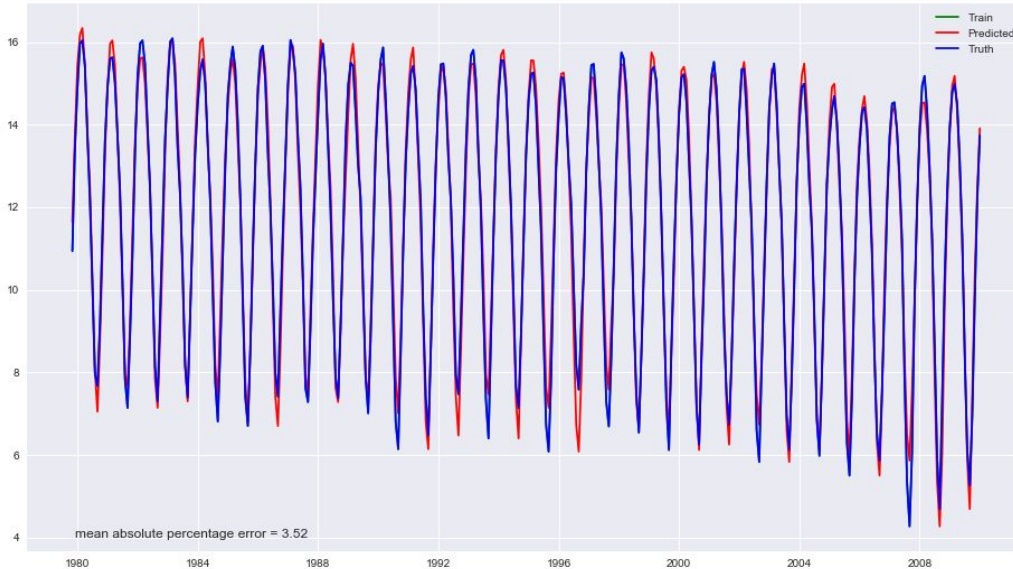
Summary



Models-First approach

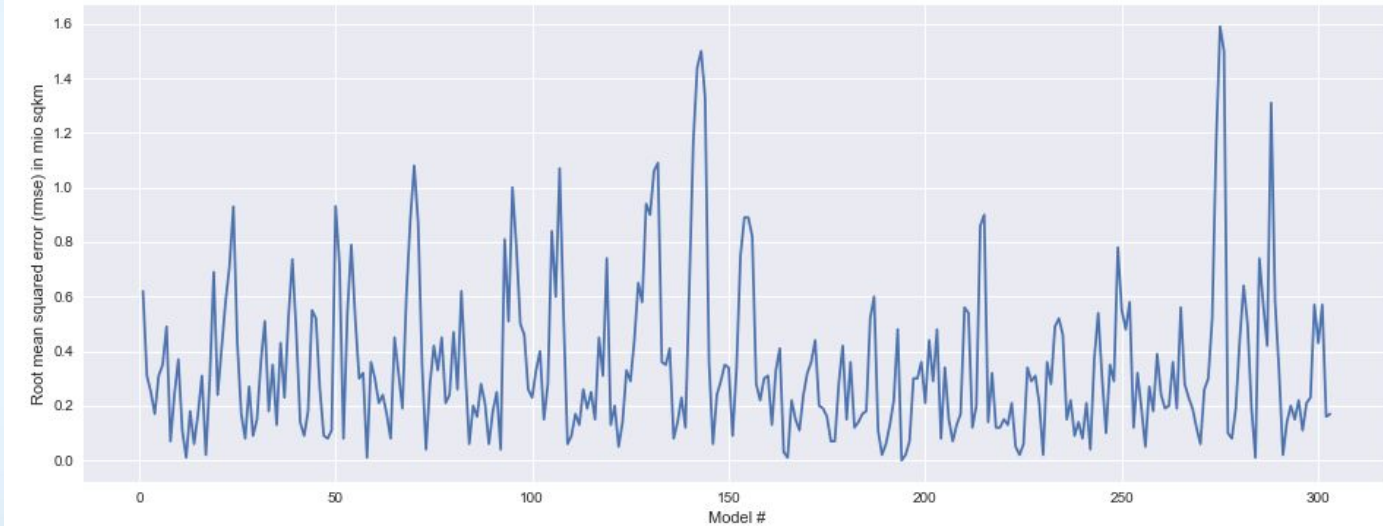
Approaches	Performance as Mean Averaged Percentage error (MAPE)
Lag1: take last value to predict next	14.57 %
Use overall mean	27.37 %
Lag12: use value of 12 month ago for prediction	3.53 %
Lag24: use value of 24 month ago for prediction	3.69 %
Lag36: use value of 36 month ago for prediction	3.93 %
Use seasonal cycle of previous year and long term trend	4.04 %

Best performance: lag12



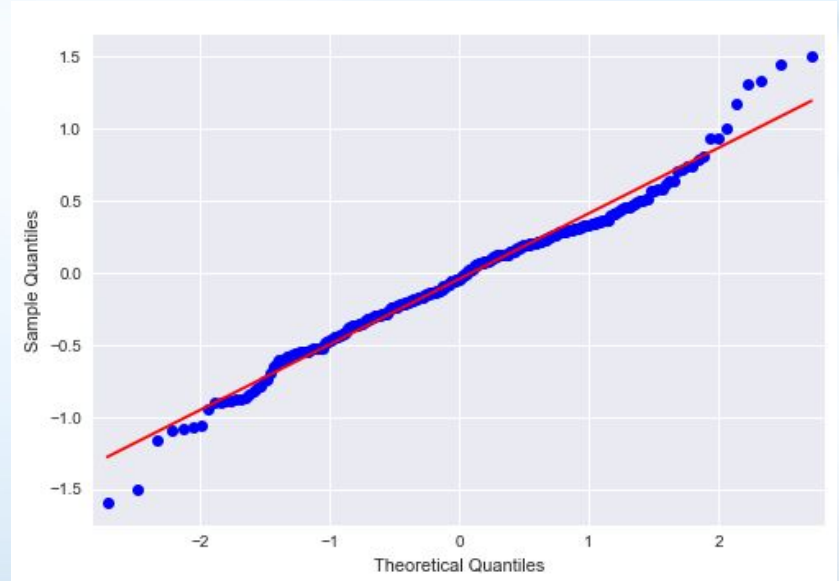
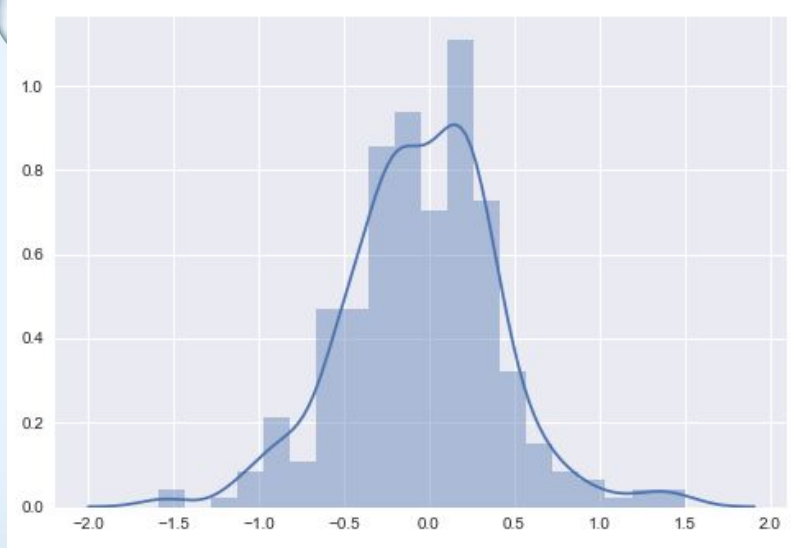
- Assumption: value of 12 month ago can be used for prediction
- Run several models for evaluation
- MAPE: 3.52 %

Distribution of residuals – RMSE



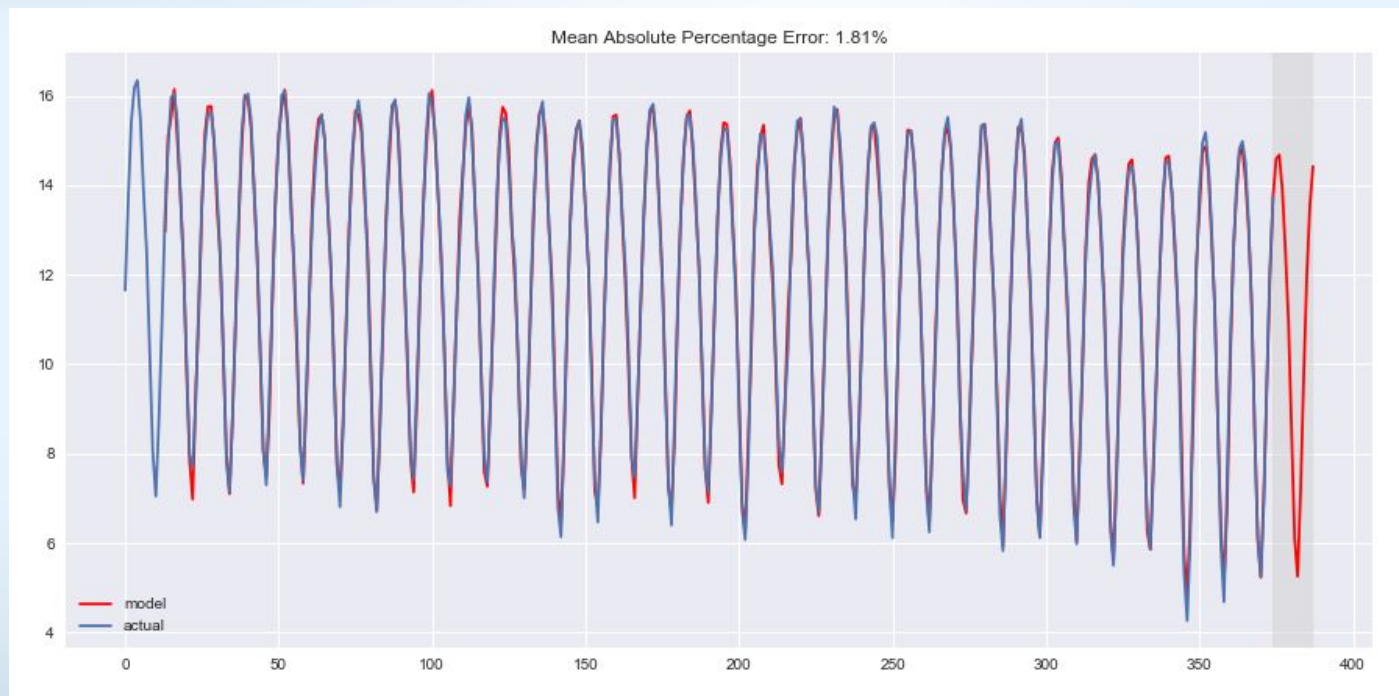
On Average, RMSE is 1/10 of sea ice extents standard deviation

Distribution of residuals



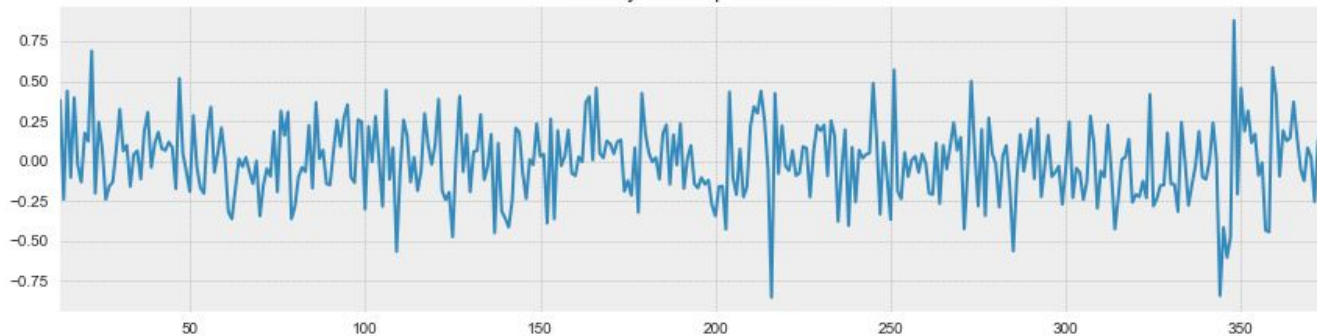
Residuals look quite normally distributed

SARIMA

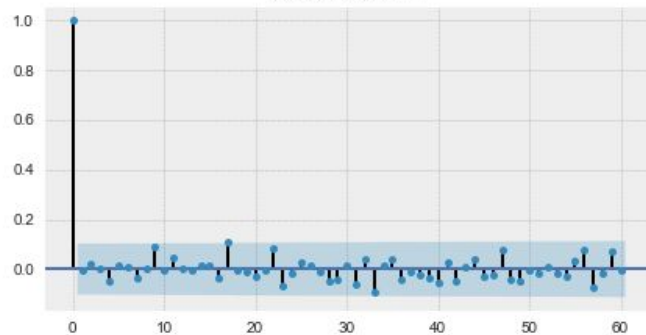


SARIMA

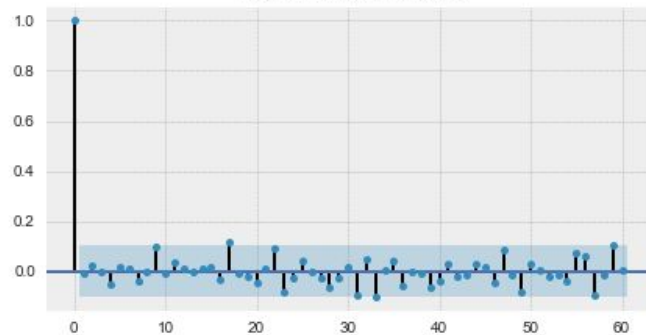
Time Series Analysis Plots
Dickey-Fuller: $p=0.00000$



Autocorrelation



Partial Autocorrelation



Next steps



Data

- Remove trend from data



Feature Engineering

- Met data handling
- Check other possibilities



Modelling

- Random walk
- Try different models & different features
- Predict future SIE & ICA
- Predict summer minimum < or > avg using only spring data

THANKS!



CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon, and infographics & images by Freepik.

