Temporal characteristics of Arctic sea ice in CCSM and observations: implications for seasonal predictability

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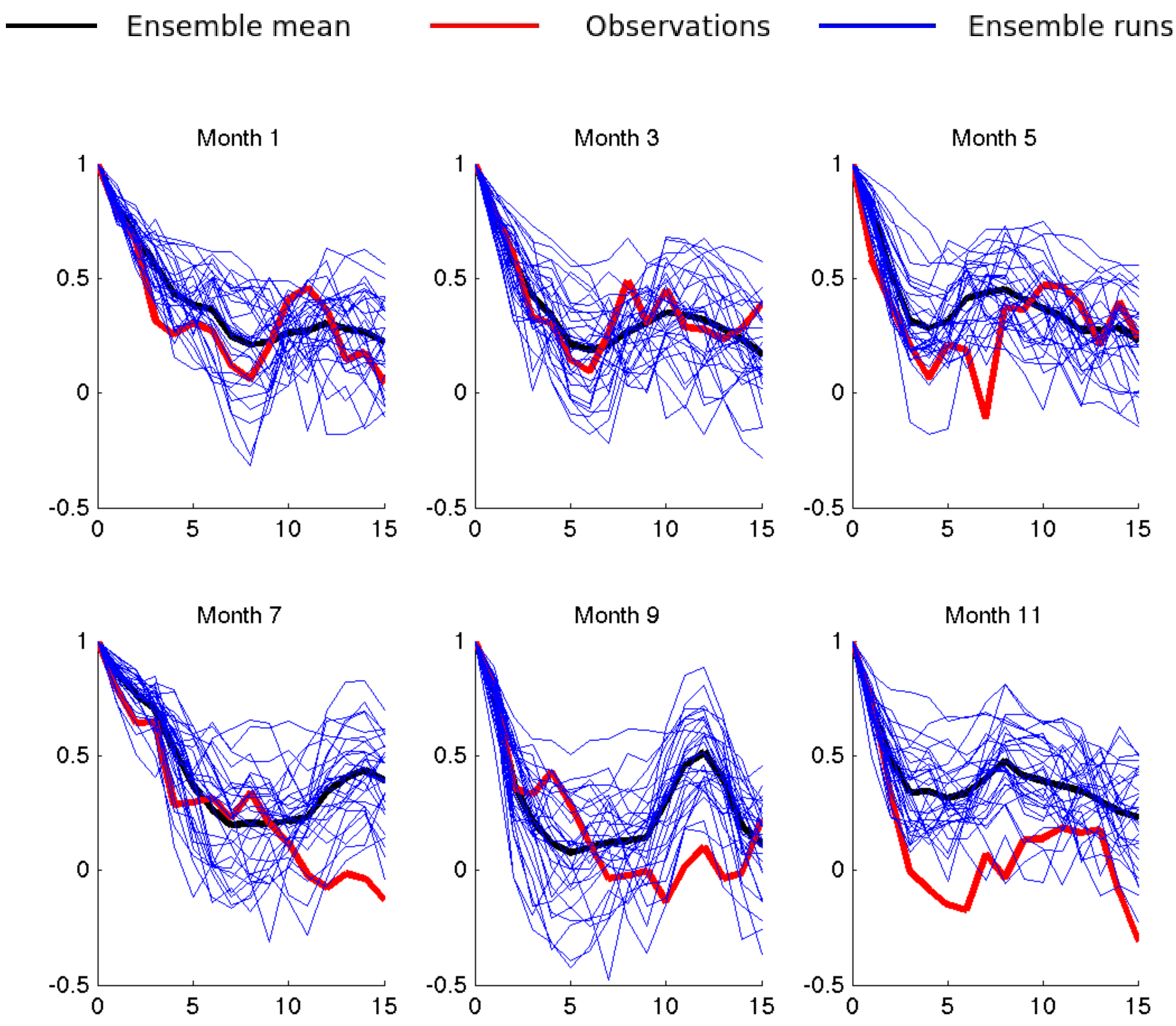
Data used

Model: CCSM T42 Large Ensemble Experiment

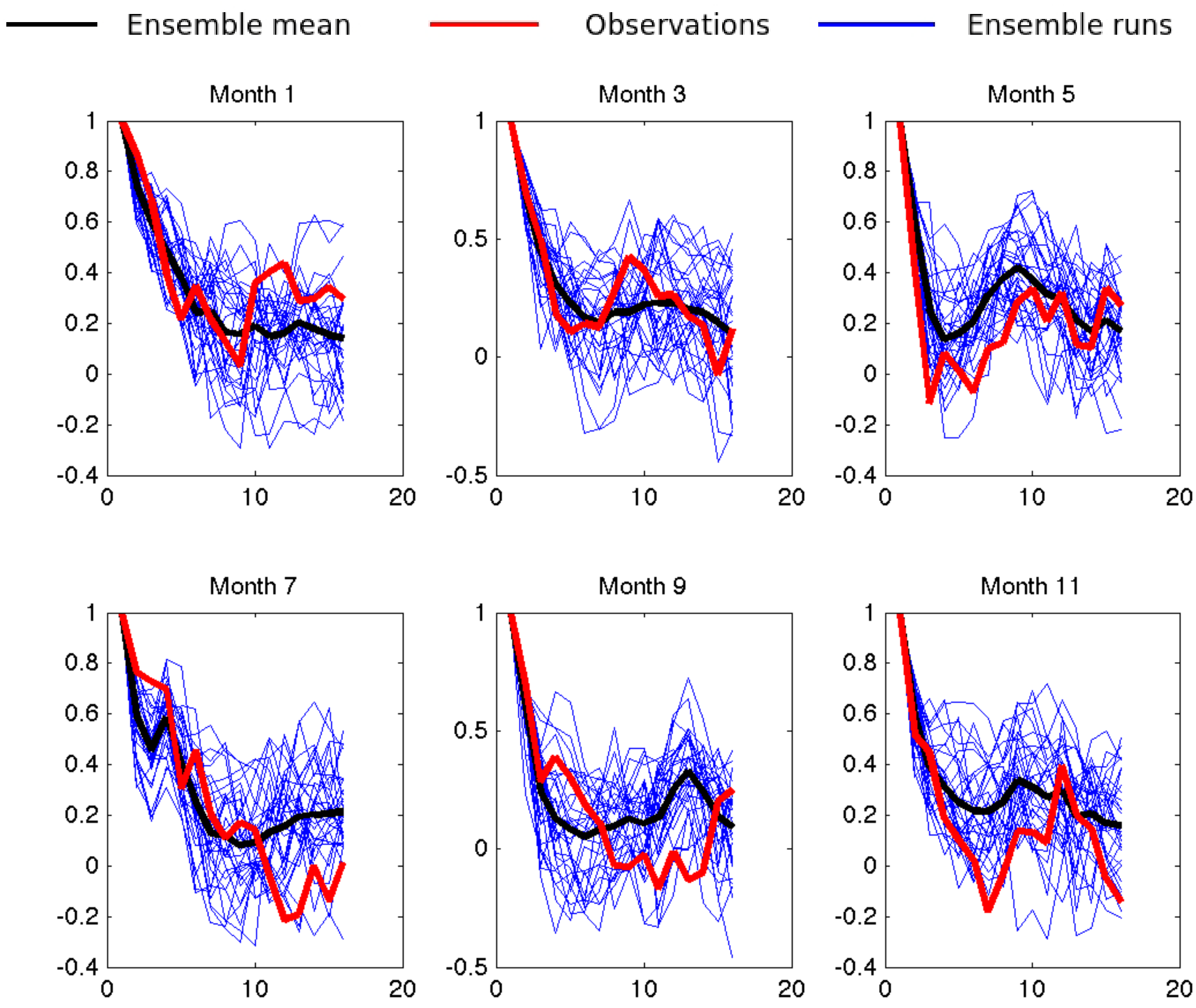
30 runs, A1B scenario, 2000-2062

Observations: NSIDC sea ice extent and area

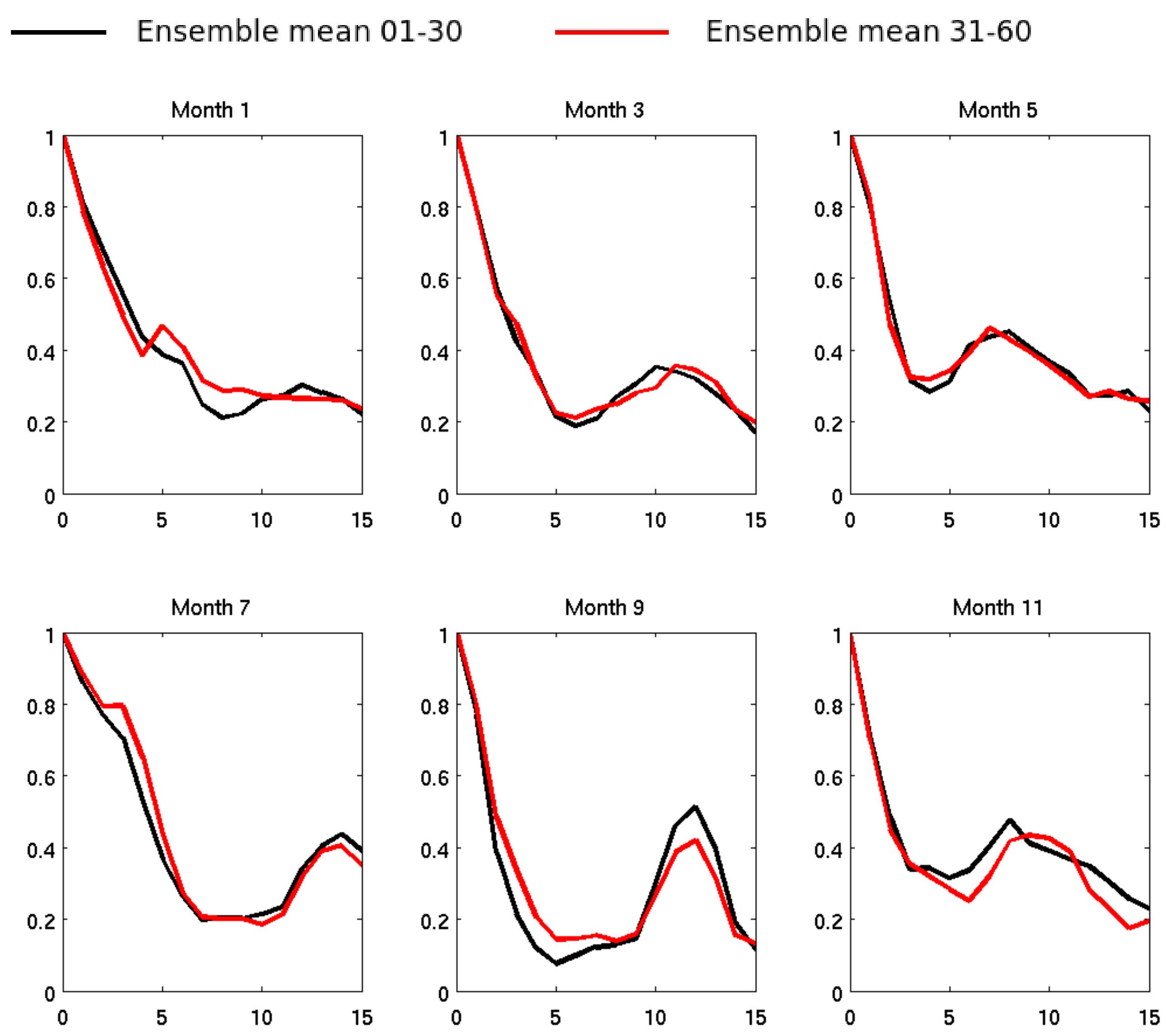
Monthly lagged autocorrelations Arctic sea ice area



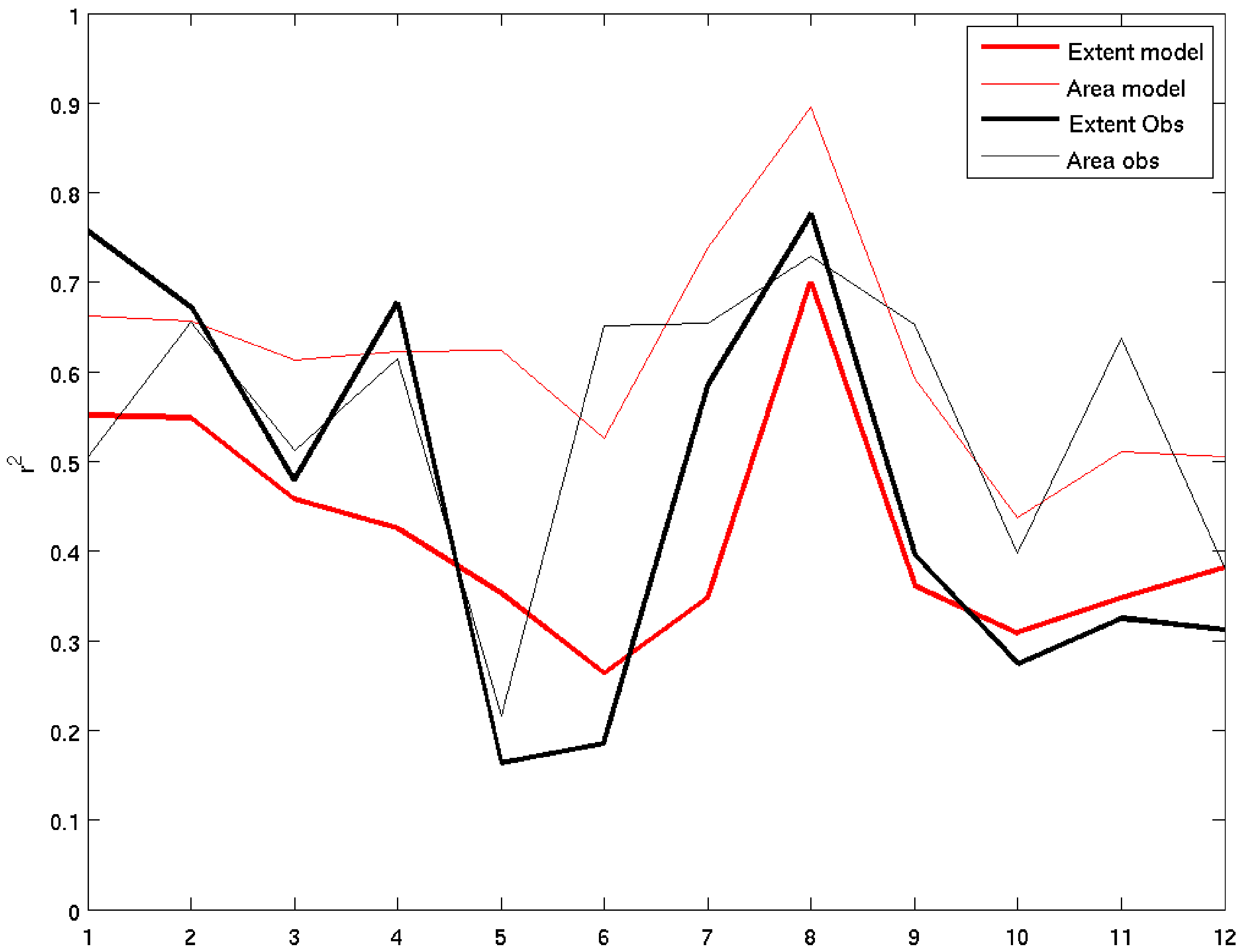
Monthly lagged autocorrelations Arctic sea ice extent



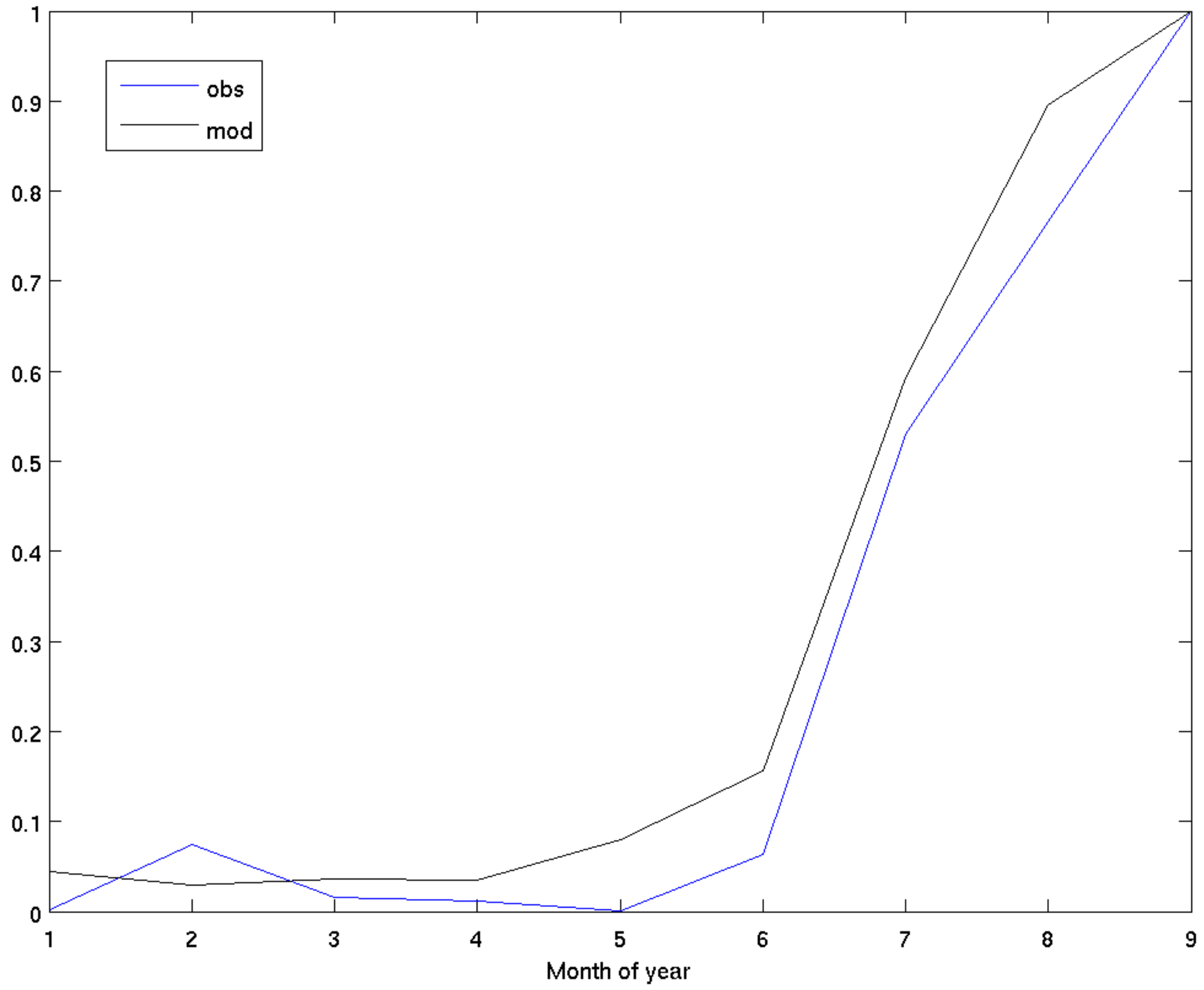
Model area autocorrs., 1st & 2nd halves ensemble

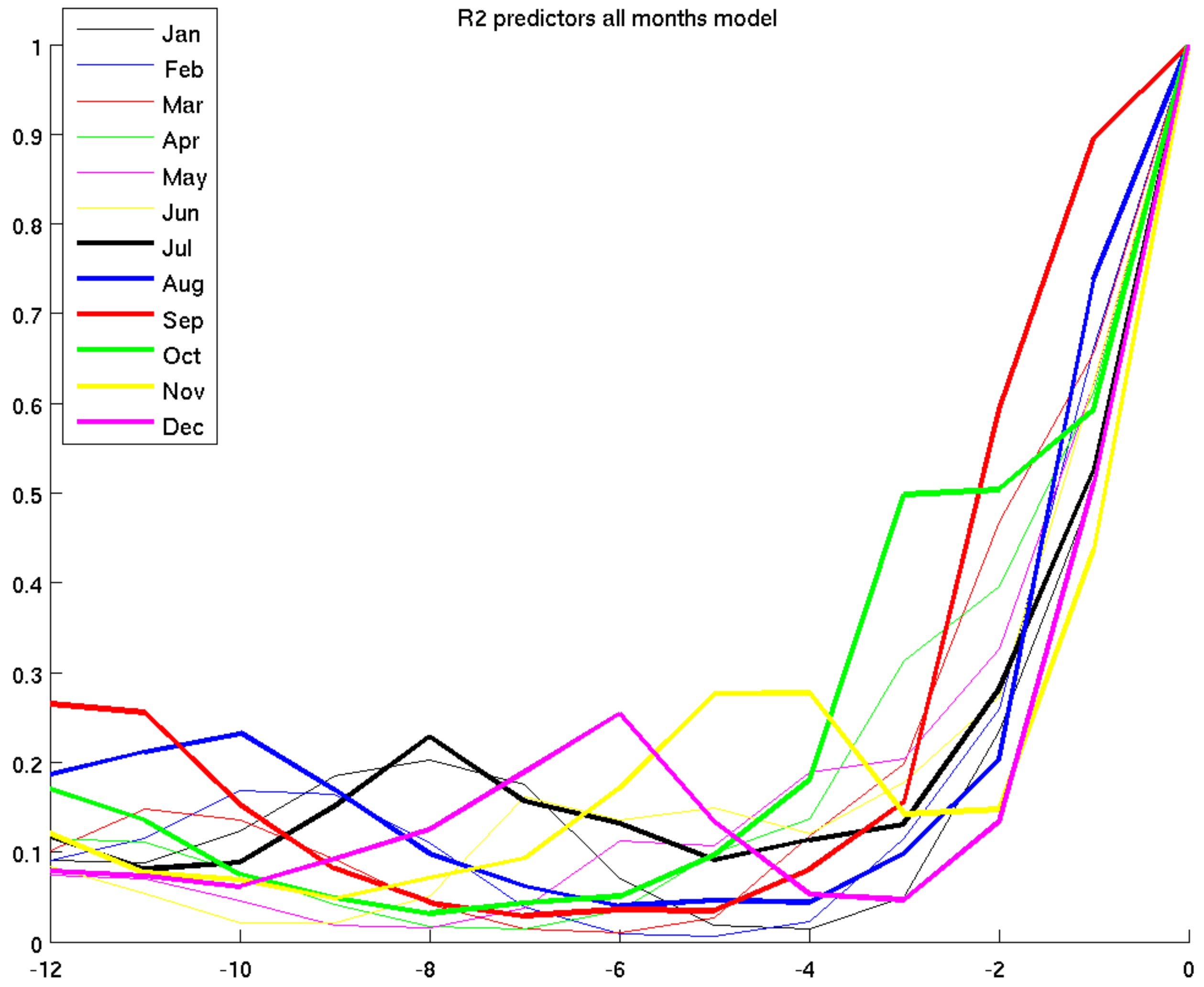


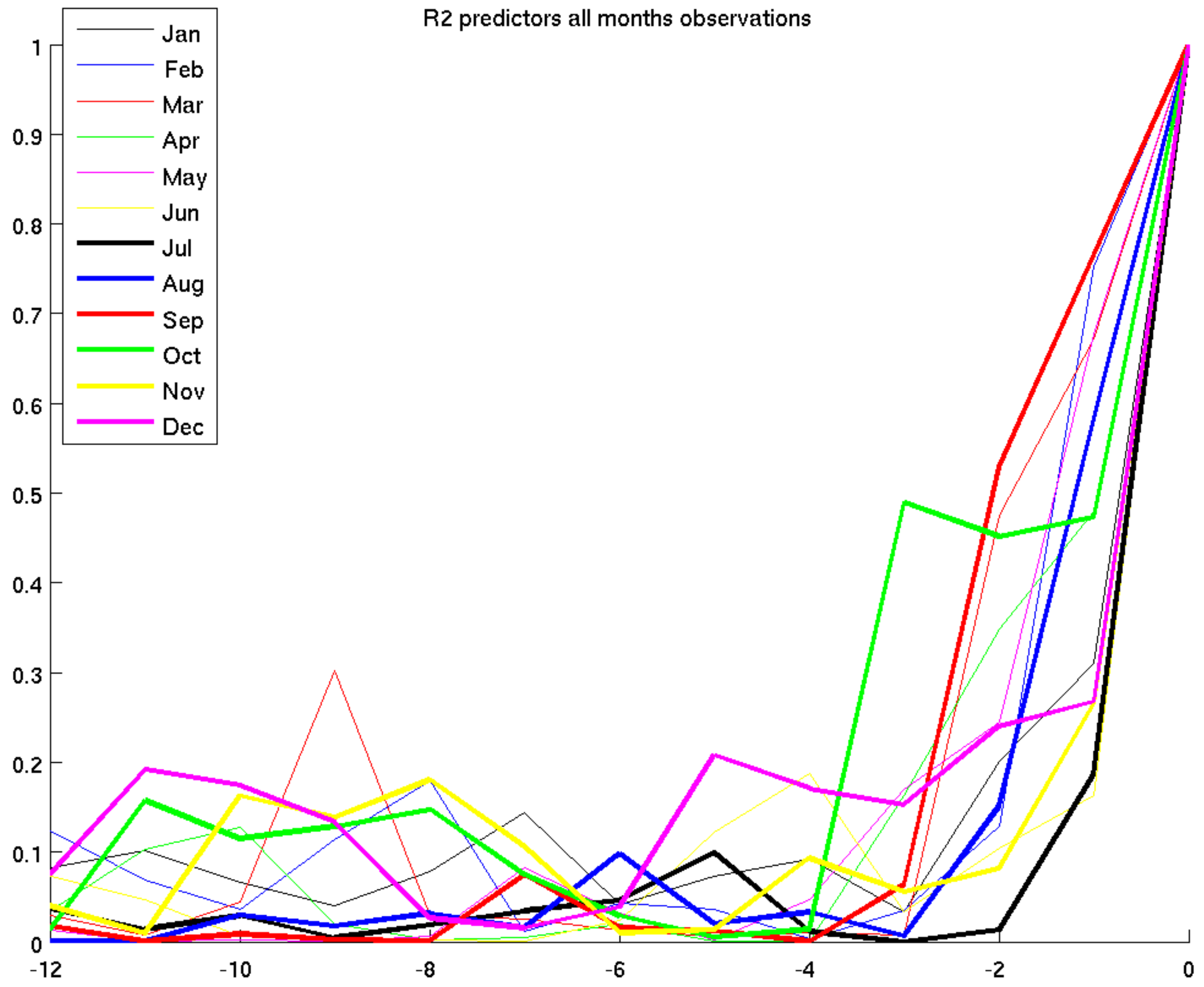
One month lag autocorrelations



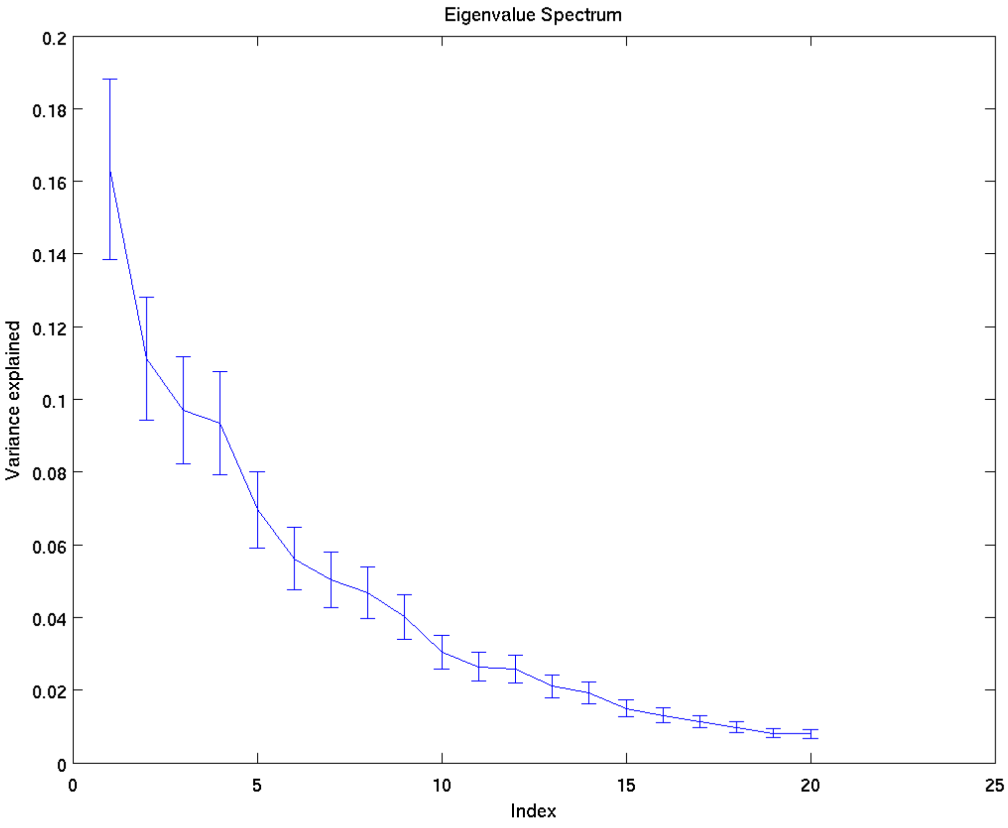
Variance explained of September sea ice anomalies by preceding months

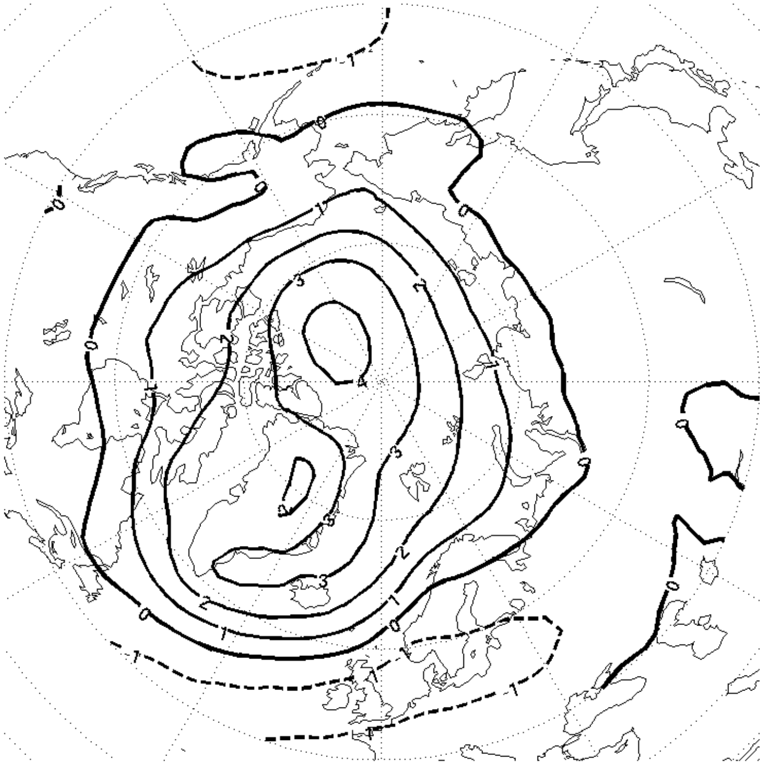



R2 predictors all months model
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-12
-10
-8
-6
-4
-2
0

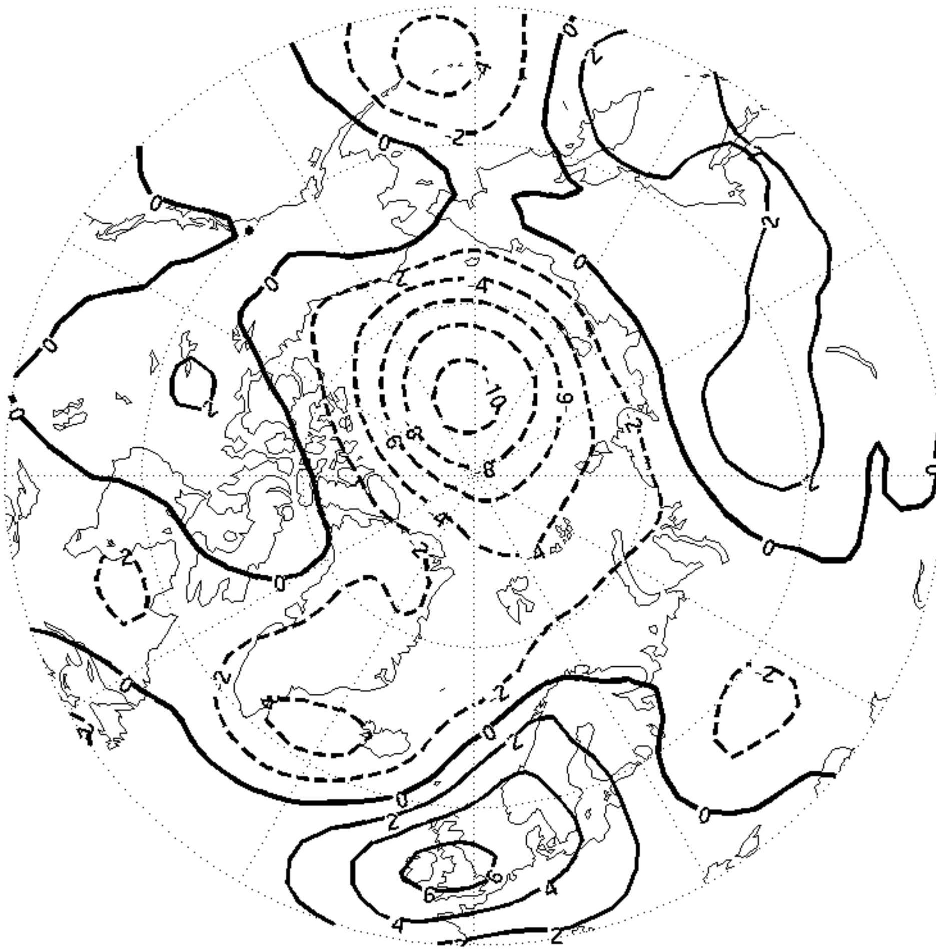

R2 predictors all months observations
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-12
-10
-8
-6
-4
-2
0

1 EOF summer (JJA) SLP field





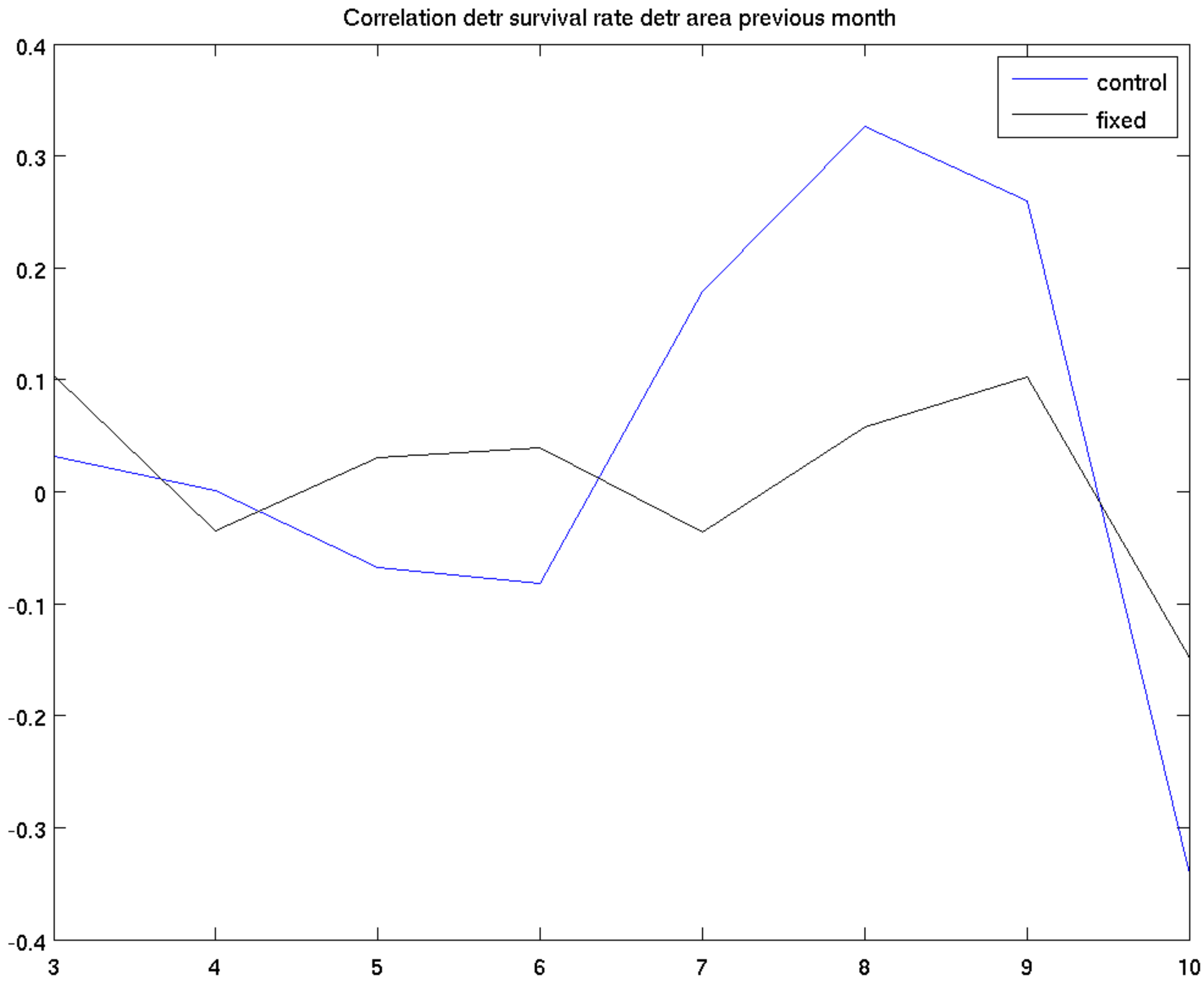
June-July and July-August tendency slp composites



June-July

July-August

Albedo enhancement of high summer autocorrelation values



Summary

Model and observations show similar trends in autocorrelation, apart from summer-to-summer memory in model

Autocorrelation trends do not change significantly as sea ice extent and thickness decreases

Summer minima both in model and observations, uncorrelated to previous June (and earlier in spring/winter), highly correlated to previous July.

It's possible that stochastic atmospheric forcing is more significant up to early summer (decreasing autocorrelation), albedo effects become important in late summer (increasing autocorrelation)