

A Series of Stabilization Runs in the 21st Century

What tipping point?

**Cecilia Bitz, Marika Holland,
David Bailey, and Eric deWeaver**

Arctic sea ice extent at top of list of tipping points
Lenton et al 2008
Al Gore, Jim Hansen, etc.

Question posed by R. Lindsay et al., 2005

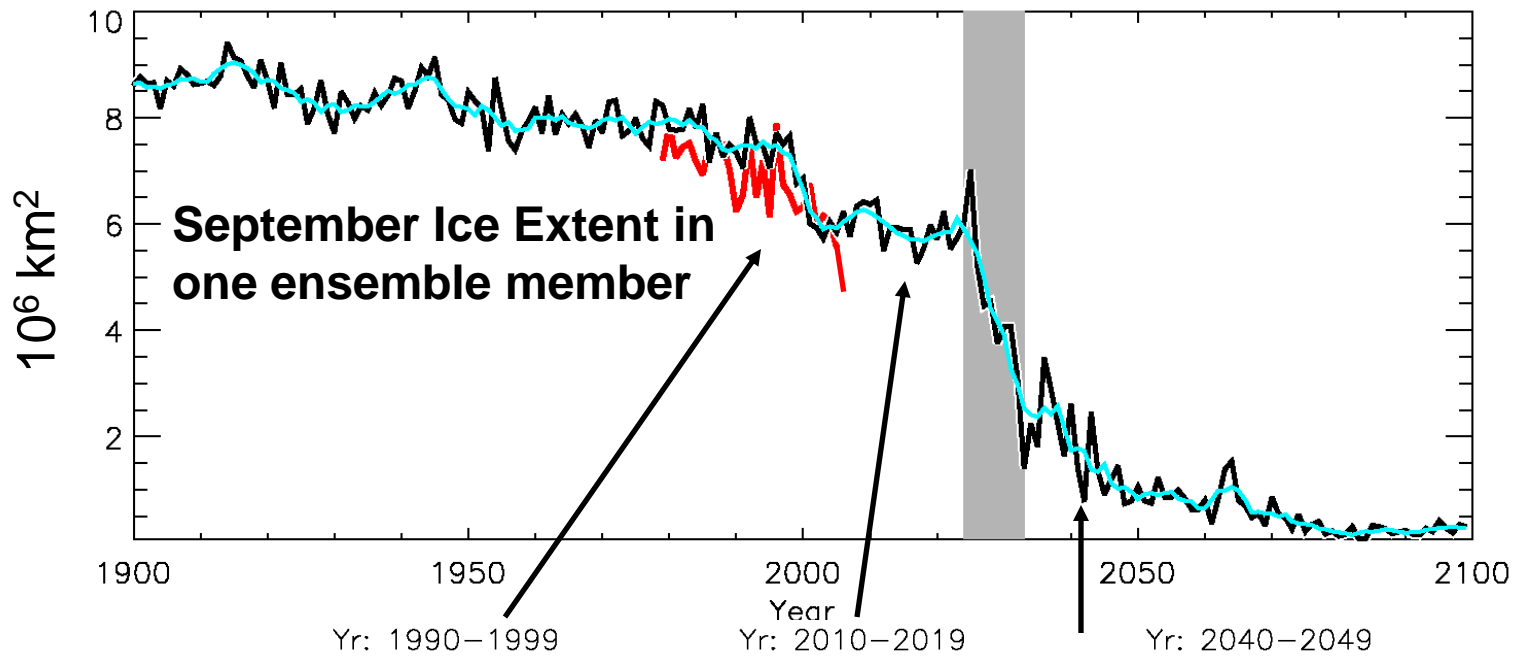
Tipping Point Definitions:

- 1) bifurcation - irreversible transition to a new state
- 2) small change in forcing causes a large and/or fast change

Sea Ice Outlook Project

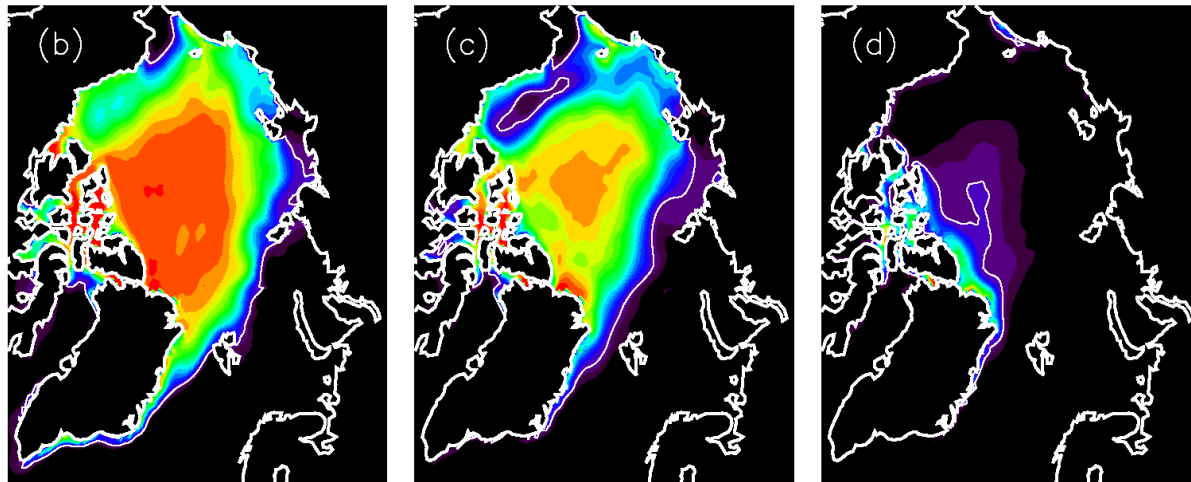
QuickTime™ and a
decompressor
are needed to see this picture.

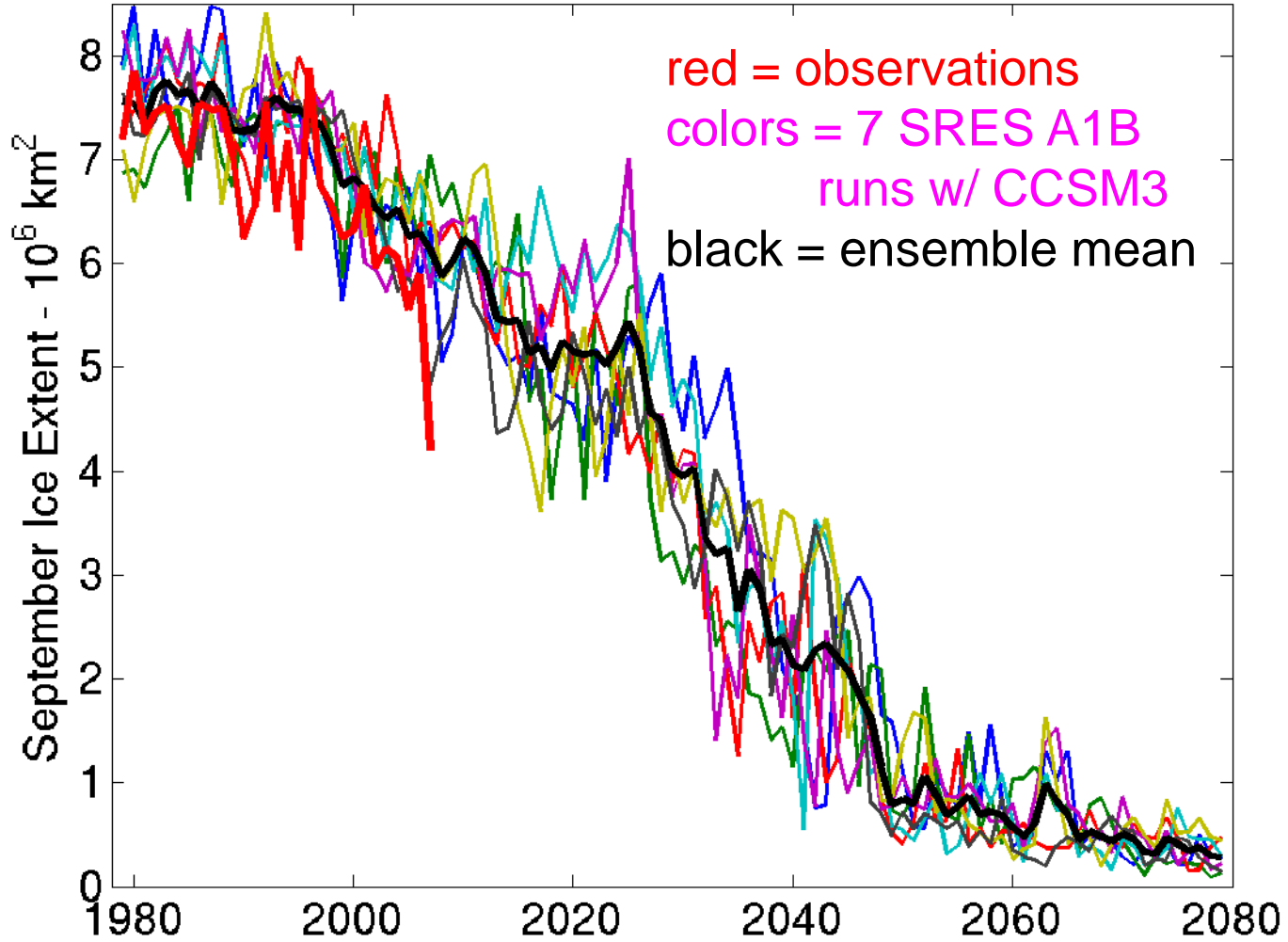
A1B Scenario with CCSM3



September Concentration

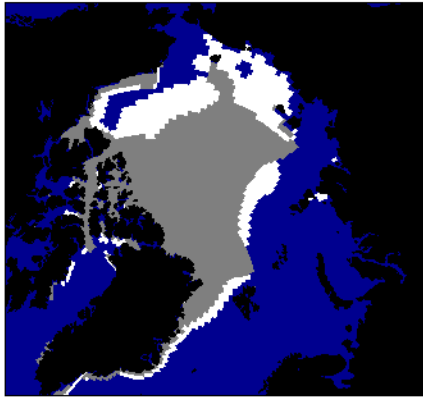
Holland, Bitz, and Tremblay, 2006



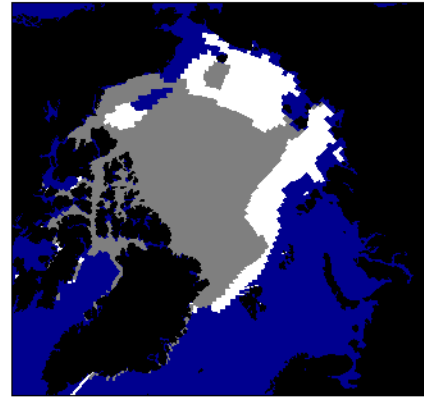


CCSM3 Single Year Decline at Least as Big as Observed in 2007

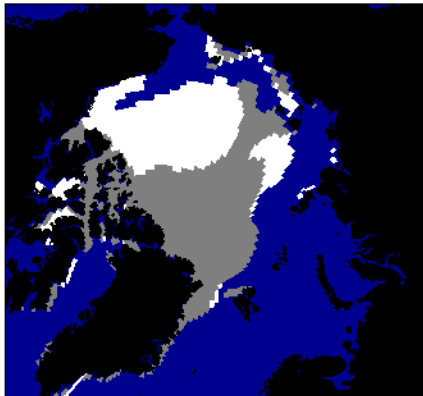
Run 2, 2017



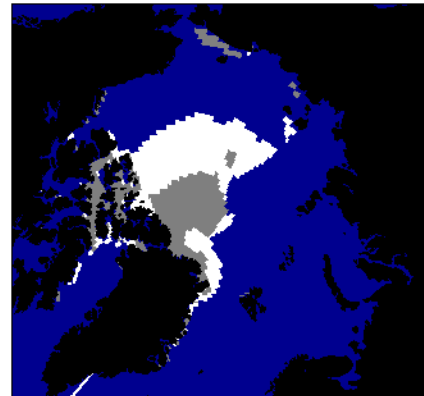
Run 5, 2027



Run 2, 2028

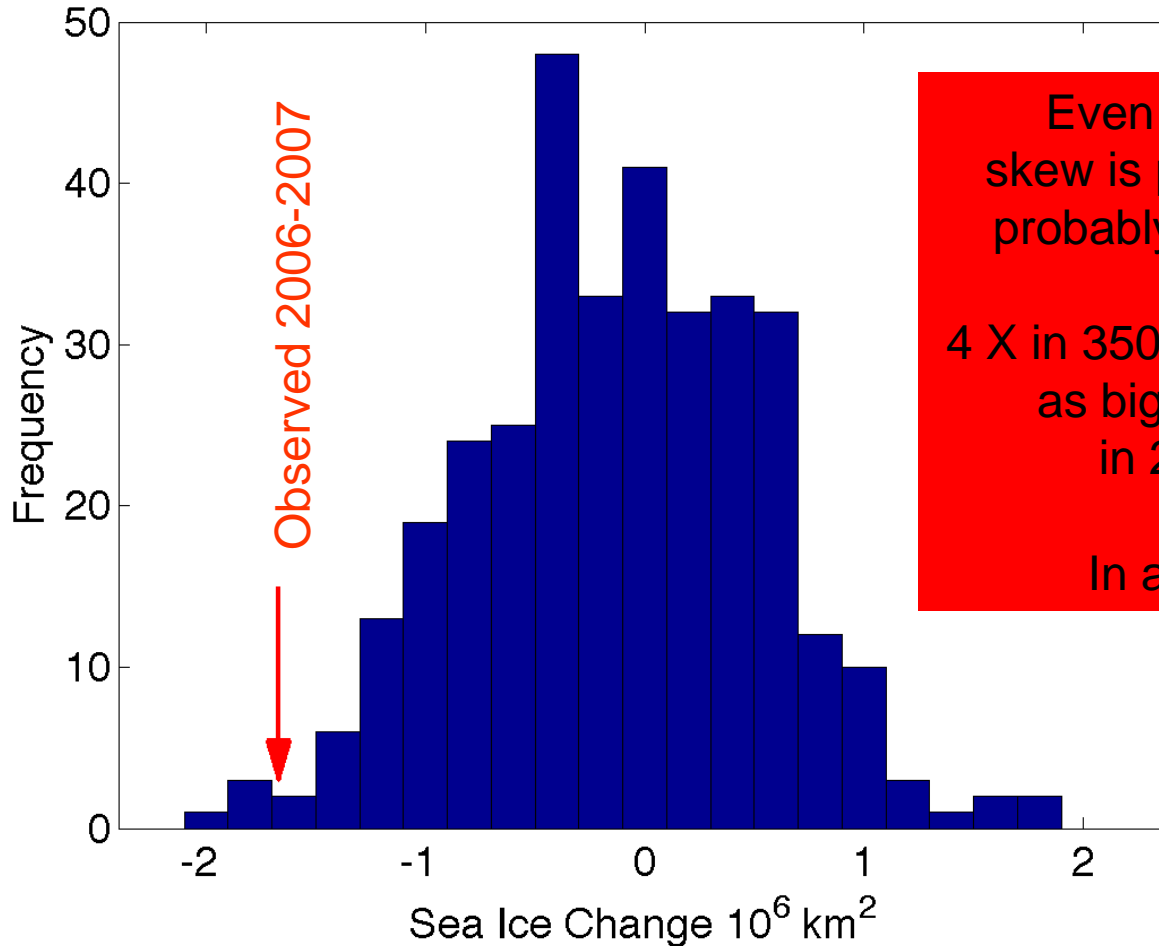


Run 5, 2034



CCSM3 2001-2050 A1B Scenario - 7 Runs

Histogram of 1 yr September Sea Ice Change



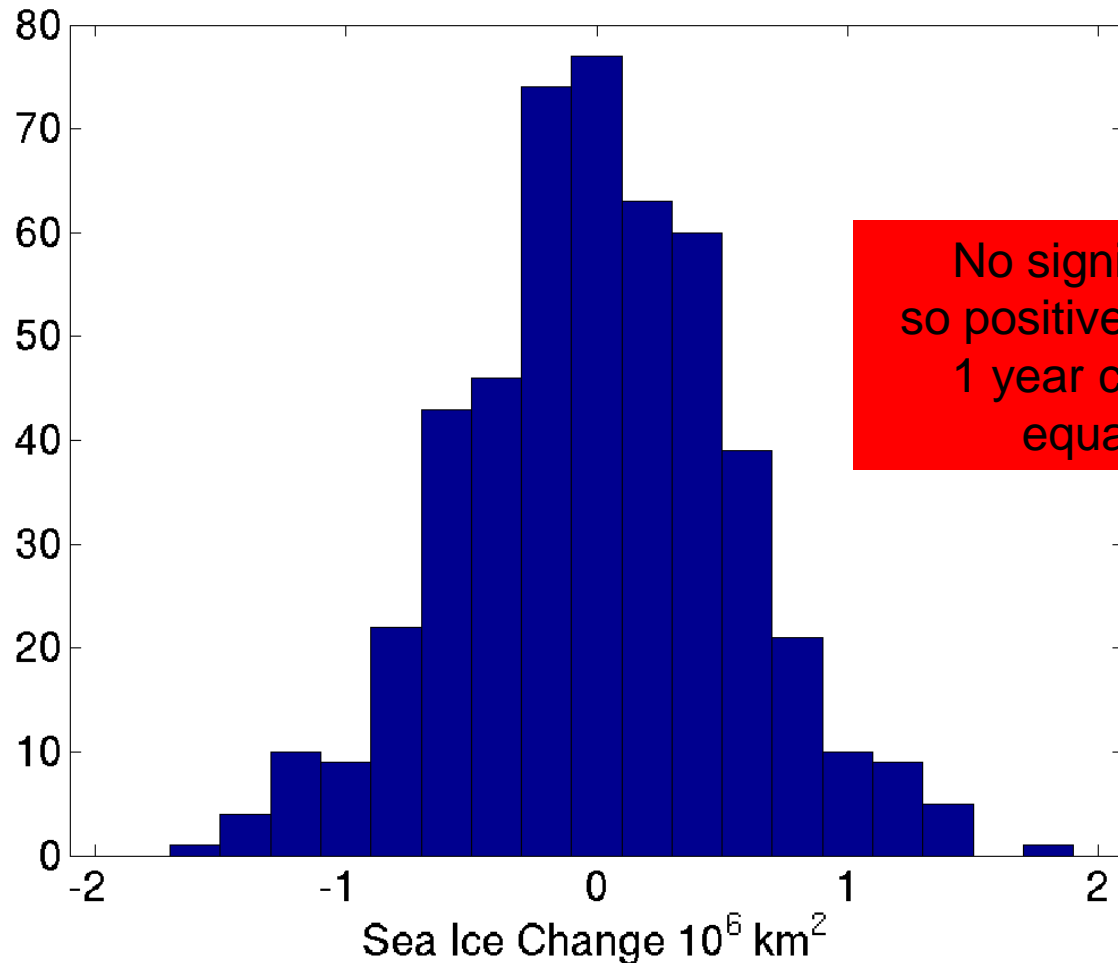
Even with TREND
skew is positive, though
probably not significant

4 X in 350 years the drop is
as big as observed
in 2006-2007

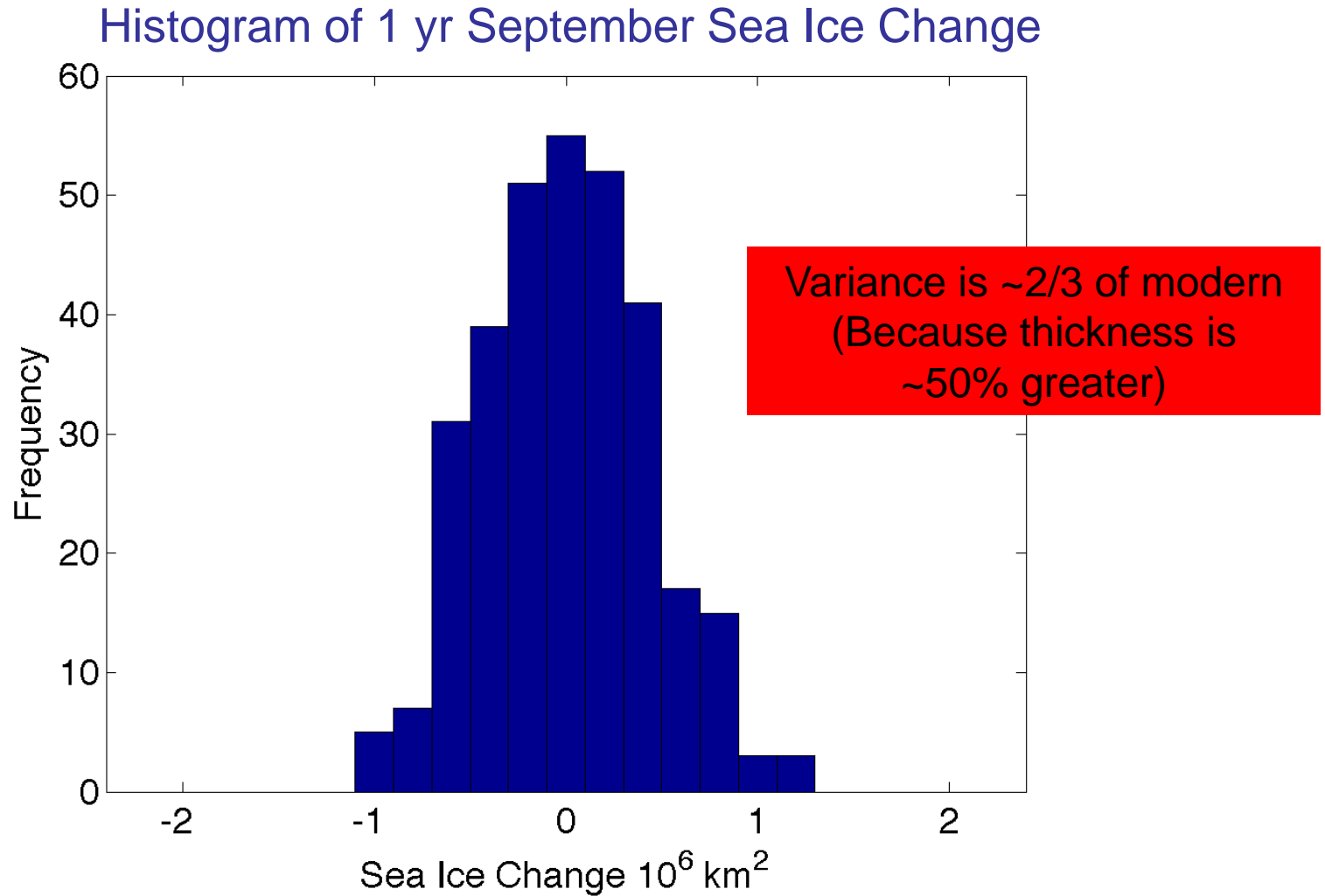
In any decade

Histogram of 400 yr CCSM3 1990s Control

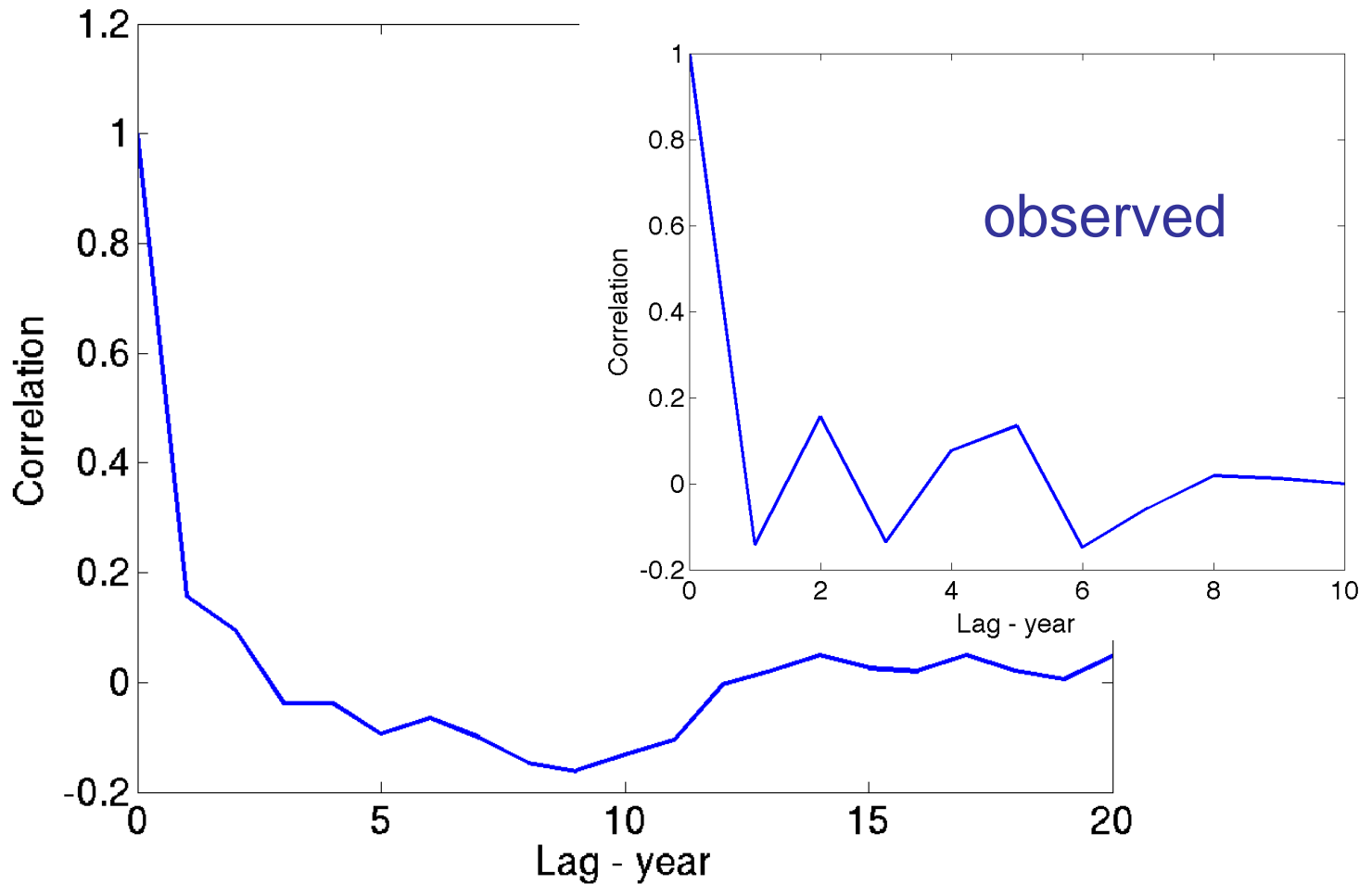
Histogram of 1 yr September Sea Ice Change



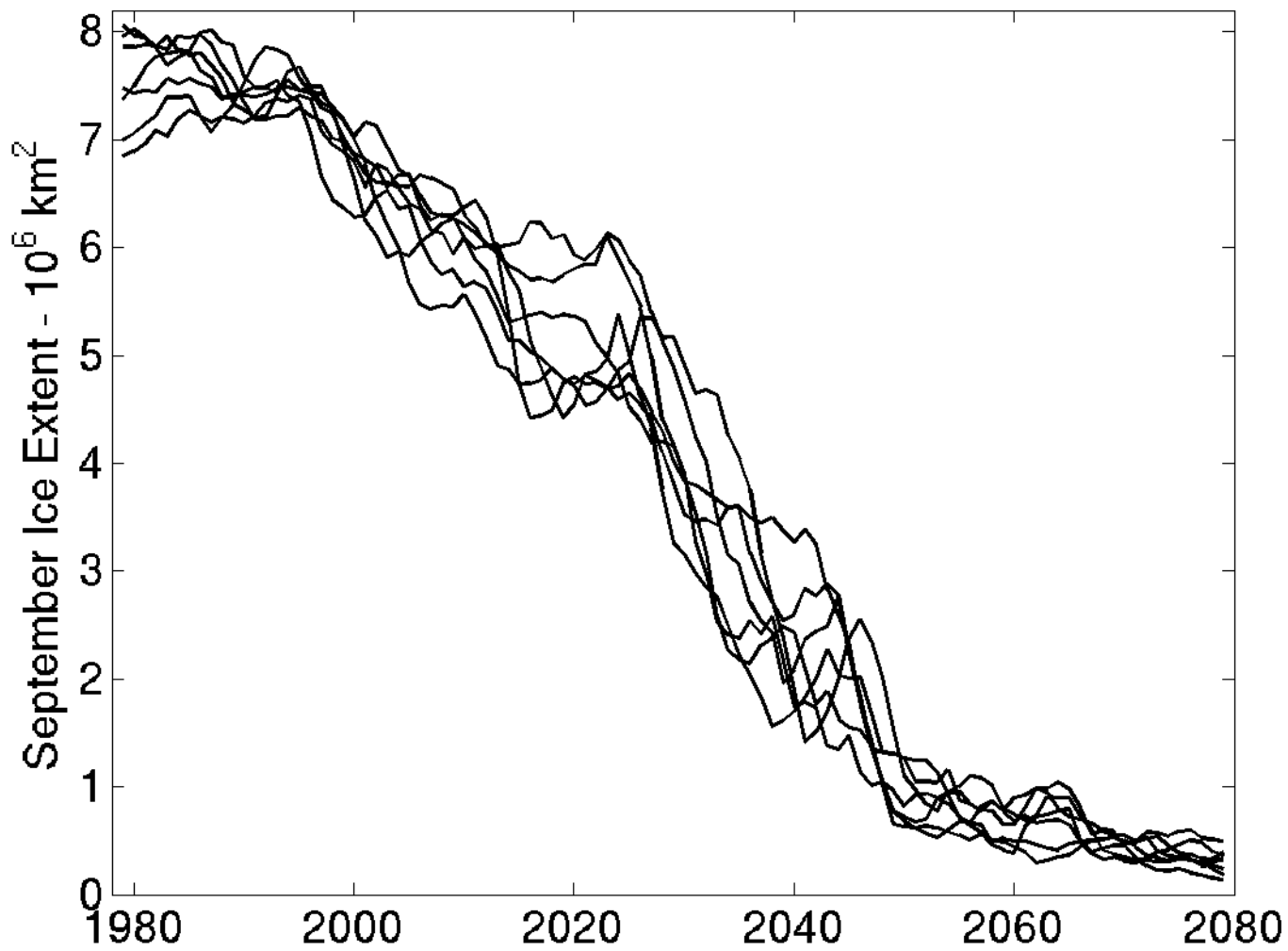
Histogram of 320 yr CCSM3 Pre-Industrial Control



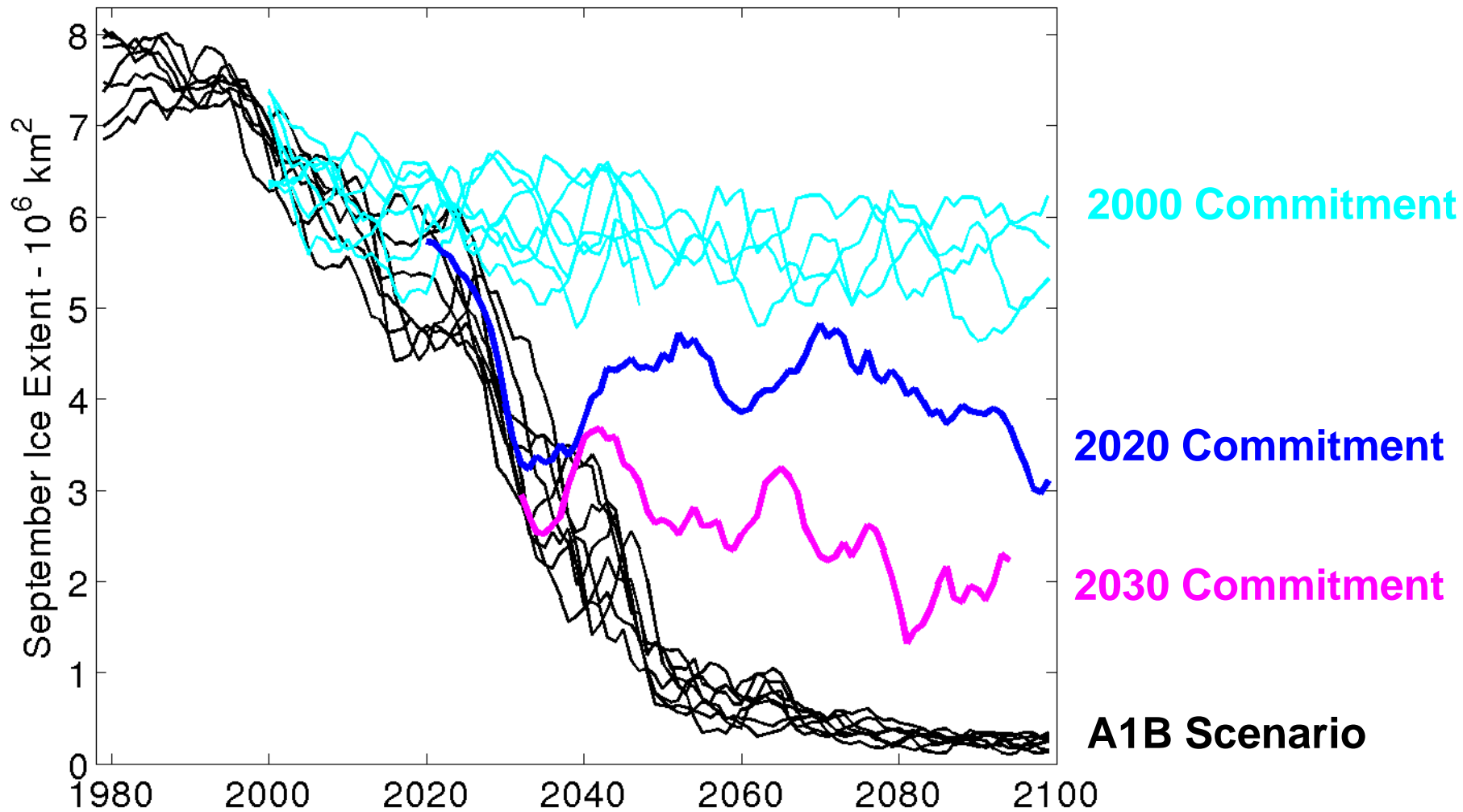
Autocorrelation of 400 yr CCSM3 1990s Control September ice cover



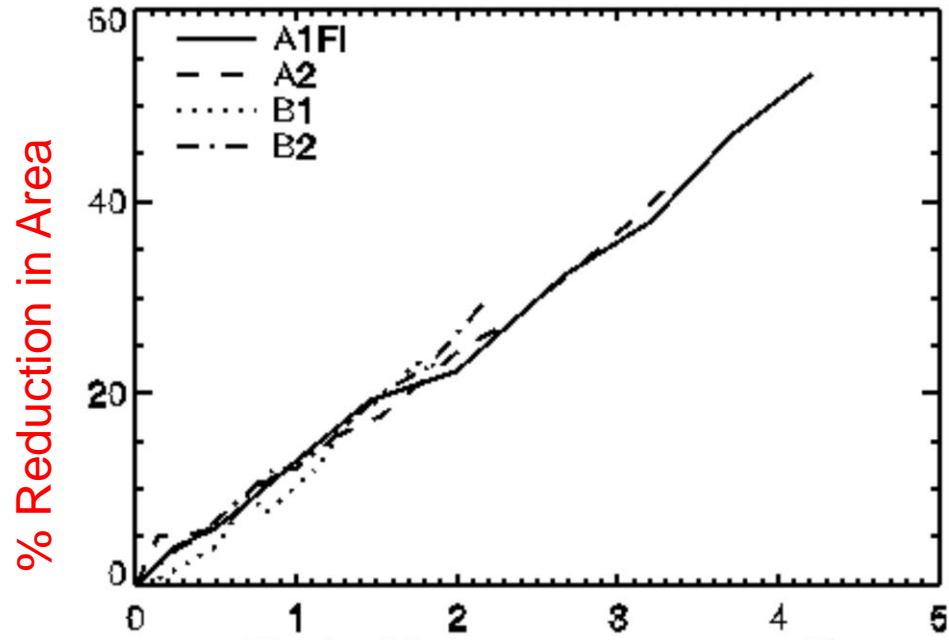
A1B Runs - 5 yr smoothing



Now with Commitment Runs



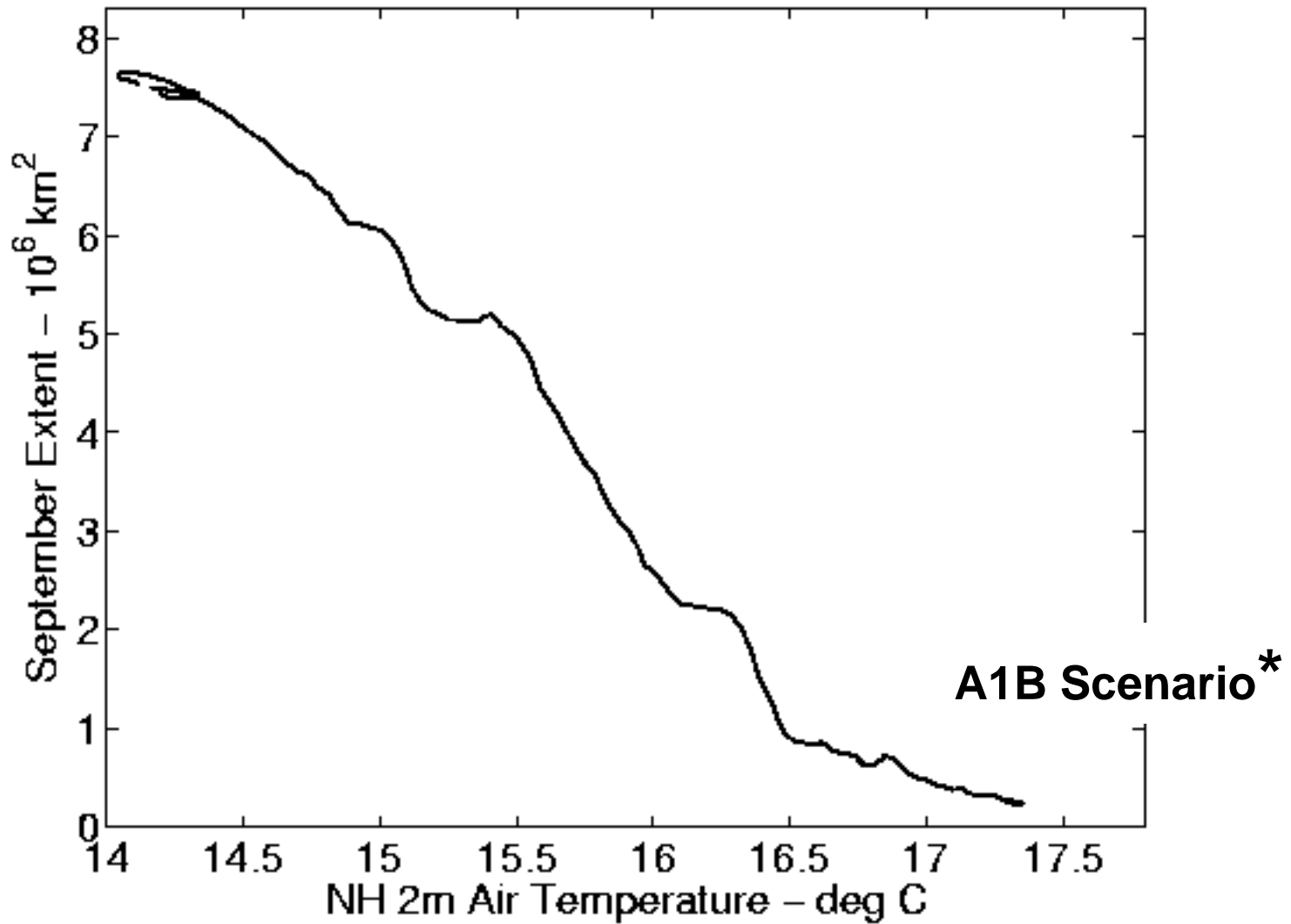
Gregory et al., 2002 using HadCM3



Global Warming - deg C

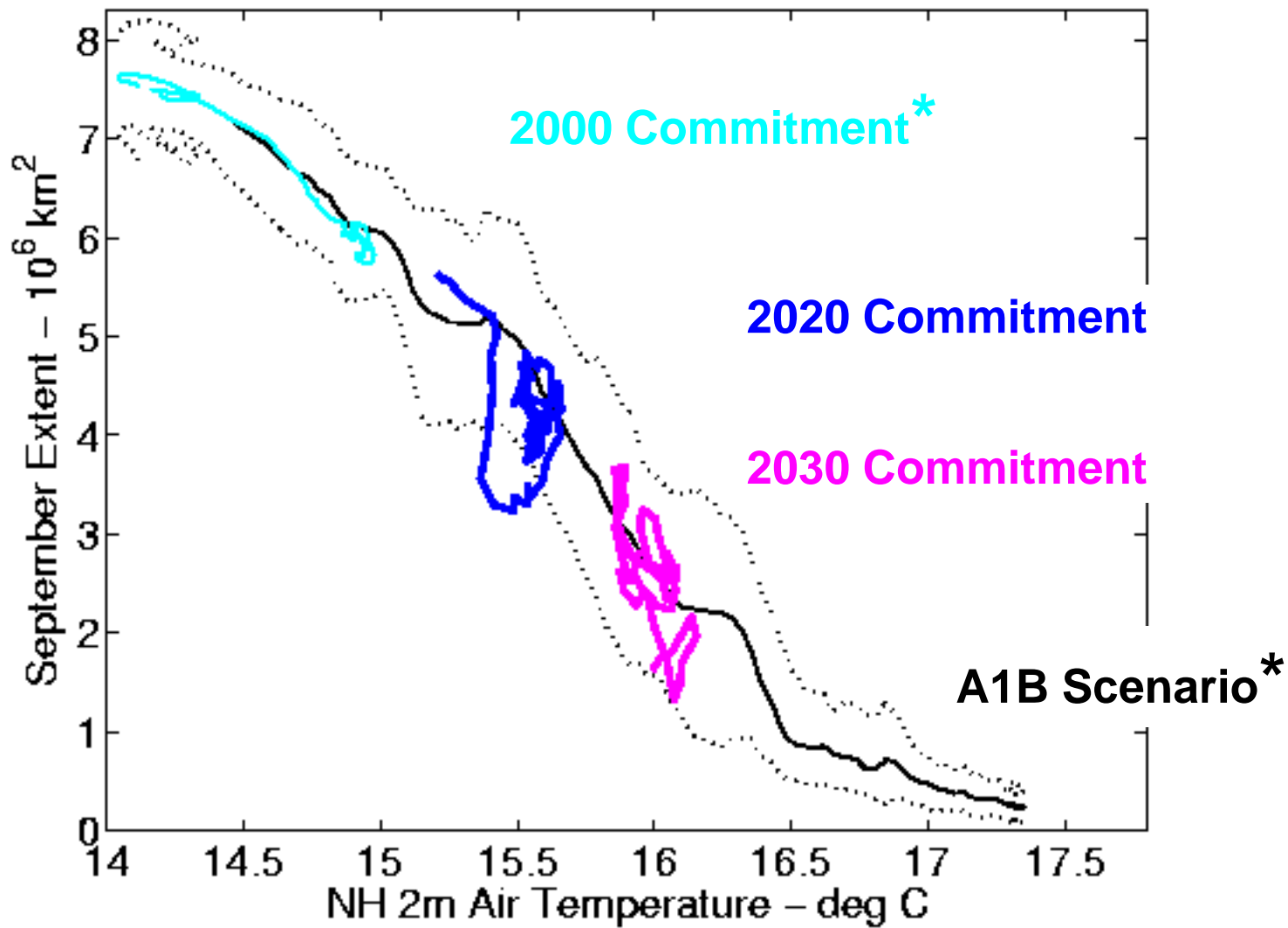
(annual mean area!)

Gregory-like plots using CCSM3

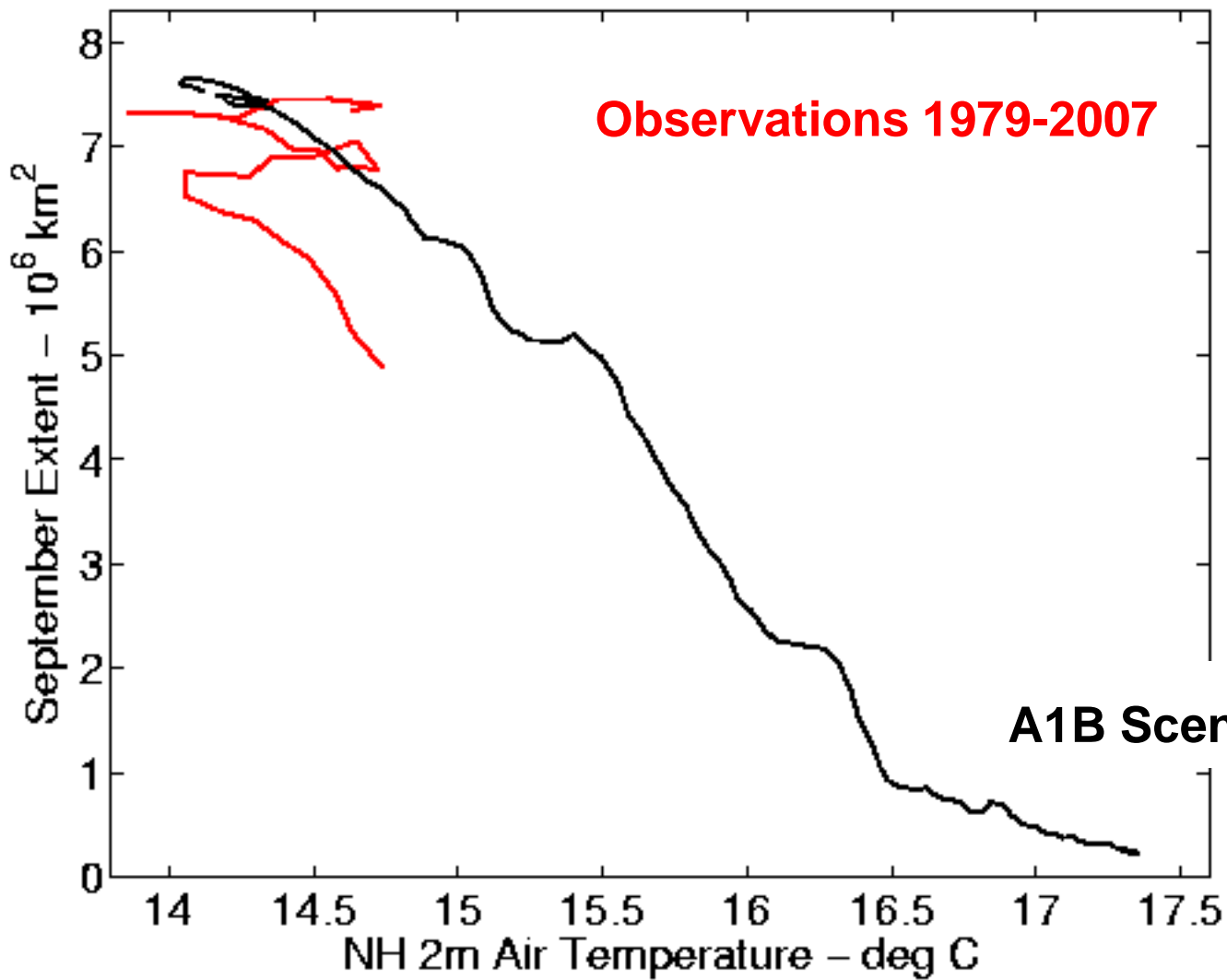


A1B Scenario*

***Ensemble Average**

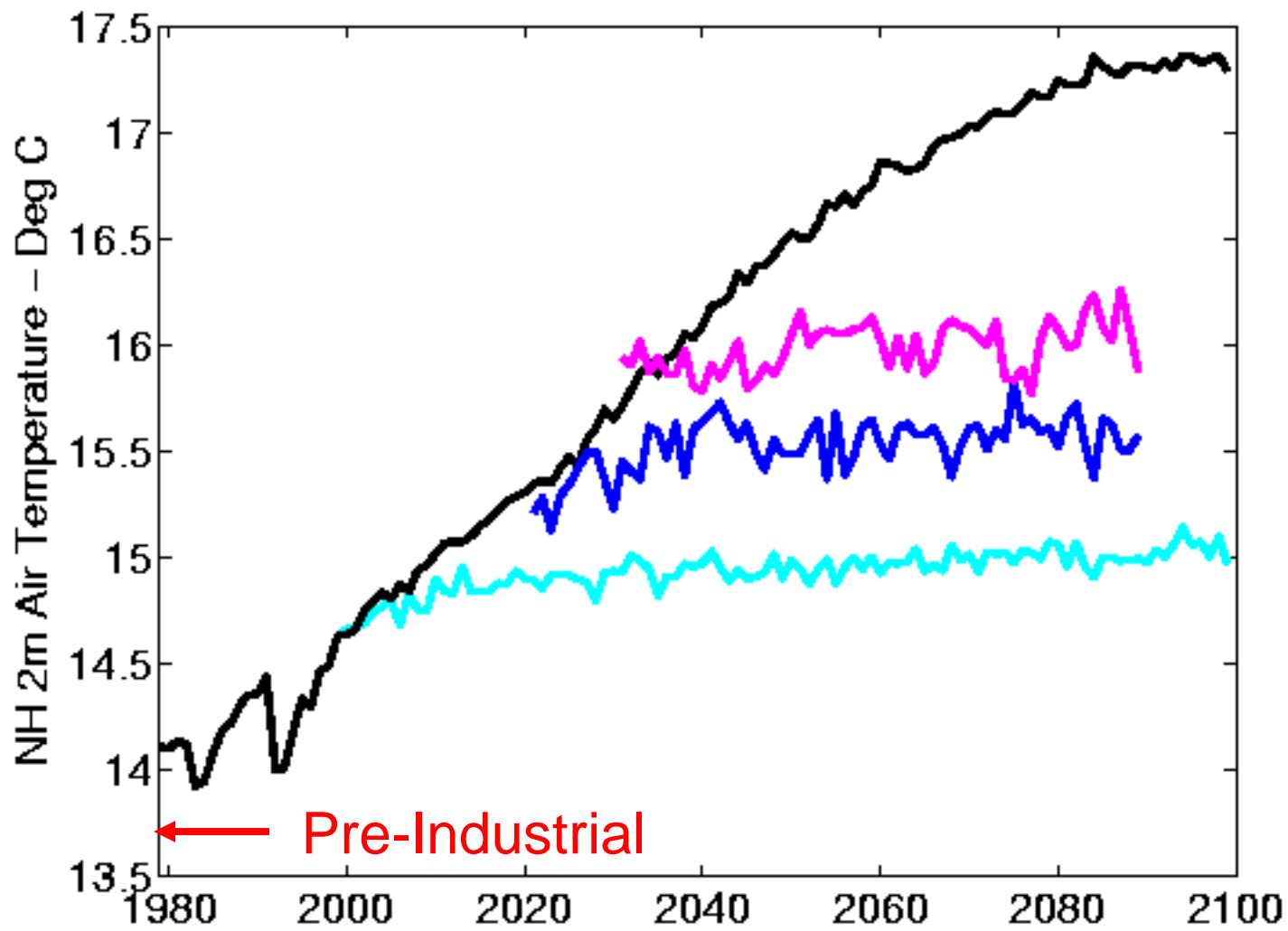


*Ensemble Average (with envelope)

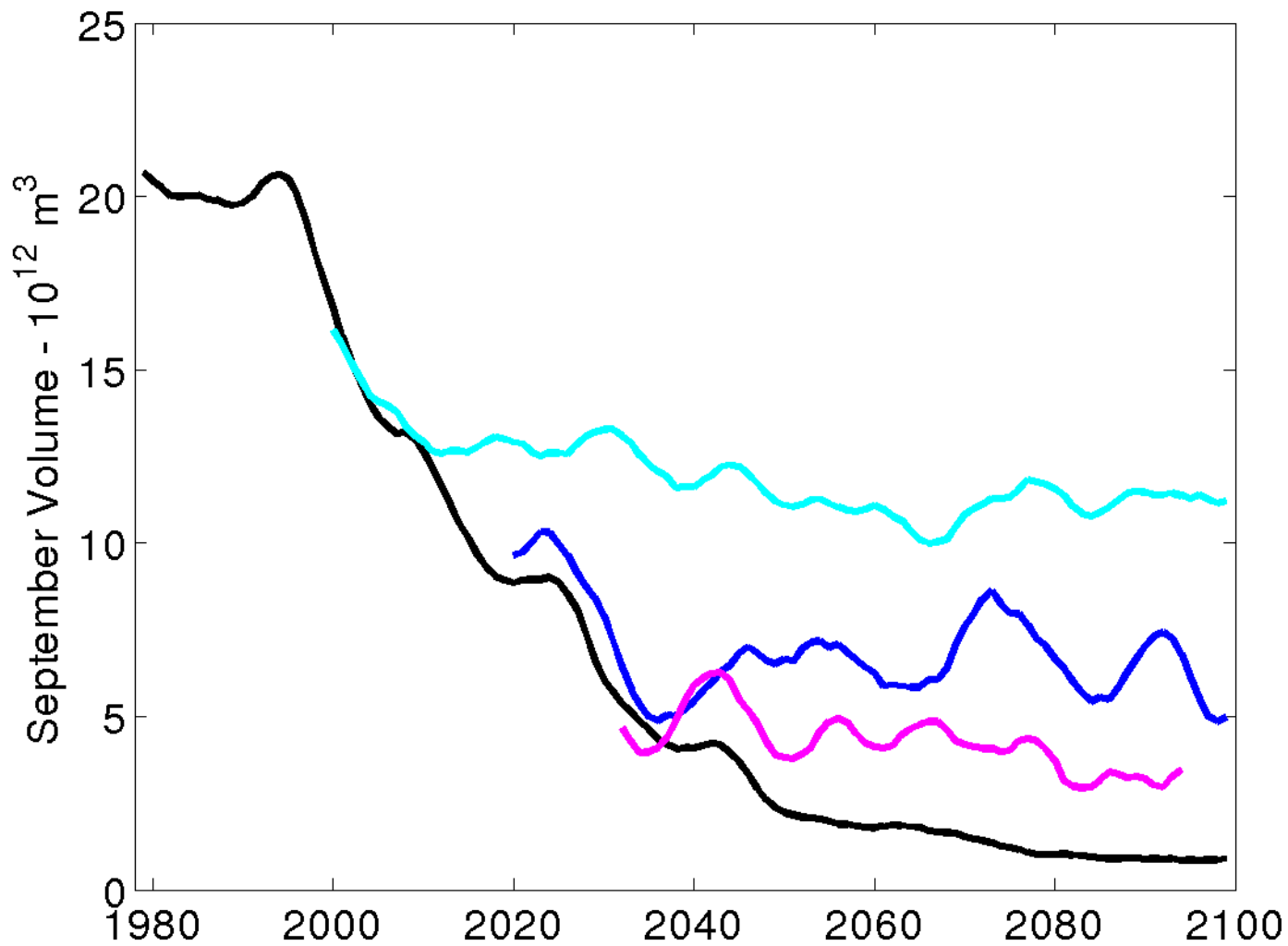


A1B Scenario *

*** Ensemble Average**



← Pre-Industrial



Summary

Sea ice anomalies like 2007 occur about 1% of the time in 21st century CCSM3 runs.

Larger anomalies are increasing probable as ice thins

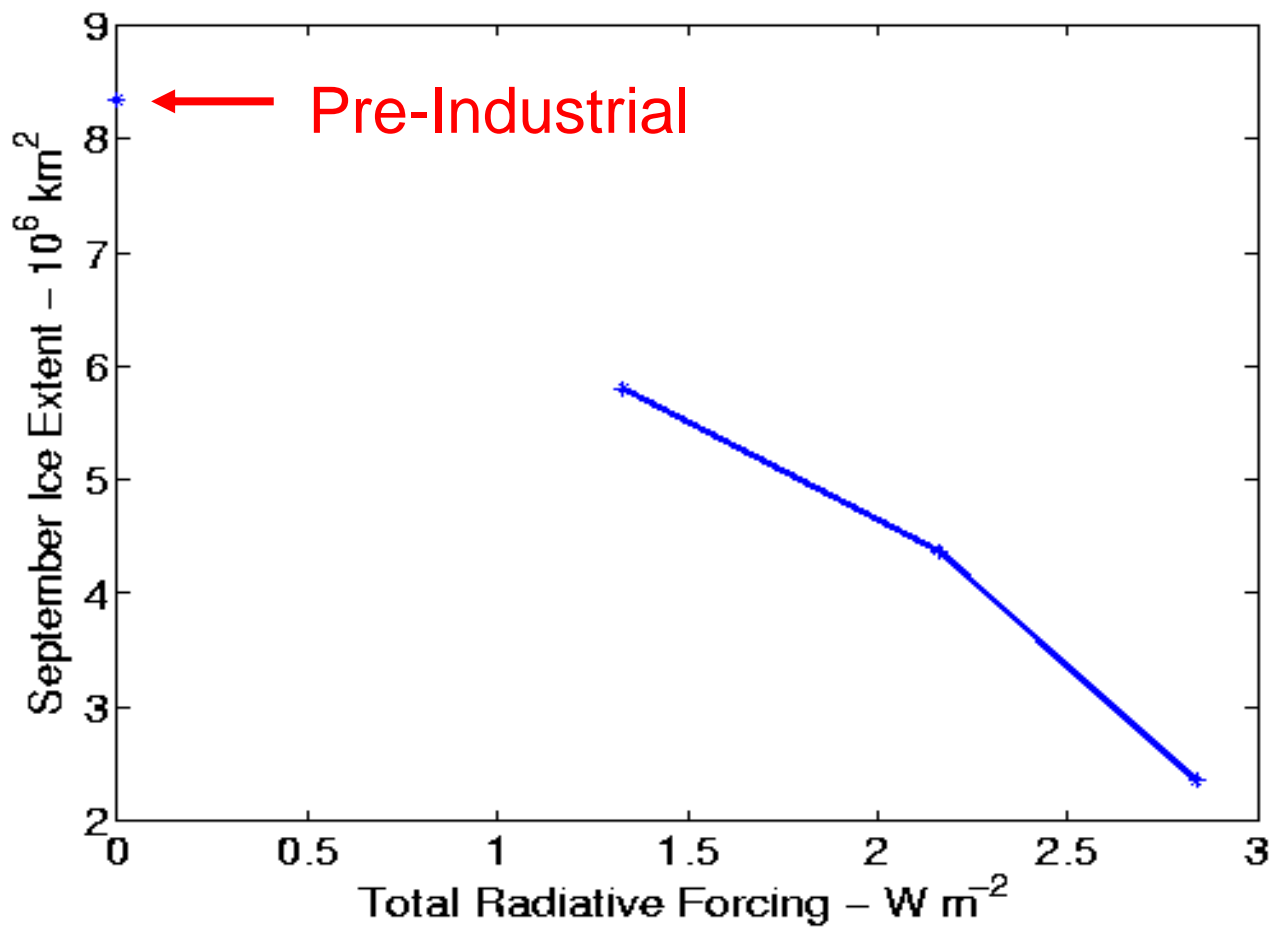
Anomalies are not negatively skewed and there is little memory in extent from one September to the next.

Bifurcation - irreversible transition to a new state

No Evidence!

Small change in forcing causes a large and/or fast change

Yes!



SUTTON IMPACT

PLANNING A TROPICAL VACATION? NOW'S THE TIME TO ...

Discover the NORTH POLE!

by WARD "HOT! HOT! HOT!" SUTTON

LAZY ASS CRUISES

PARTY AT THE POLE!

DU-U-UDE!

YAAAAAAAAY!

FLOAT IN AND COOL OFF WITH A BLIZZARD

FREE DEAD POLAR BEAR FOR THE KIDS!

EVEN PENGUINS ARE "MARCHING" THEIR "HAPPY FEET" NORTH!

HOW COULD WE RESIST?

SPF 850

IT'S NEW! IT'S SEXY! IT'S TOTALLY THAWED!™

Now Booking For 2040