

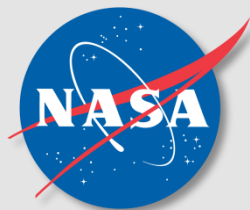
**NOAA/NASA**

# Annual Global Analysis for 2014

*2014 was Warmest Year on Record*

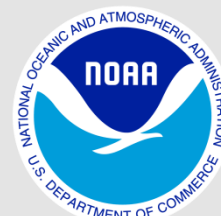
**Gavin A. Schmidt**

*Director, NASA's Goddard Institute for Space Studies*



**Thomas R. Karl**

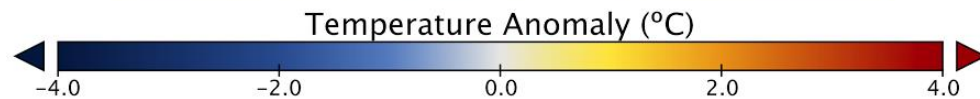
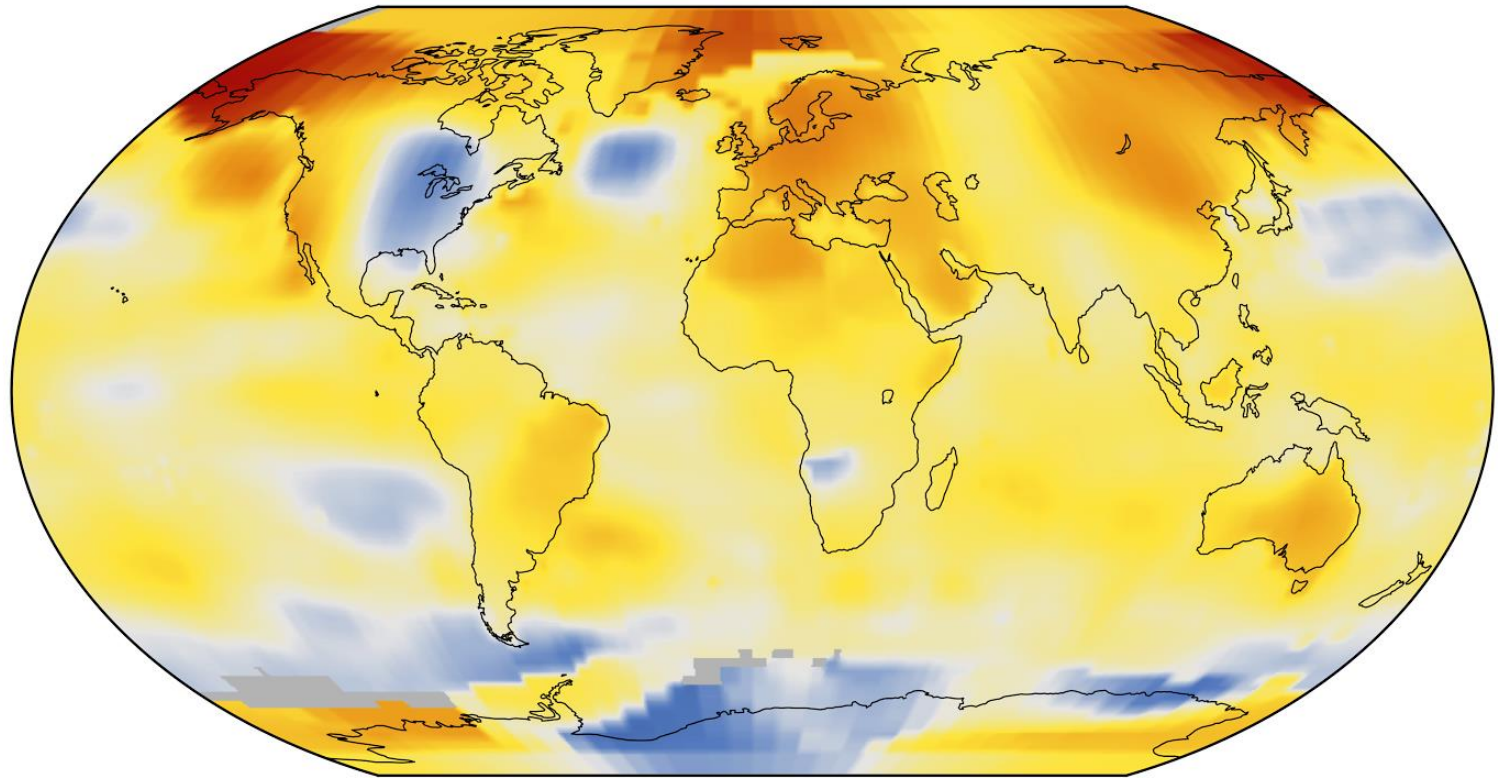
*Director, NOAA's National Climatic Data Center*



January 2015

# NASA 2014 Global Temperature

GISTEMP 2014 Anomaly  
with respect to 1951-1980 climatology



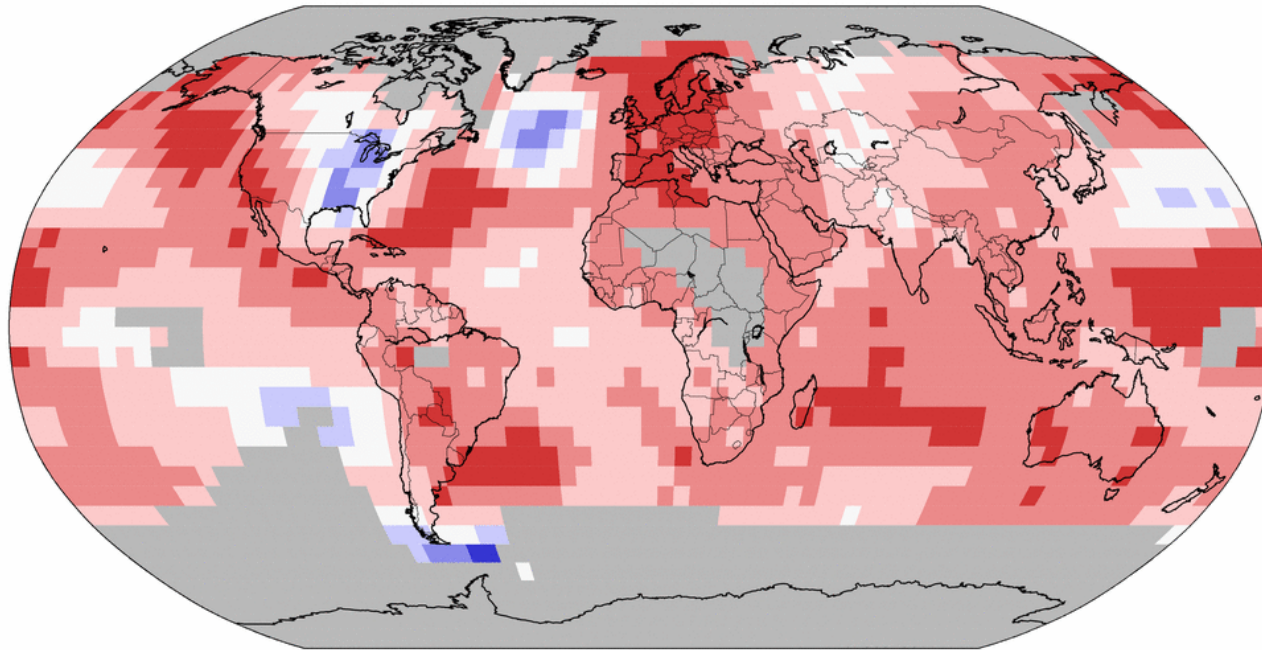
Global  
Anomaly:  
0.68°C

# NOAA 2014 Global Temperature

Land & Ocean Temperature Percentiles Jan–Dec 2014

NOAA's National Climatic Data Center

Data Source: GHCN–M version 3.2.2 & ERSST version 3b



Record Coldest

Much Cooler than Average

Cooler than Average

Near Average

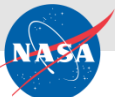
Warmer than Average

Much Warmer than Average

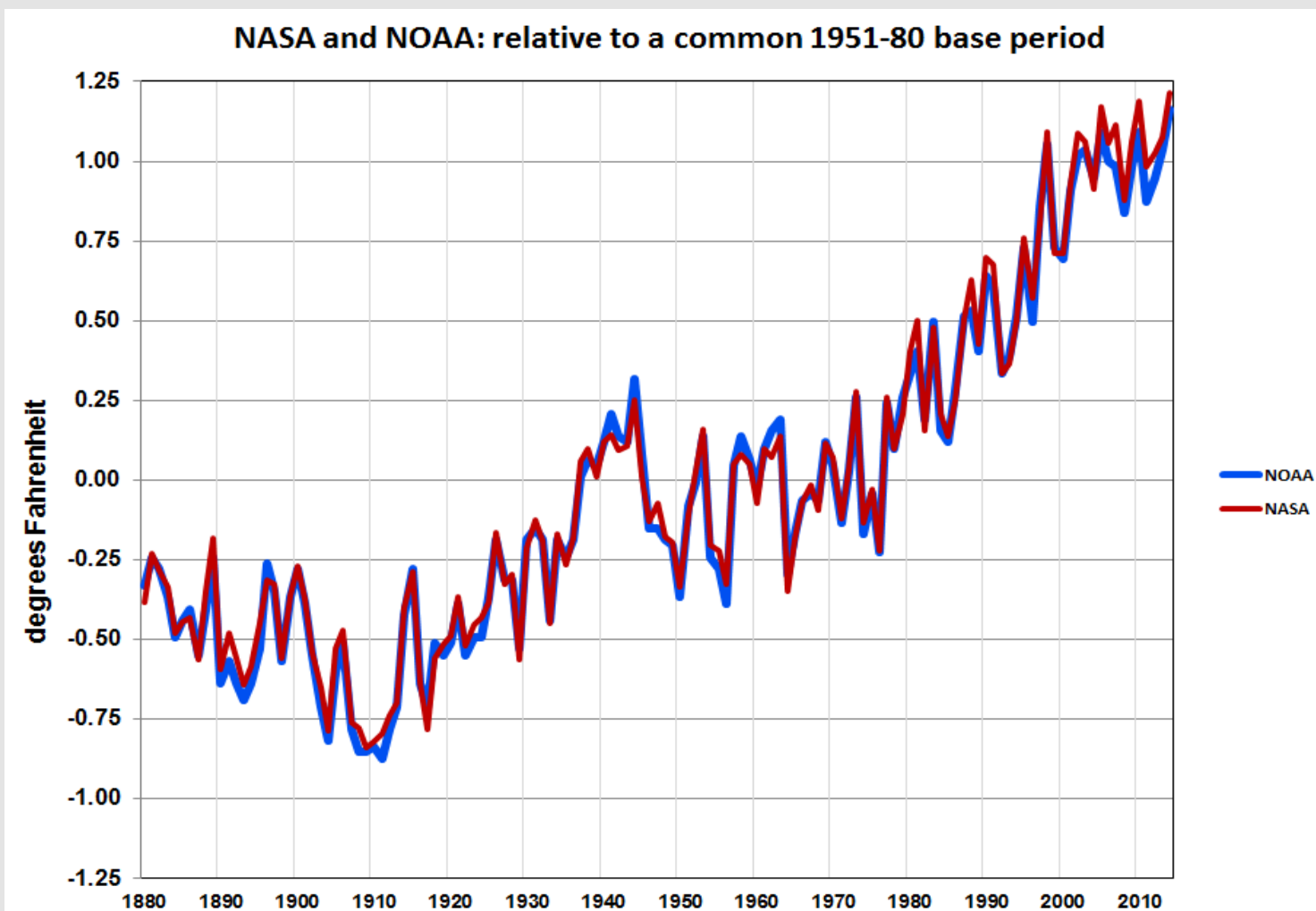
Record Warmest

- El Niño Southern Oscillation (ENSO) neutral conditions all year; almost weak ENSO in Nov-Dec
- Warmest year on record: 0.69°C / 1.24°F higher than 20<sup>th</sup> century average
- Global ocean surface record warm
- Global land surface 4<sup>th</sup> warmest on record

Mon Jan 12 14:27:33 EST 2015



# Comparing Global Temperature Analysis



# Ranking of Record Years is Sensitive to Methodology and Coverage

## NOAA

Probability of warmest year	
2014	~48%
2010	~18%
2005	~13%
2013	~6%
1998	~5%

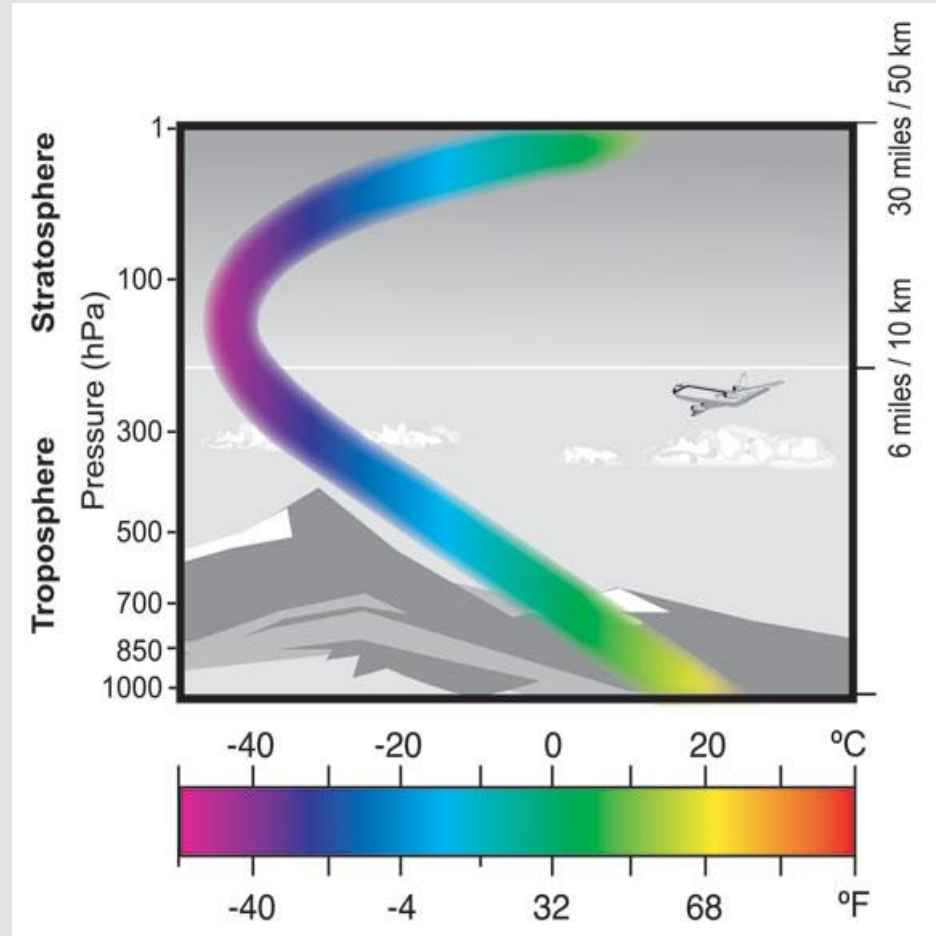
## NASA

Probability of warmest year	
2014	~38%
2010	~23%
2005	~17%
1998	~4%



# Looking at the Atmosphere

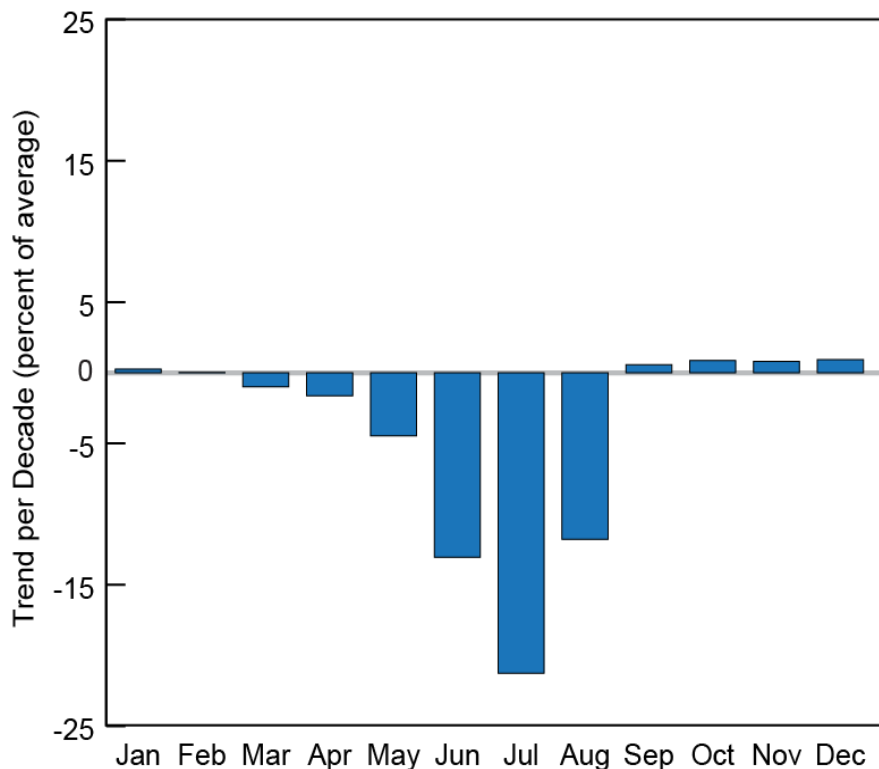
- Lower Stratosphere
  - UAH: 13<sup>th</sup> coolest
  - RSS: 13<sup>th</sup> coolest
- Middle Troposphere
  - UAH: 3<sup>rd</sup> warmest
  - RSS: 6<sup>th</sup> warmest
- Lower Troposphere
  - UAH: 3<sup>rd</sup> warmest
  - RSS: 6<sup>th</sup> warmest



# Northern Hemisphere Monthly Snow Cover Extent

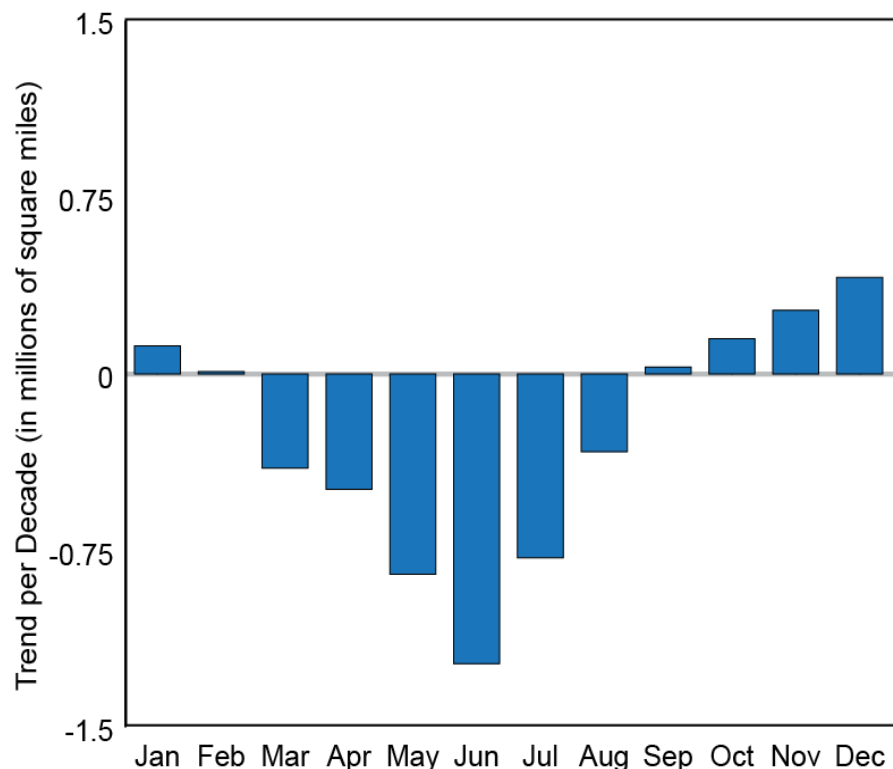
## Percent of Average Per Decade

Period Analyzed: November 1966 through December 2014

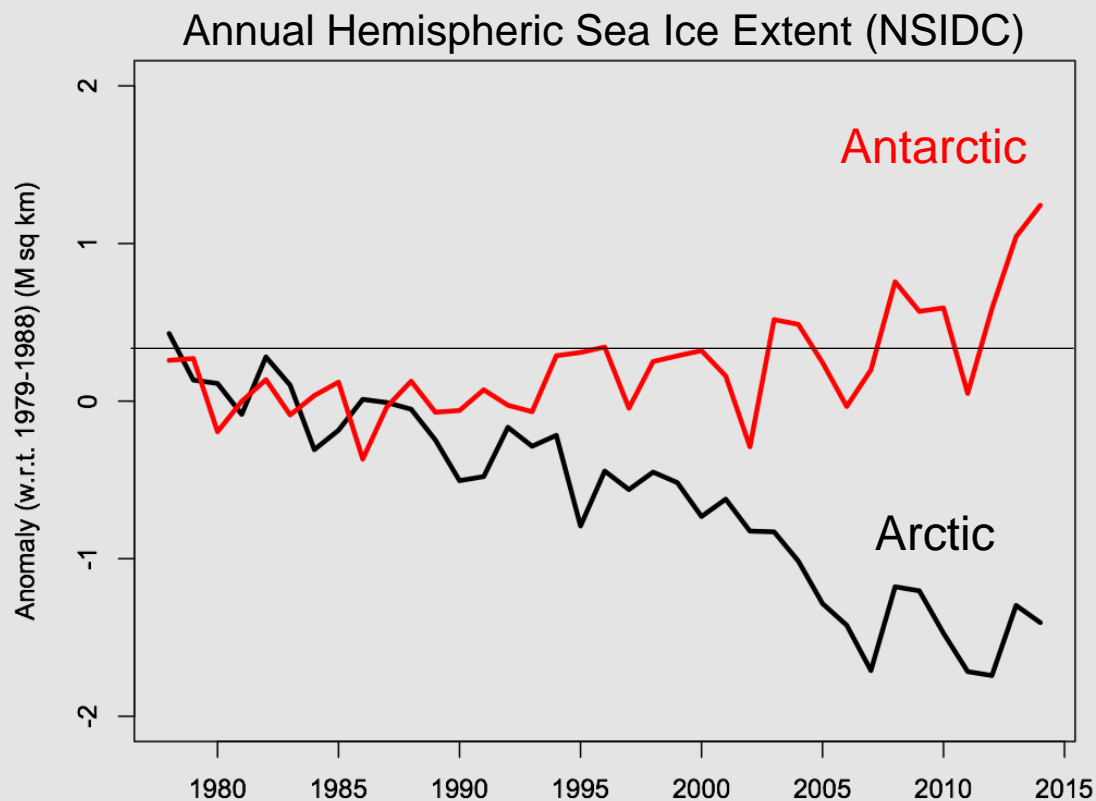


## Rate of Change Per Decade

Period Analyzed: November 1966 through December 2014

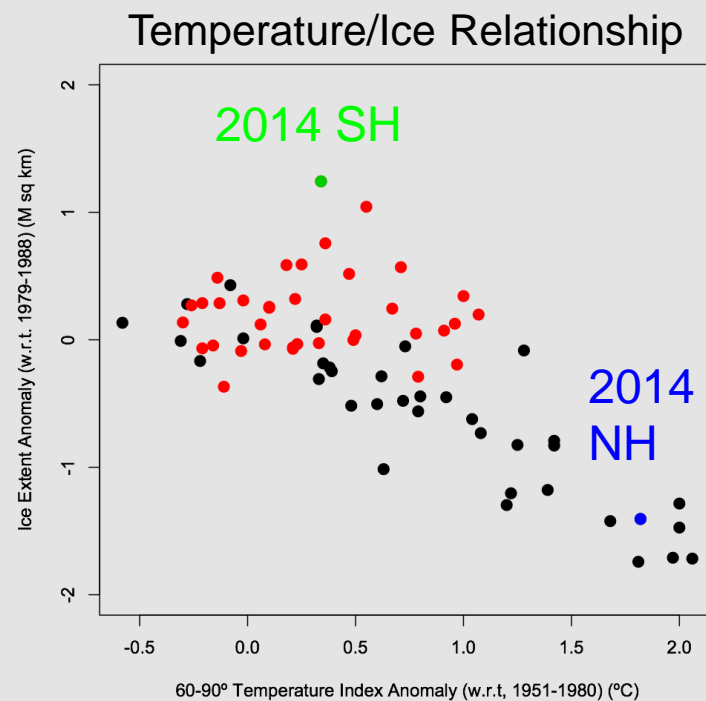


# Arctic and Antarctic Sea ice Extent



Arctic changes strongly correlated to polar temperature index. No clear relationship in Southern Hemisphere.

2014 was 6th lowest Arctic, *highest* Antarctic extent.



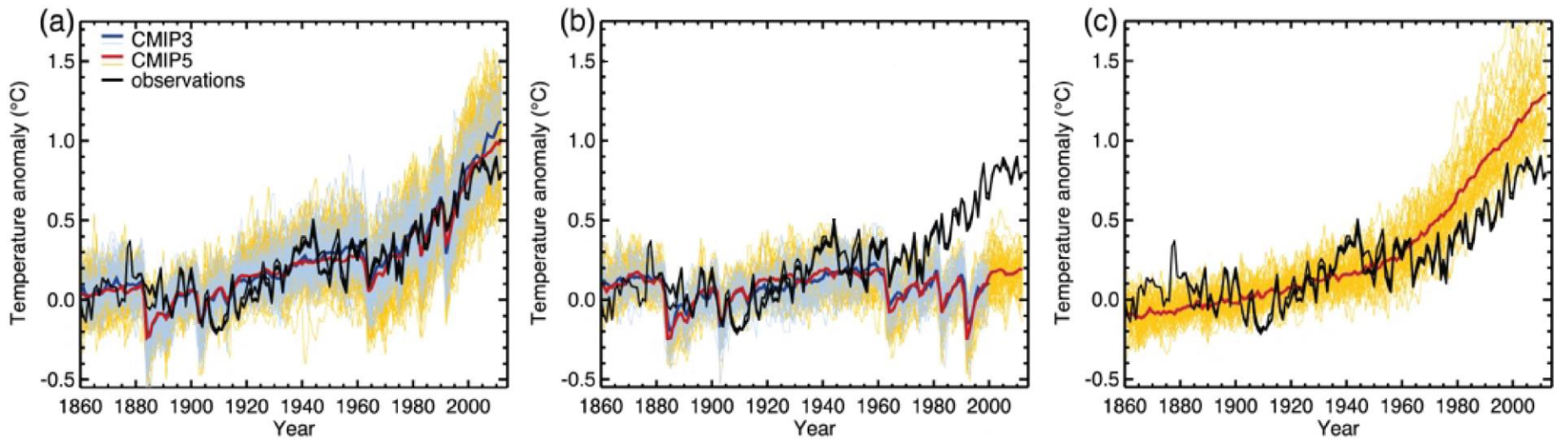


# Attribution of Long Term Trends

**All forcings (GHGs, aerosols, natural, land use etc.)**

**Natural forcings only (solar, volcanic)**

**Greenhouse Gases only**



Long term trends since ~1970 are dominated by increases in greenhouse gases (principally CO<sub>2</sub>). Natural forcings are slightly cooling.

IPCC AR5 Fig 10.1

# Questions?

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