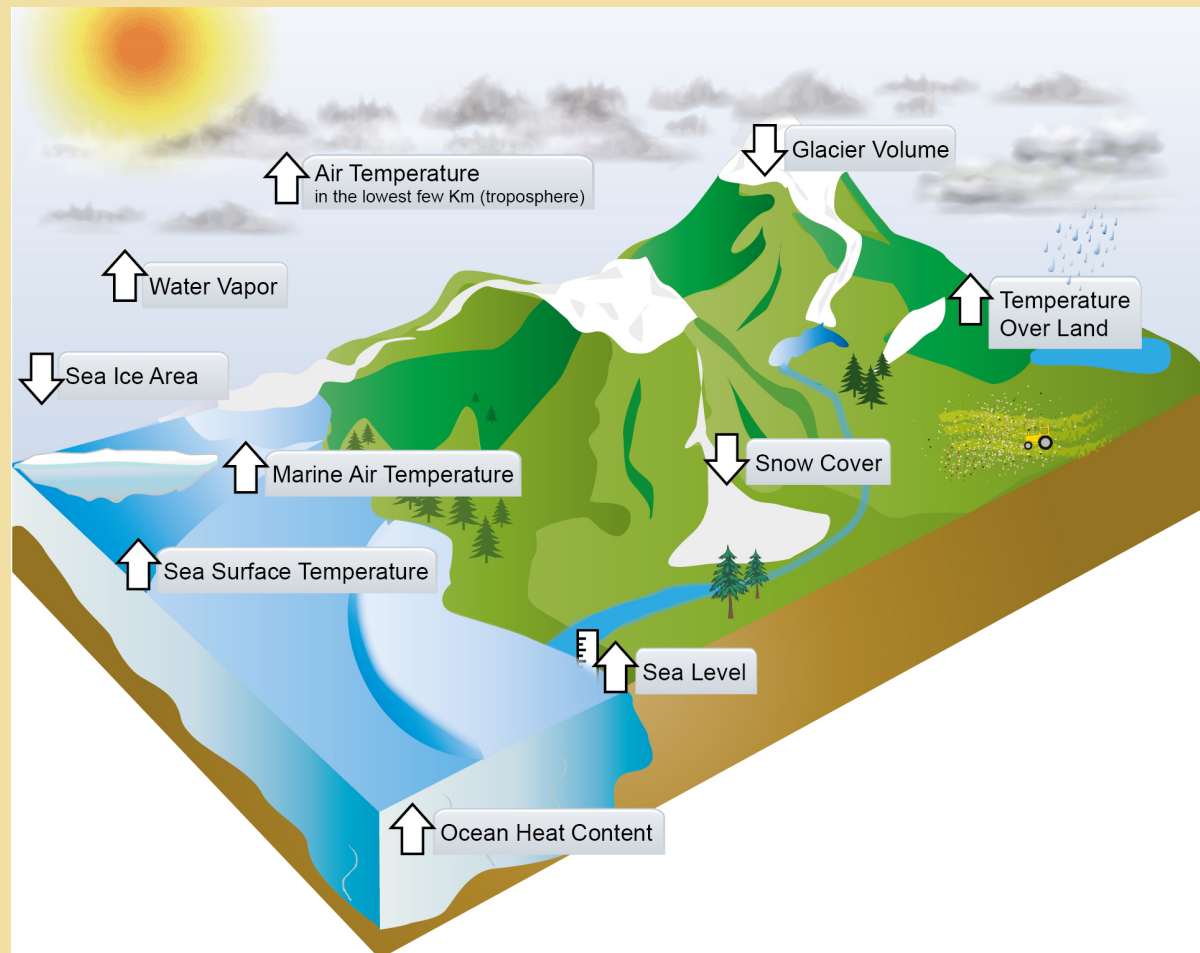


Climate Change and Society

GEOL-G490

Lecture 3: Observations: Atmosphere and Surface



1. Changes in Atmospheric Composition

2. Changes in Radiation Budgets

3. Changes in Temperature

4. Changes in Hydrological Cycle

5. Changes in Extreme Events

6. Changes in Atmospheric Circulation

4. Changes in Hydrological Cycle

Large-Scale Changes in Precipitation

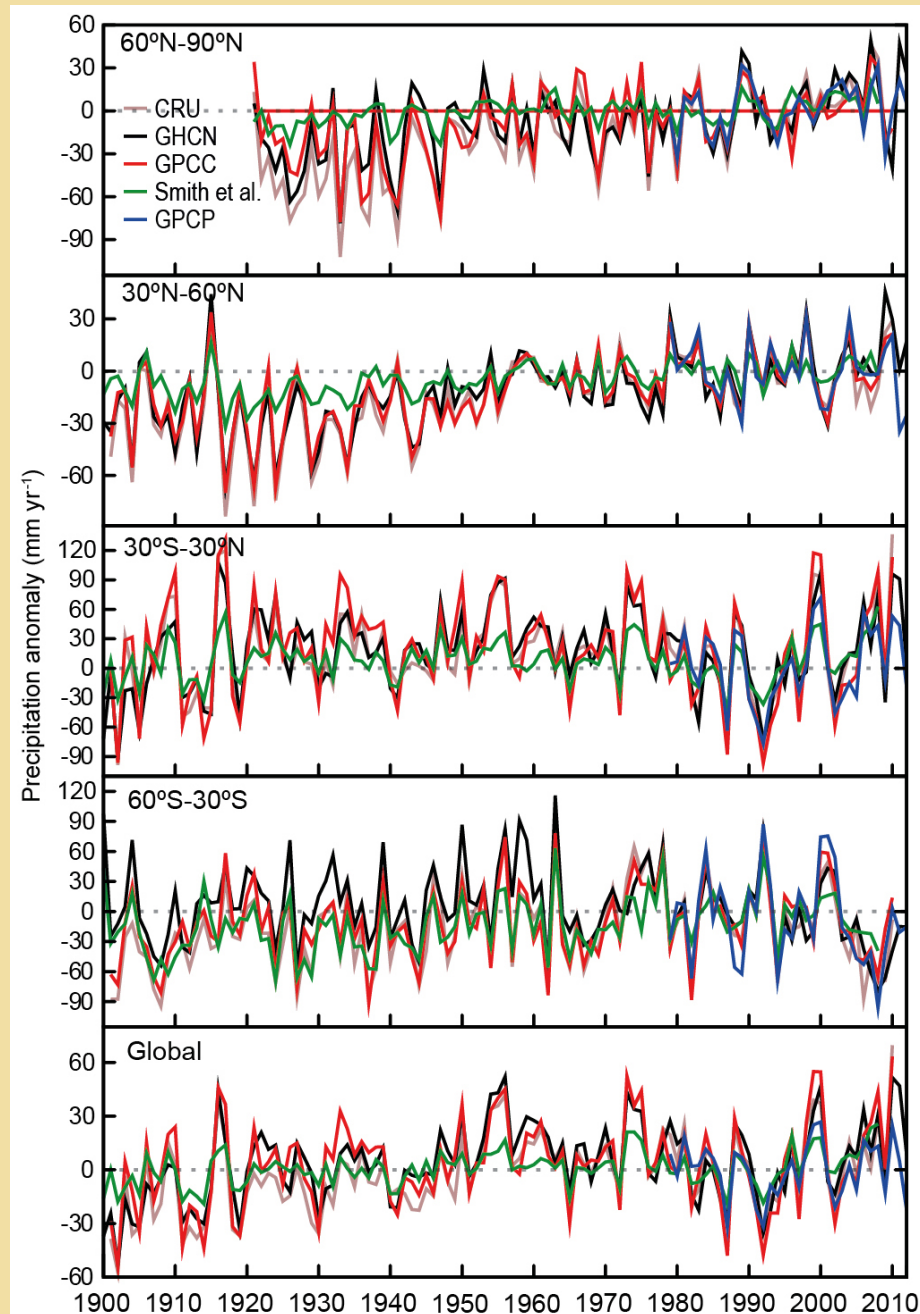


Fig. 2. 28

4. Changes in Hydrological Cycle

Large-Scale Changes in Precipitation

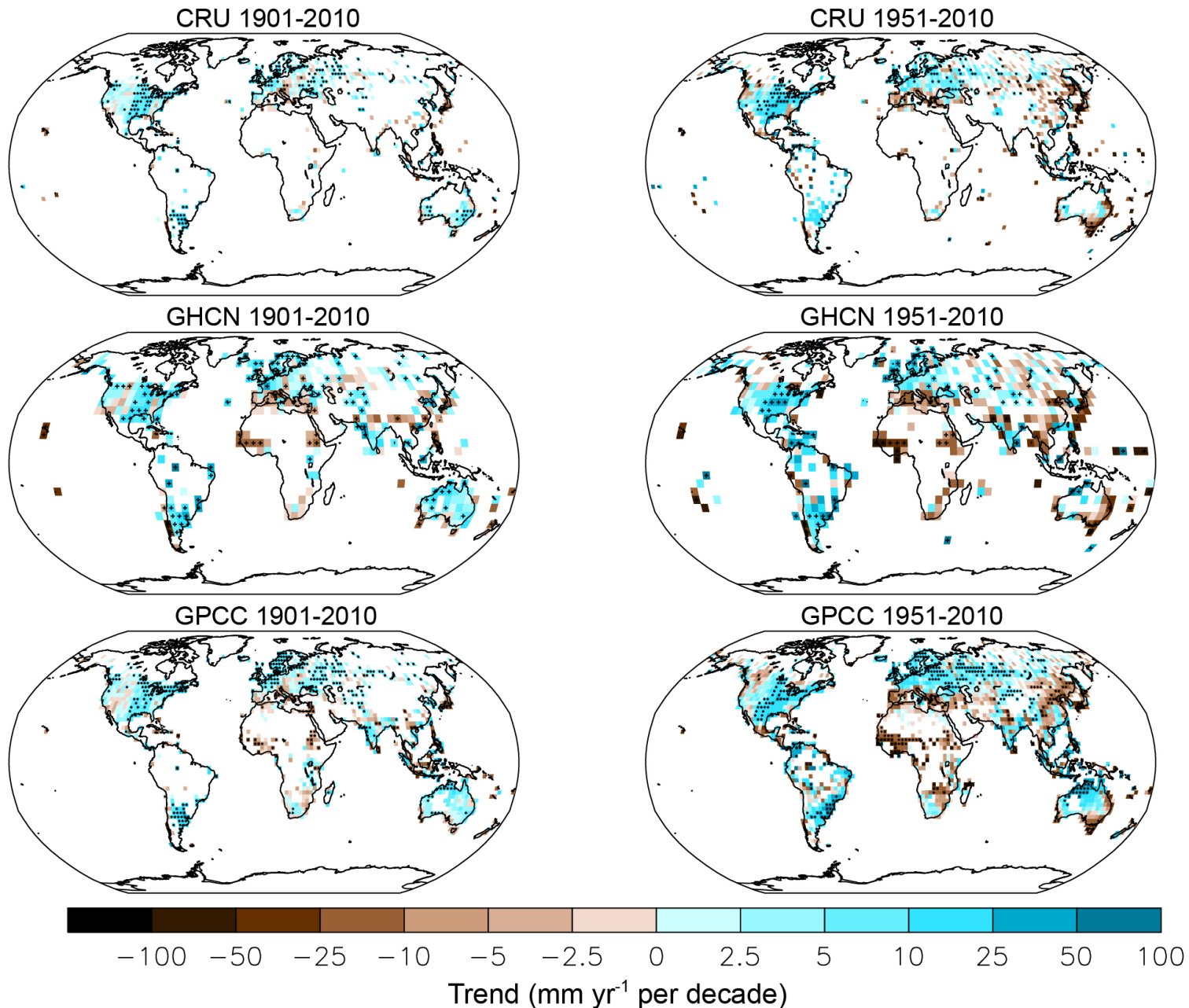


Fig. 2. 28

4. Changes in Hydrological Cycle

Changes in surface humidity

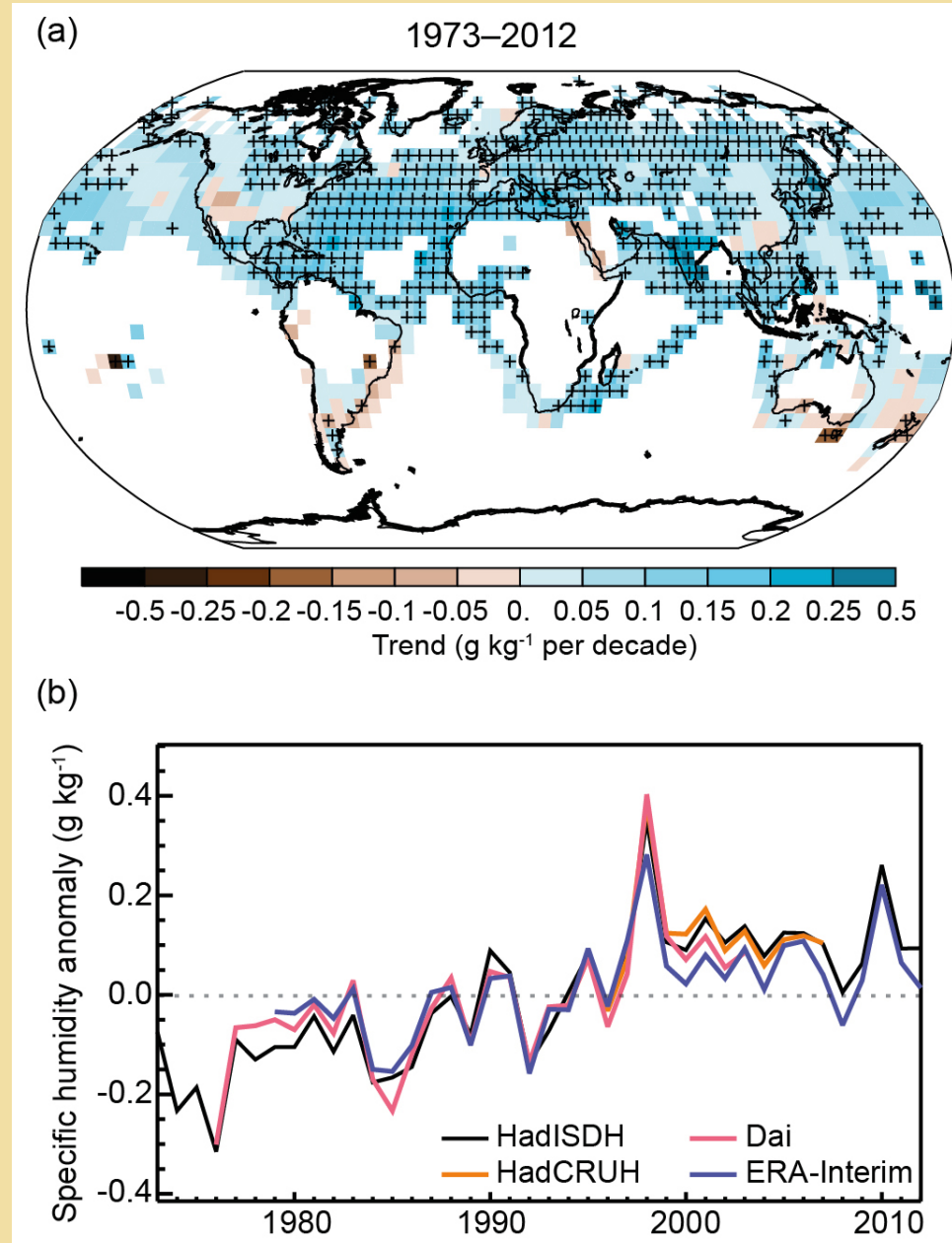


Fig. 2. 30

4. Changes in Hydrological Cycle

Changes in troposphere humidity

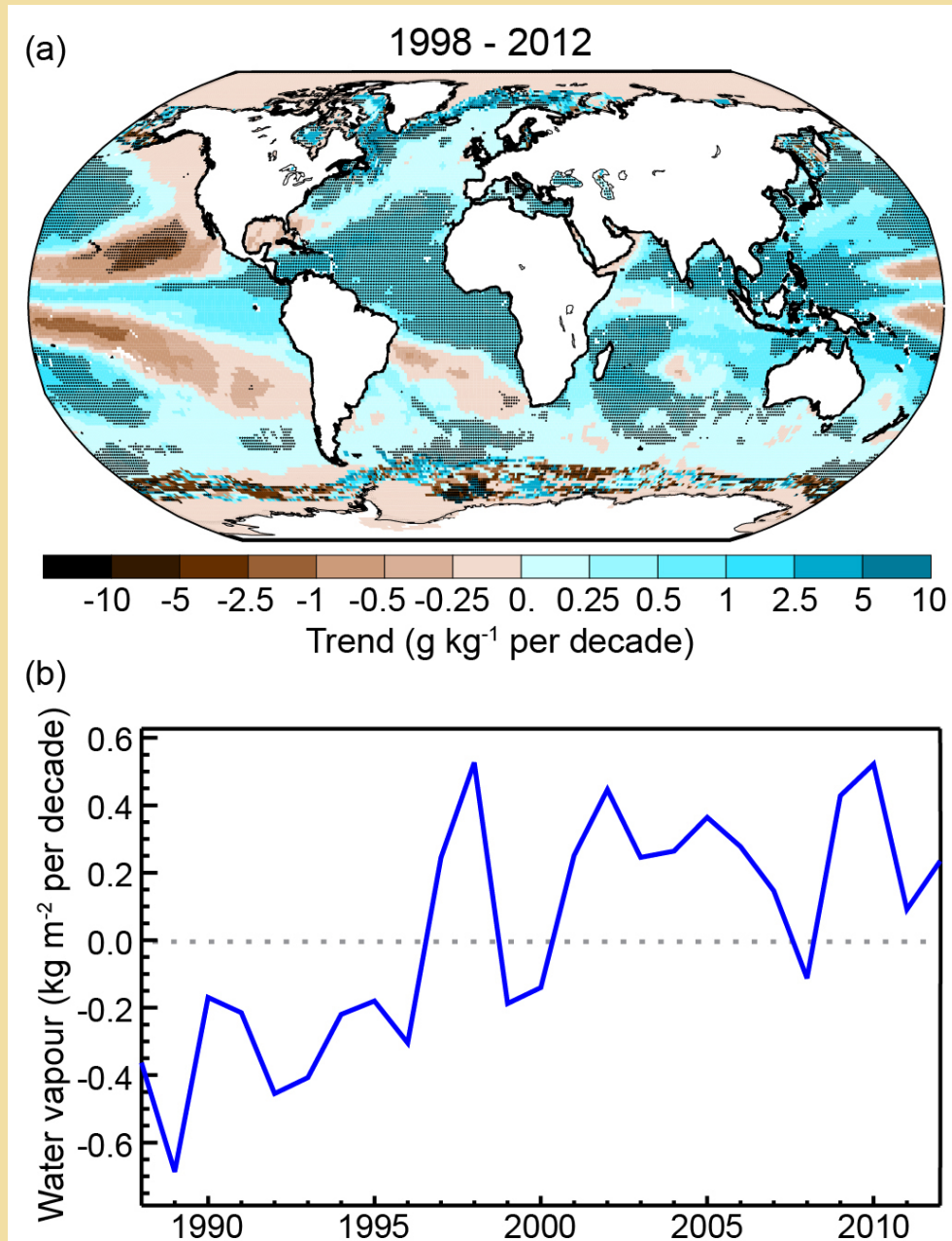


Fig. 2. 31

4. Changes in Hydrological Cycle



Changes in snowfall

Changes in streamflow

Changes in evapotranspiration and pan evaporation

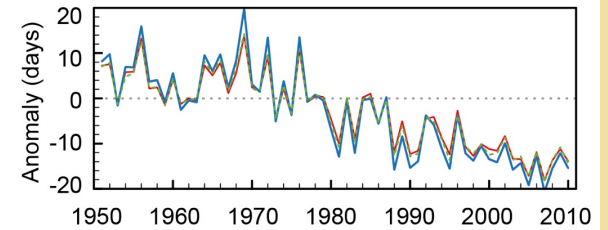
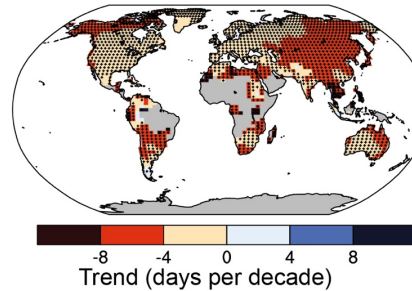
Changes in clouds

5. Changes in Extreme Events

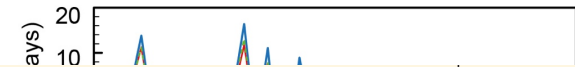
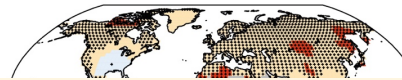
Fig. 2. 32

Temperature extremes

(a) Cold Nights

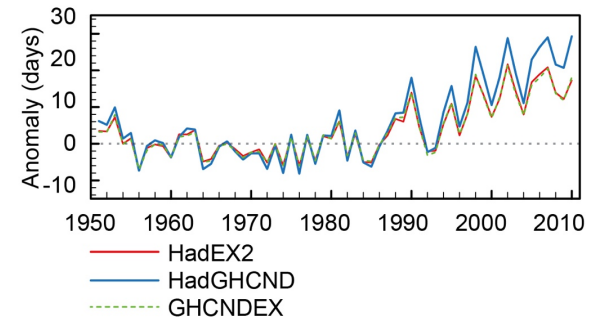
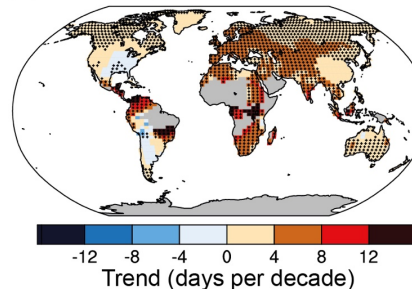


(b) Cold Days



TN10p	Cold nights	Days (or fraction of time) when daily minimum temperature <10th percentile	Days (%)
TX10p	Cold days	Days (or fraction of time) when daily maximum temperature <10th percentile	Days (%)
TN90p	Warm nights	Days (or fraction of time) when daily minimum temperature >90th percentile	Days (%)
TX90p	Warm days	Days (or fraction of time) when daily maximum temperature >90th percentile	Days (%)

(c) Warm Days





Donald J. Trump ✓

@realDonaldTrump



In the beautiful Midwest, windchill temperatures are reaching minus 60 degrees, the coldest ever recorded. In coming days, expected to get even colder. People can't last outside even for minutes. What the hell is going on with Global Warming? Please come back fast, we need you!

♡ 182K 9:28 PM - Jan 28, 2019



💬 162K people are talking about this

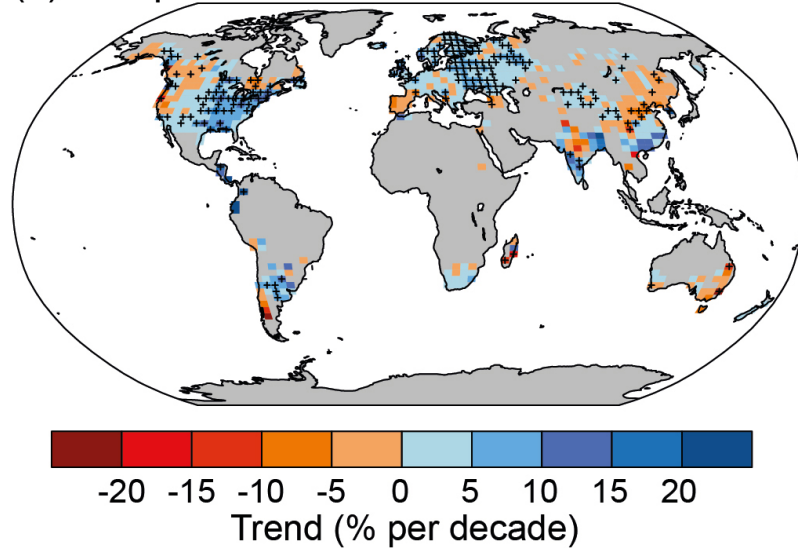


5. Changes in Extreme Events

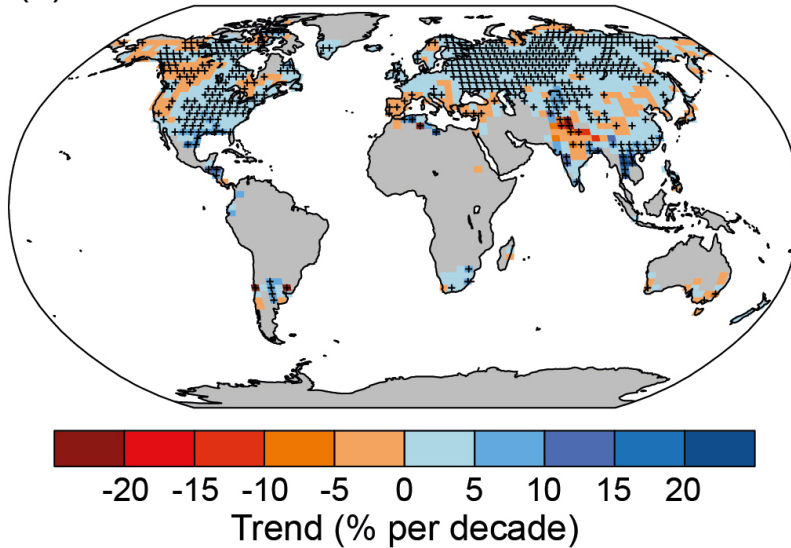
Precipitation extremes

SDII	Simple daily intensity index	Ratio of annual total precipitation to the number of wet days (≥ 1 mm)	mm day ⁻¹
R95p	Precipitation from very wet days	Amount of precipitation from days >95th percentile	mm
CDD	Consecutive dry days	Maximum number of consecutive days when precipitation < 1 mm	Days

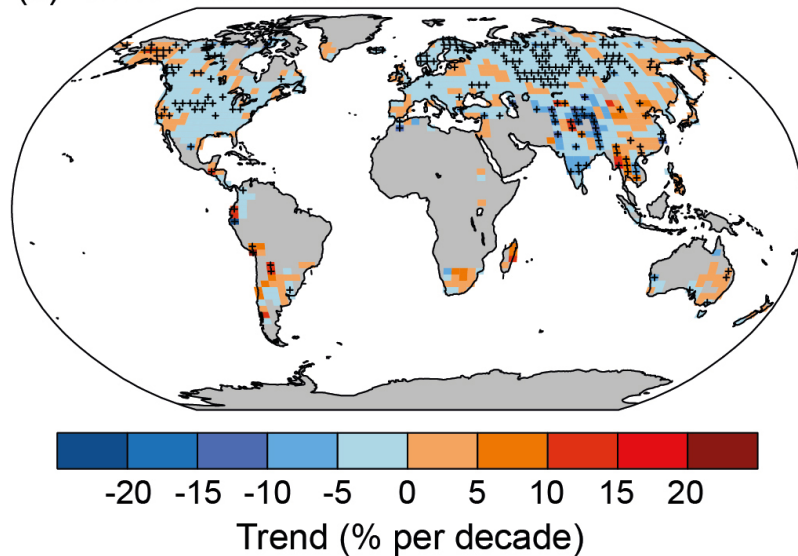
(a) R95p 1951-2010



(b) SDII 1951-2010



(c) CDD 1951-2010



(d) HY-INT 1976-2000

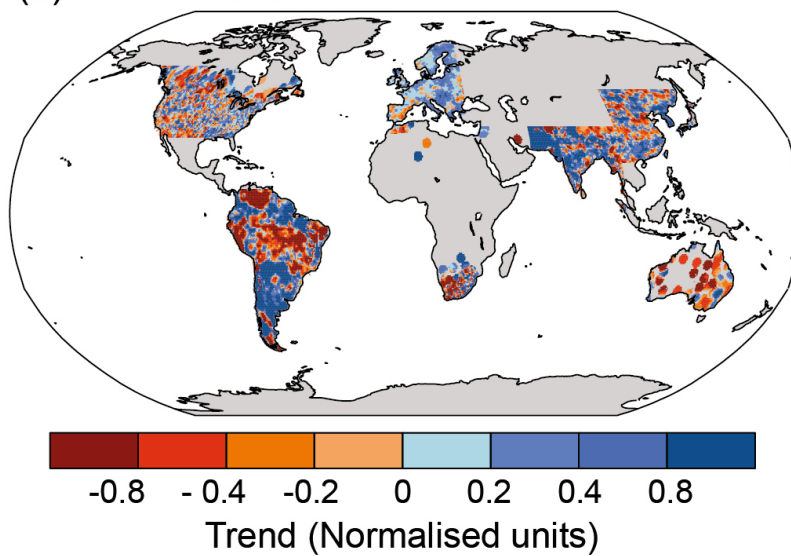


Fig. 2. 33

5. Changes in Extreme Events

Flood

In summary, there continues to be a lack of evidence and thus *low confidence* regarding the sign of trend in the magnitude and/or frequency of floods on a global scale.

Drought

In summary, the current assessment concludes that there is not enough evidence at present to suggest more than *low confidence* in a global-scale observed trend in drought or dryness (lack of rainfall) since the middle of the 20th century, owing to lack of direct observations, geo-

5. Changes in Extreme Events



Hurricane Isabel (2003)

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=12140>

In summary, this assessment does not revise the SREX conclusion of *low confidence* that any reported long-term (centennial) increases in tropical cyclone activity are robust, after accounting for past changes in observing capabilities. More recent assessments indicate that it is *unlikely* that annual numbers of tropical storms, hurricanes and major hurricanes counts have increased over the past 100 years in the North Atlantic basin. Evidence, however, is for a *virtually certain* increase in the frequency and intensity of the strongest tropical cyclones since the 1970s in that region.

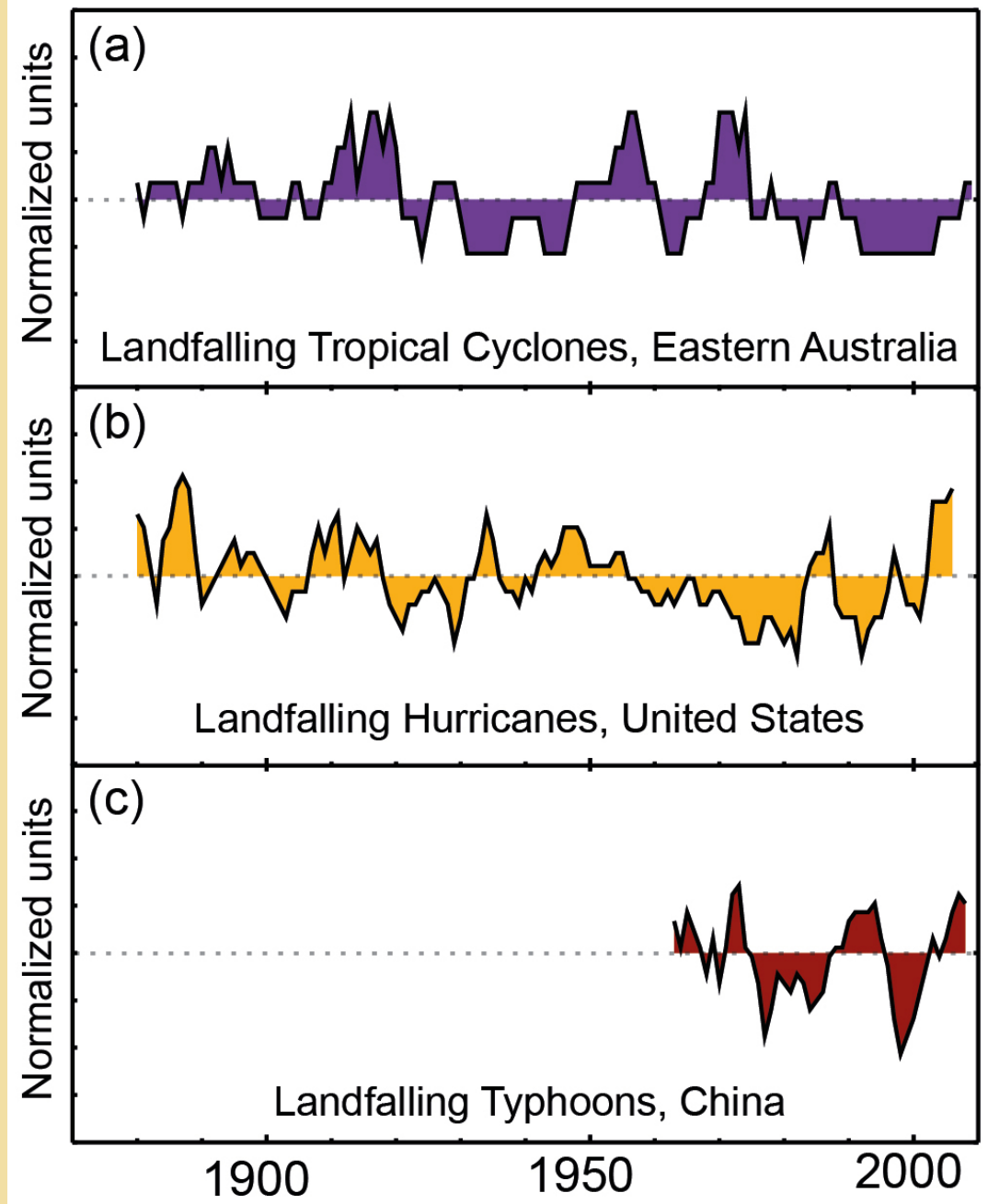
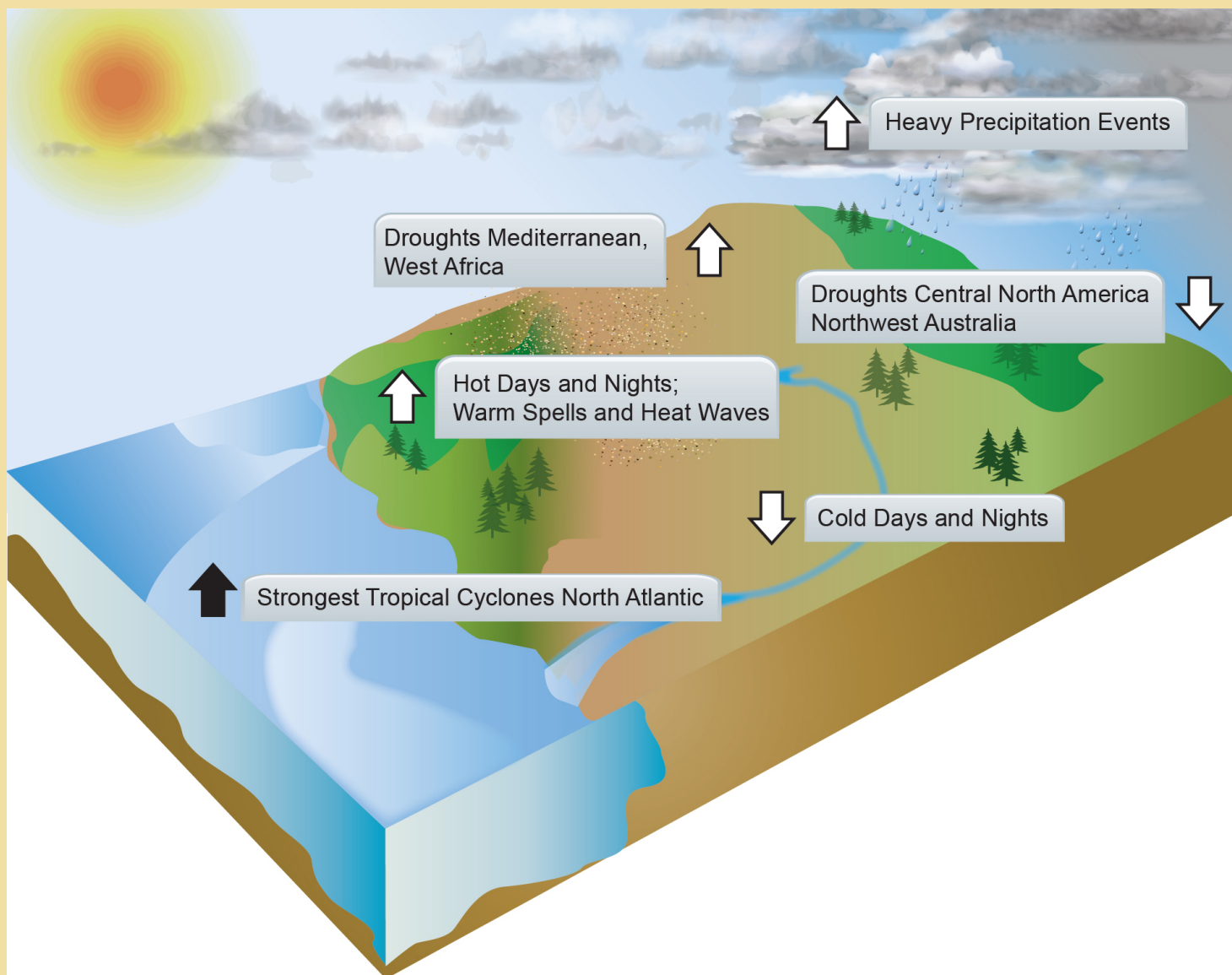


Fig. 2. 34

5. Changes in Extreme Events



6. Changes in Atmospheric Circulation

Sea level pressure

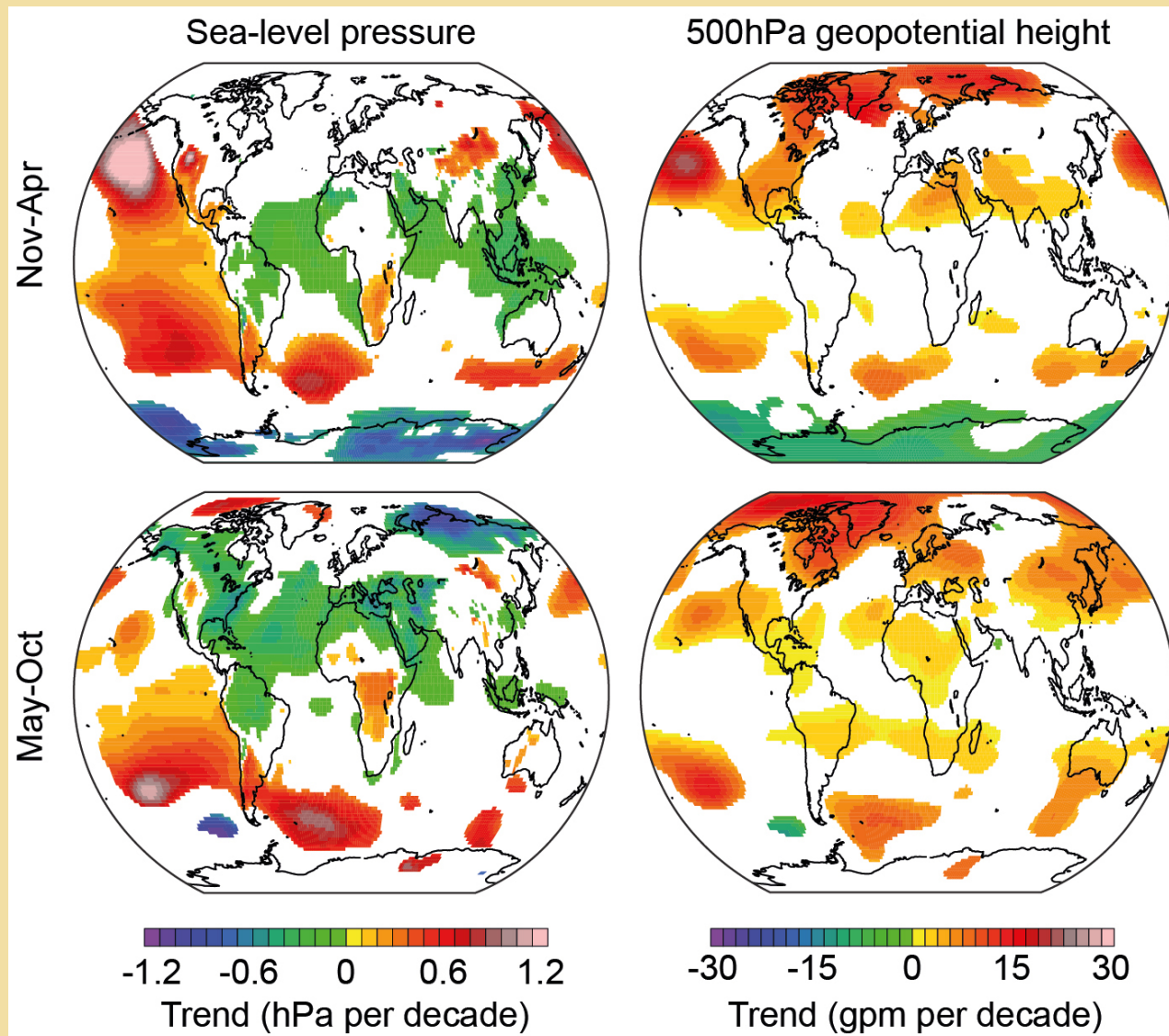


Fig. 2. 36

6. Changes in Atmospheric Circulation

Surface wind

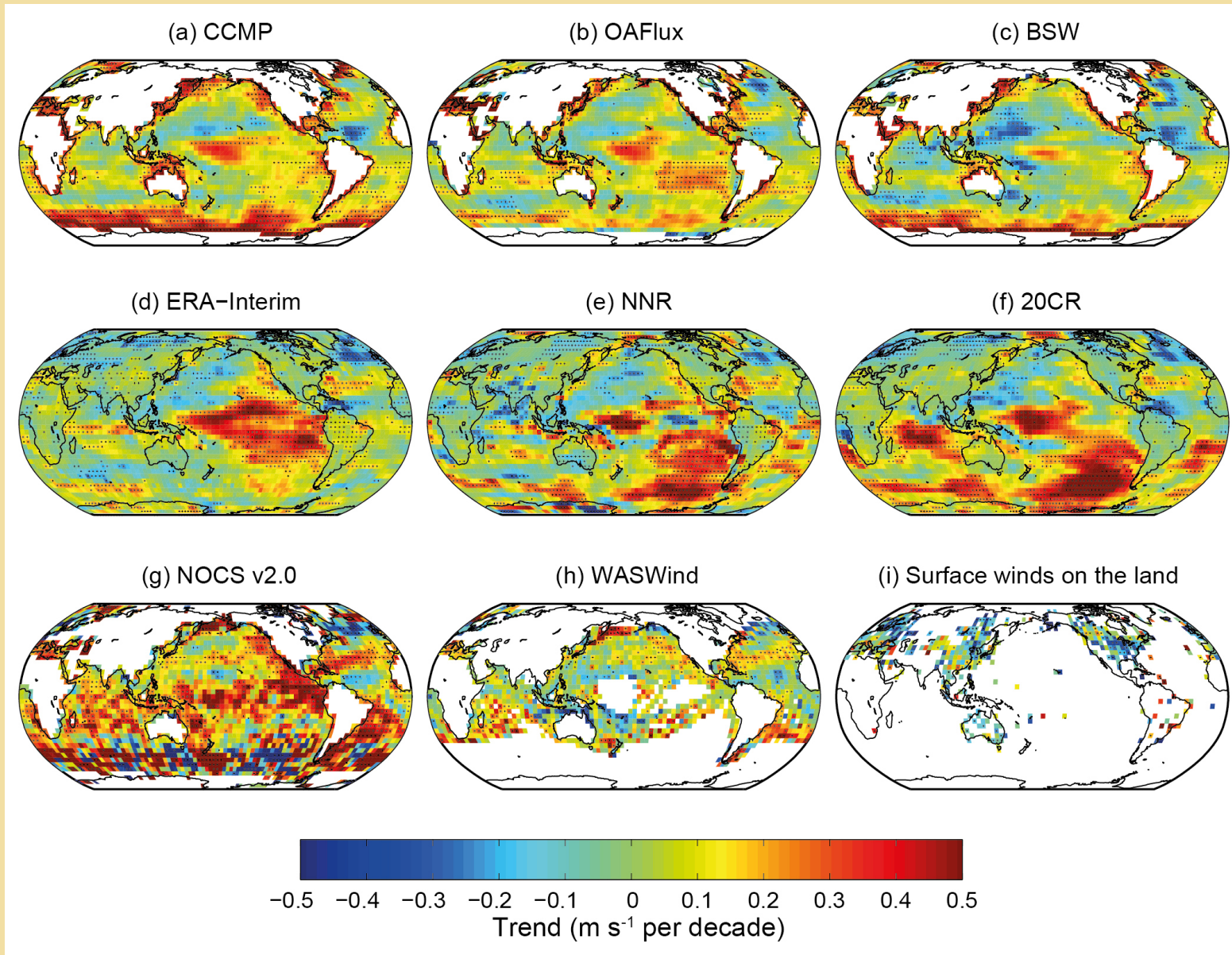
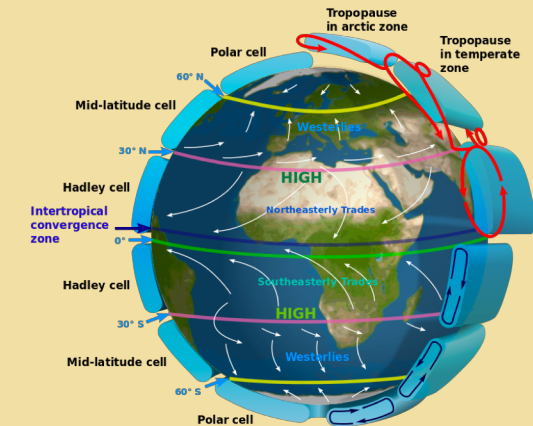
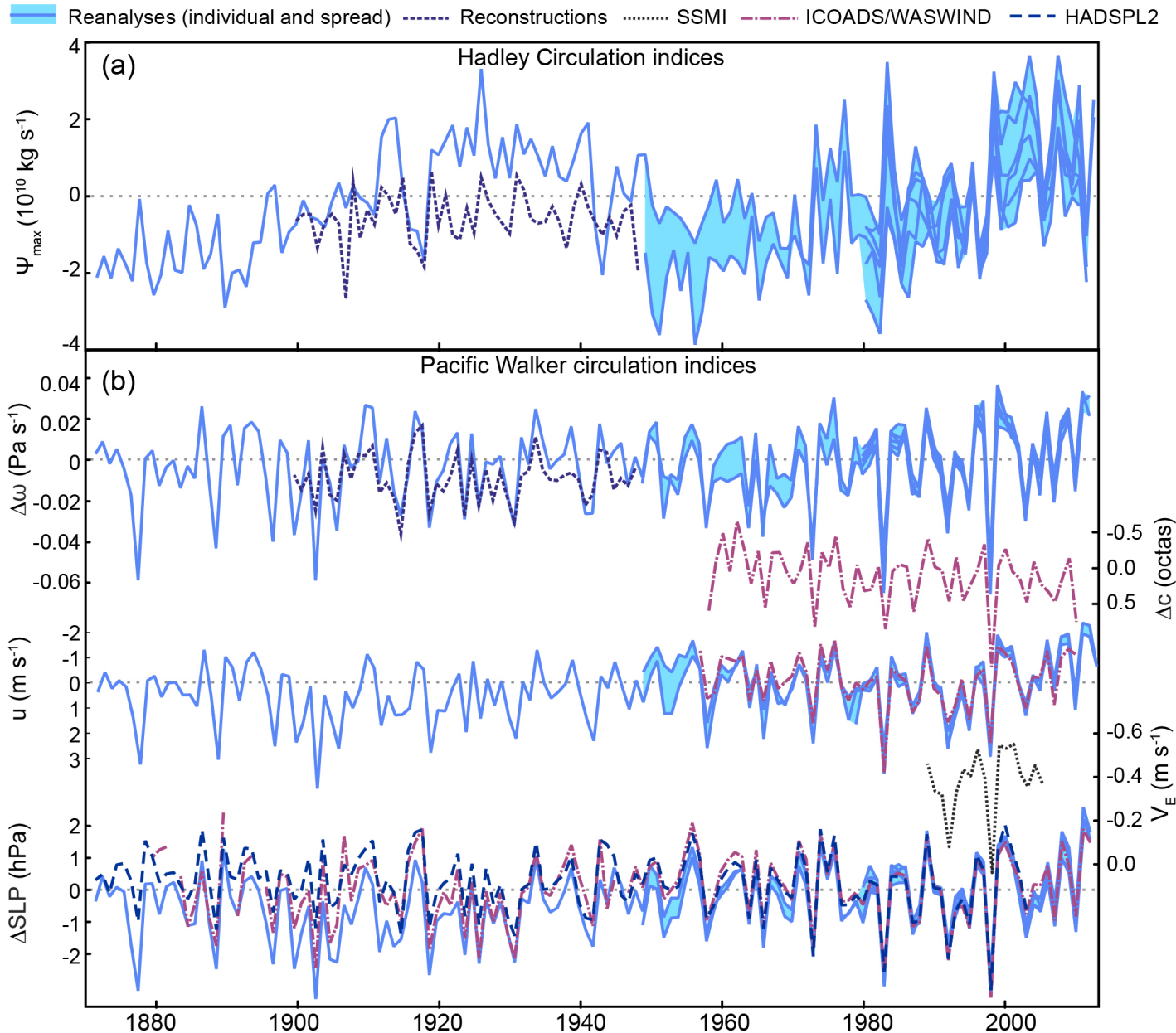


Fig. 2. 38

6. Changes in Atmospheric Circulation

Tropical circulation



El Nino and La Nina

Fig. 2. 39

6. Changes in Atmospheric Circulation

Tropical belt

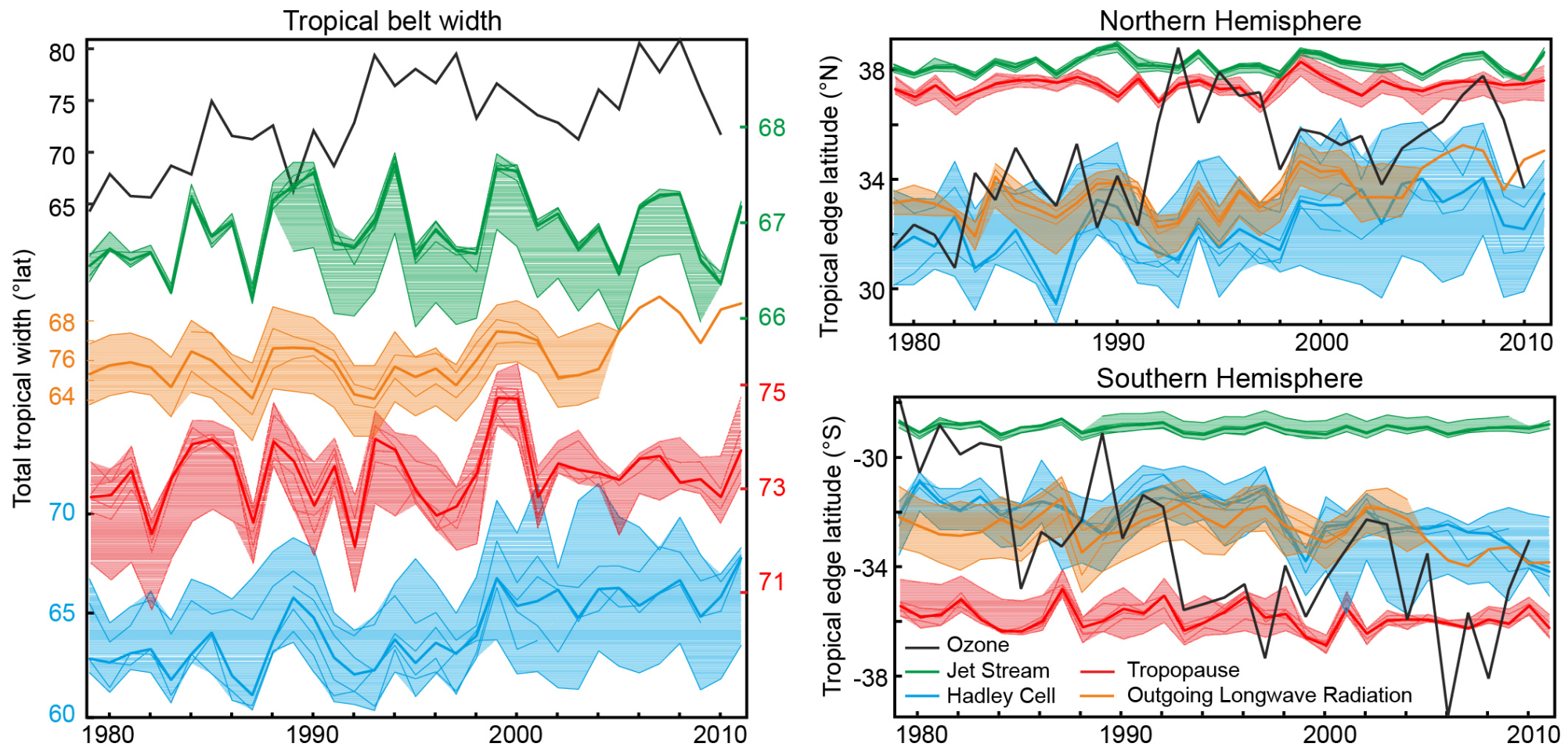
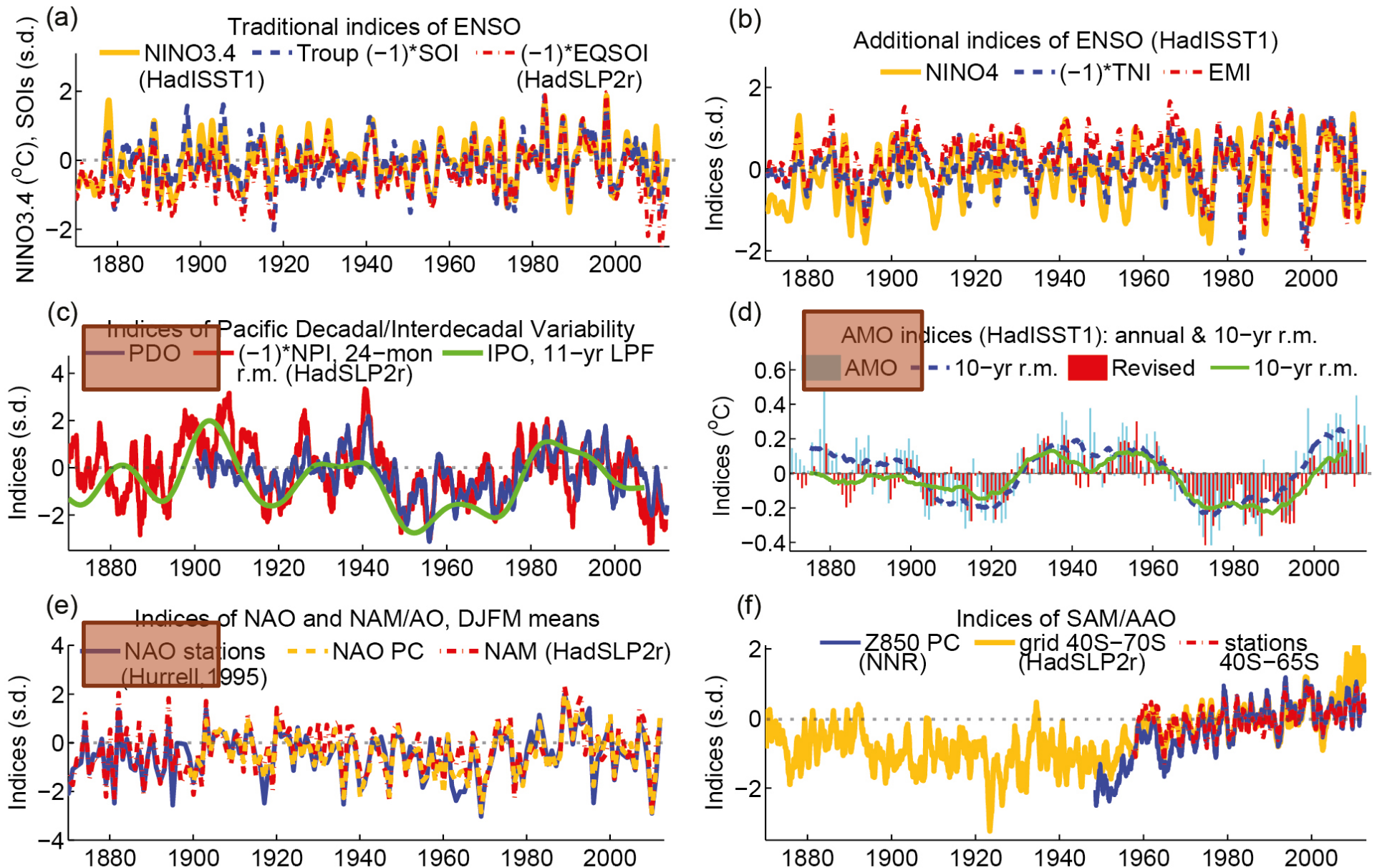


Fig. 2. 40

6. Changes in Atmospheric Circulation

Climate variability



Box 2.5 Fig. 1

Reading Assignment

WG1AR5_Chapter02_FINAL