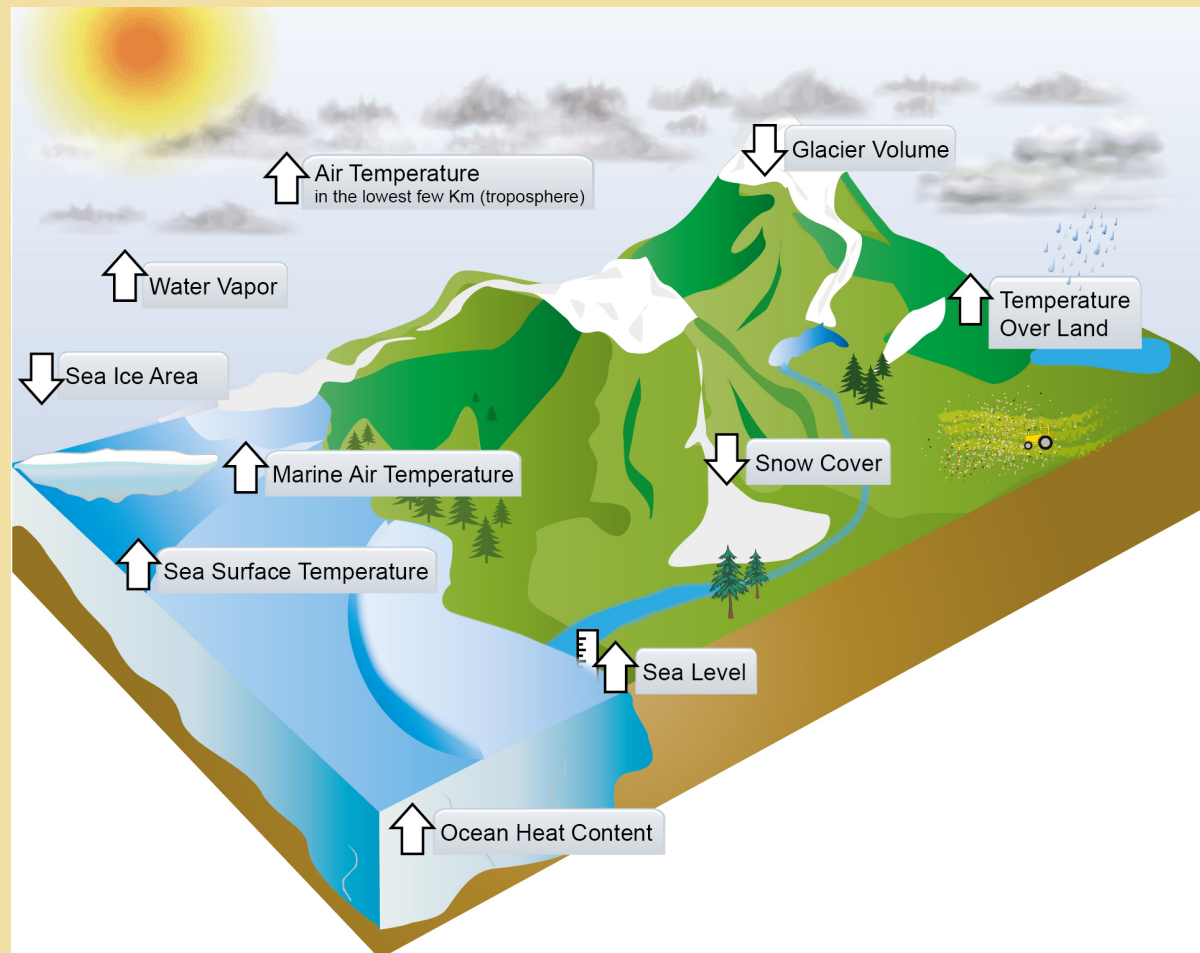


Climate Change and Society

GEOL-G490

Lecture 3: Observations: Atmosphere and Surface



1. Changes in Atmospheric Composition

2. Changes in Radiation Budgets

3. Changes in Temperature

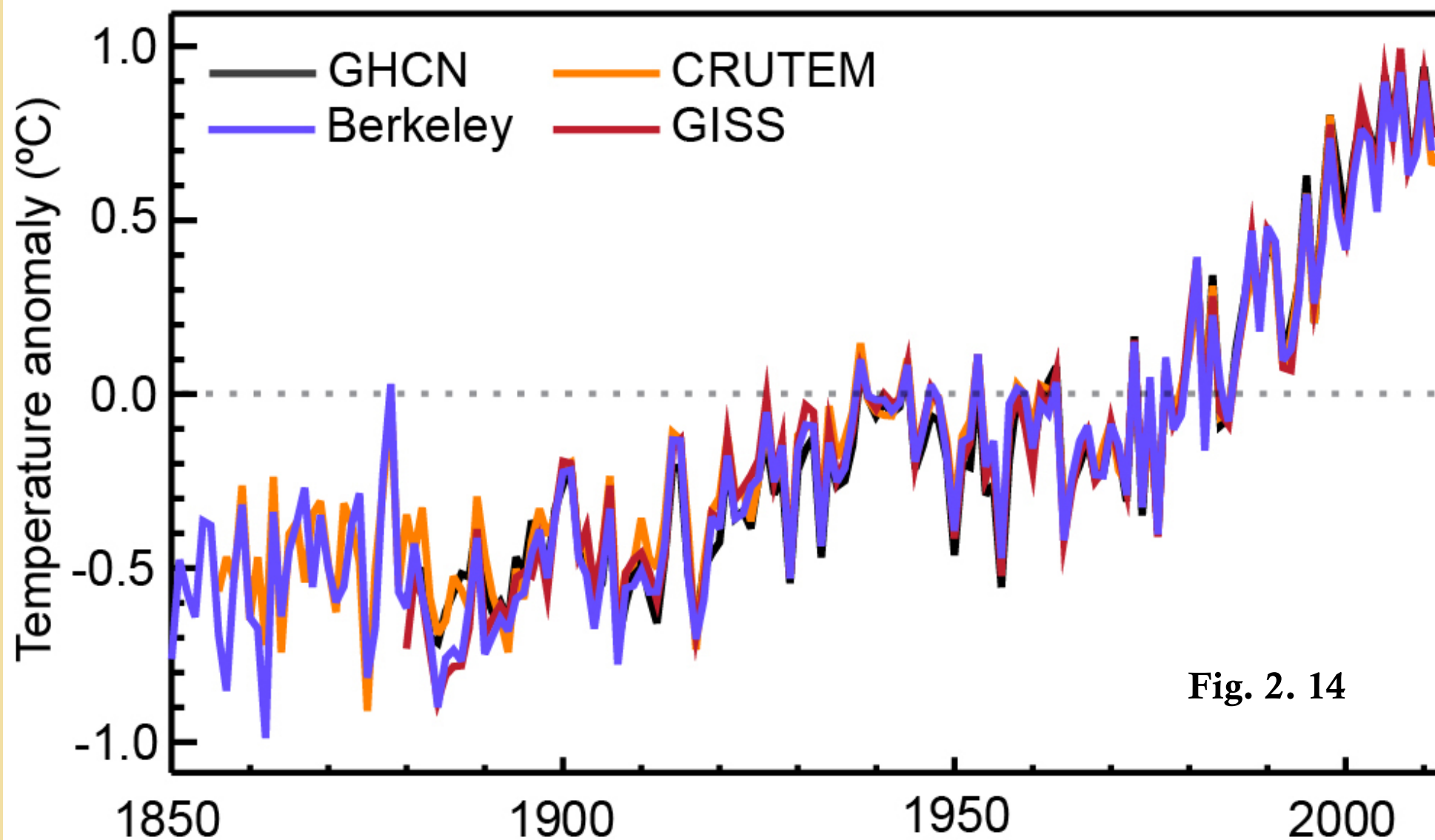
4. Changes in Hydrological Cycle

5. Changes in Extreme Events

6. Changes in Atmospheric Circulation

3. Changes in Temperature

Land Surface Air Temperature (LSAT)



3. Changes in Temperature

Land Surface Air Temperature (LSAT)



Table 2.4: | Trend estimates and 90% confidence intervals (Box 2.2) for LSAT global average values over five common periods.

Data Set	Trends in °C per decade				
	1880–2012	1901–2012	1901–1950	1951–2012	1979–2012
CRUTEM4.1.1.0 (Jones et al., 2012)	0.086 ± 0.015	0.095 ± 0.020	0.097 ± 0.029	0.175 ± 0.037	0.254 ± 0.050
GHCNv3.2.0 (Lawrimore et al., 2011)	0.094 ± 0.016	0.107 ± 0.020	0.100 ± 0.033	0.197 ± 0.031	0.273 ± 0.047
GISS (Hansen et al., 2010)	0.095 ± 0.015	0.099 ± 0.020	0.098 ± 0.032	0.188 ± 0.032	0.267 ± 0.054
Berkeley (Rohde et al., 2013)	0.094 ± 0.013	0.101 ± 0.017	0.111 ± 0.034	0.175 ± 0.029	0.254 ± 0.049

3. Changes in Temperature

Land Surface Air Temperature (LSAT)



Diurnal Temperature Range (DTR)

Land use and urban heat island (UHI)

3. Changes in Temperature

Sea Surface Temperature and Marine Air Temperature

In situ measurements

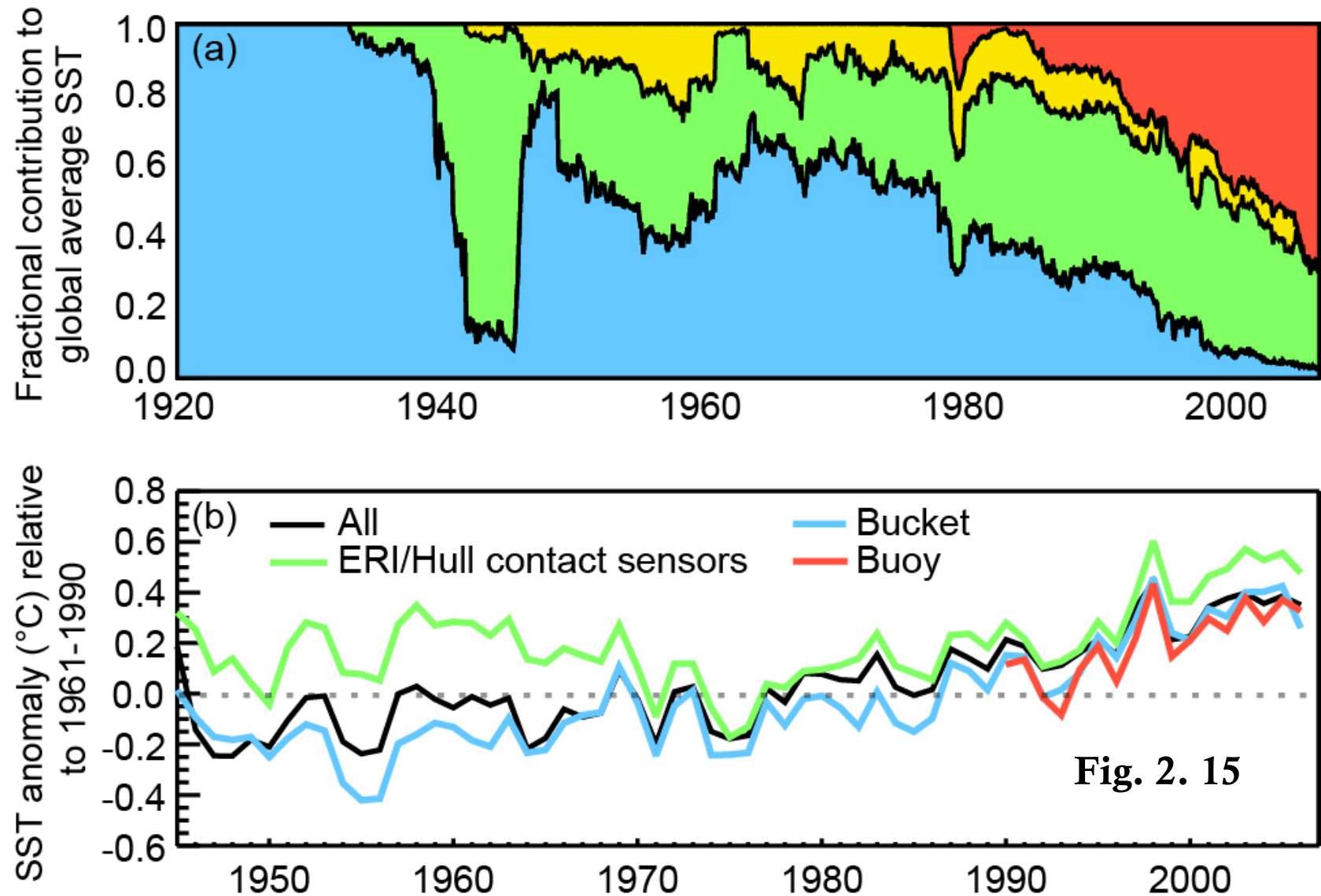


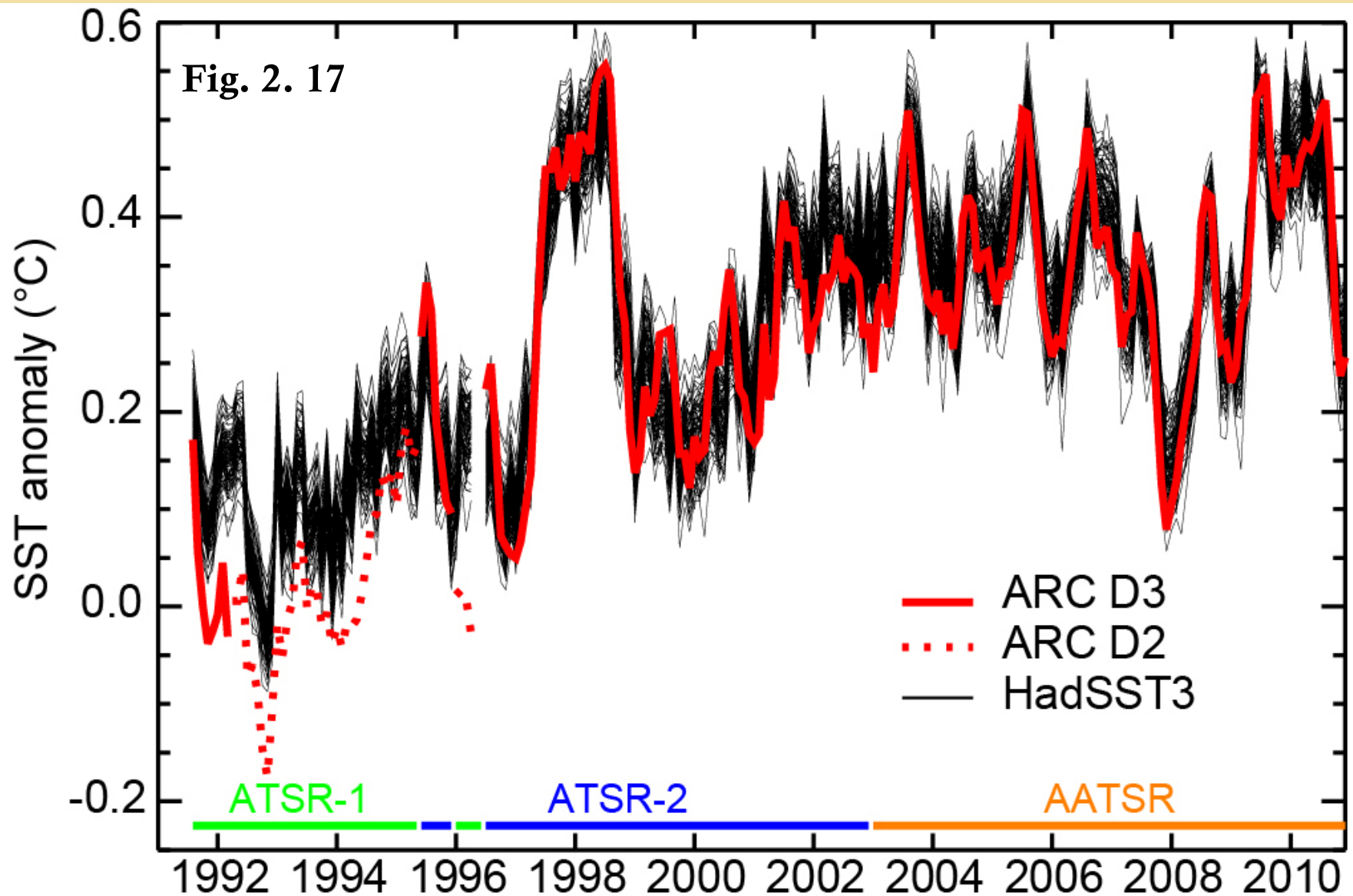
Fig. 2. 15

3. Changes in Temperature

Sea Surface Temperature and Marine Air Temperature –**satellite measurements**

Advanced Very High Resolution Radiometer – AVHRR (1981-present)

Advanced Along Track Scanning Radiometer (AATSR) (1991-2012)



3. Changes in Temperature

Sea Surface Temperature and Marine Air Temperature

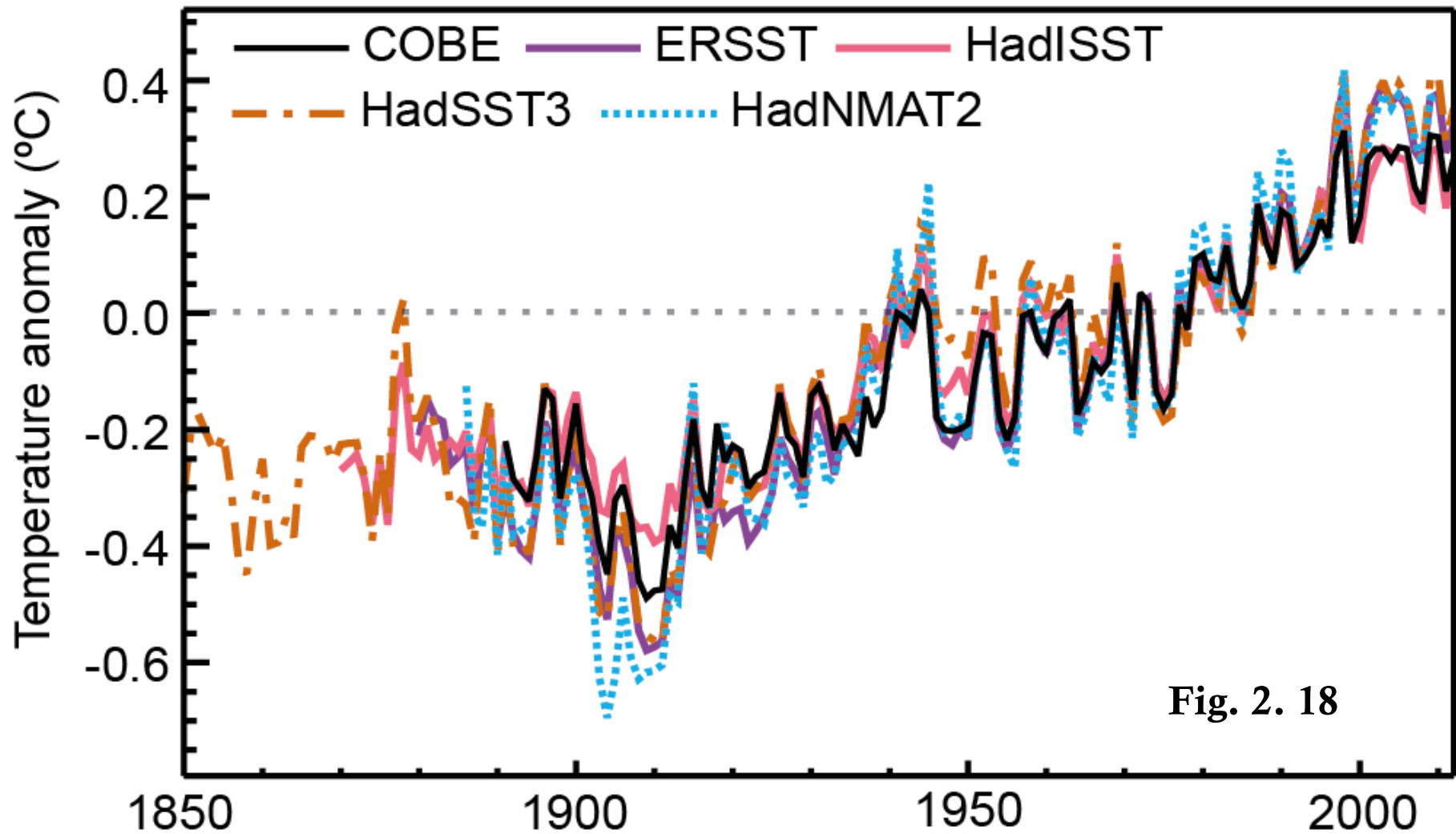
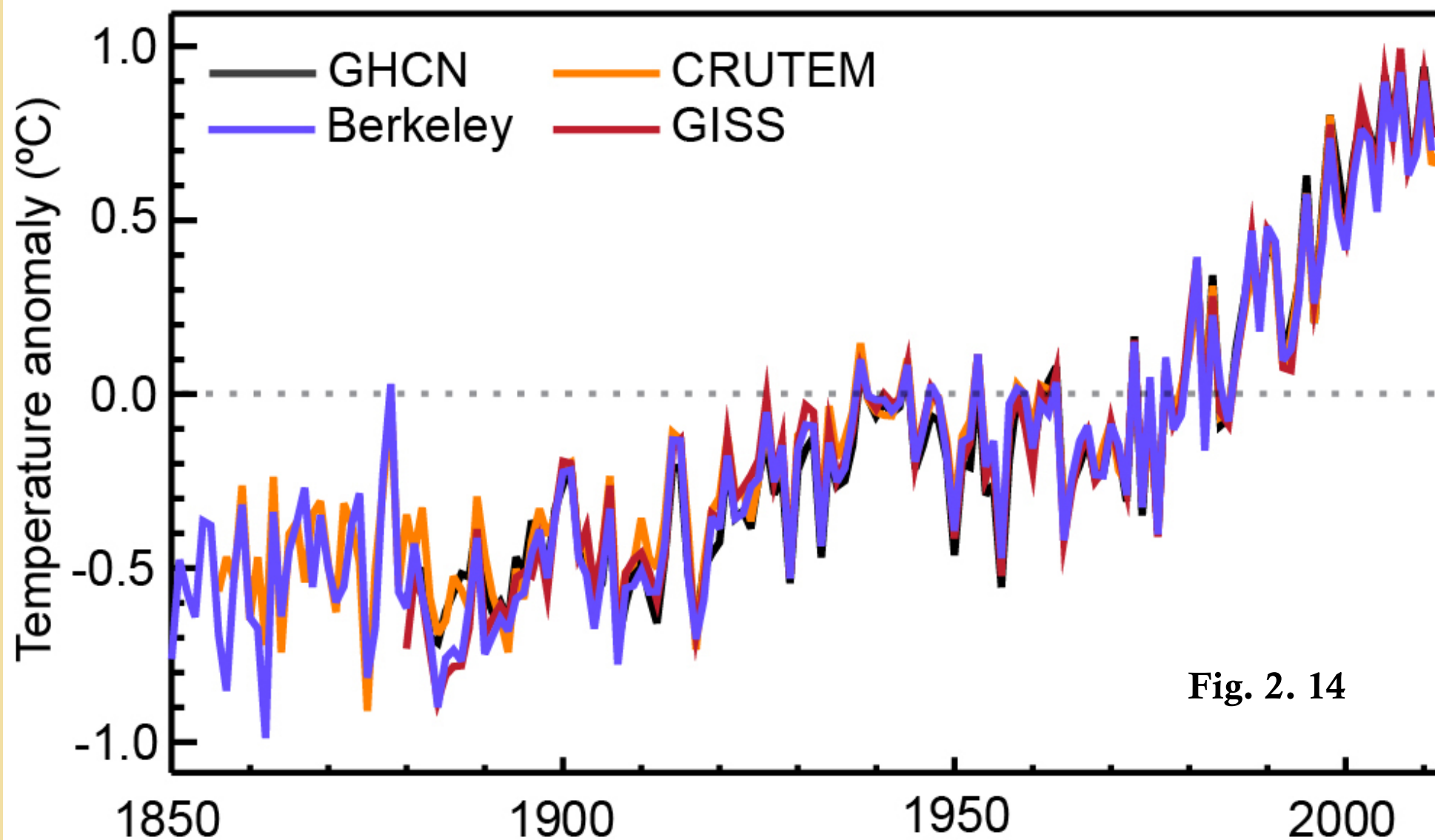


Fig. 2. 18

3. Changes in Temperature

Land Surface Air Temperature (LSAT)



3. Changes in Temperature

Combined Land and Sea Surface Temperature

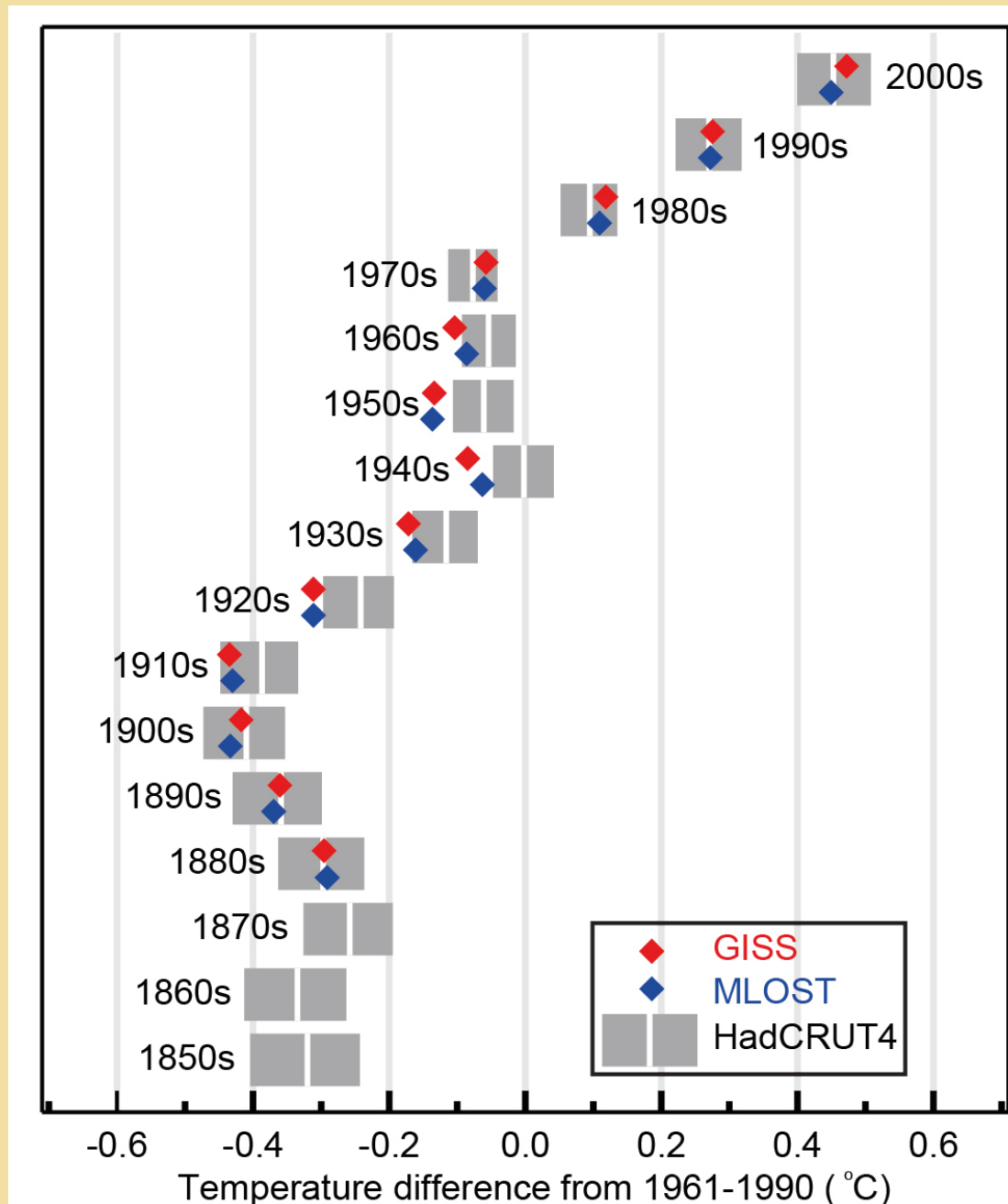
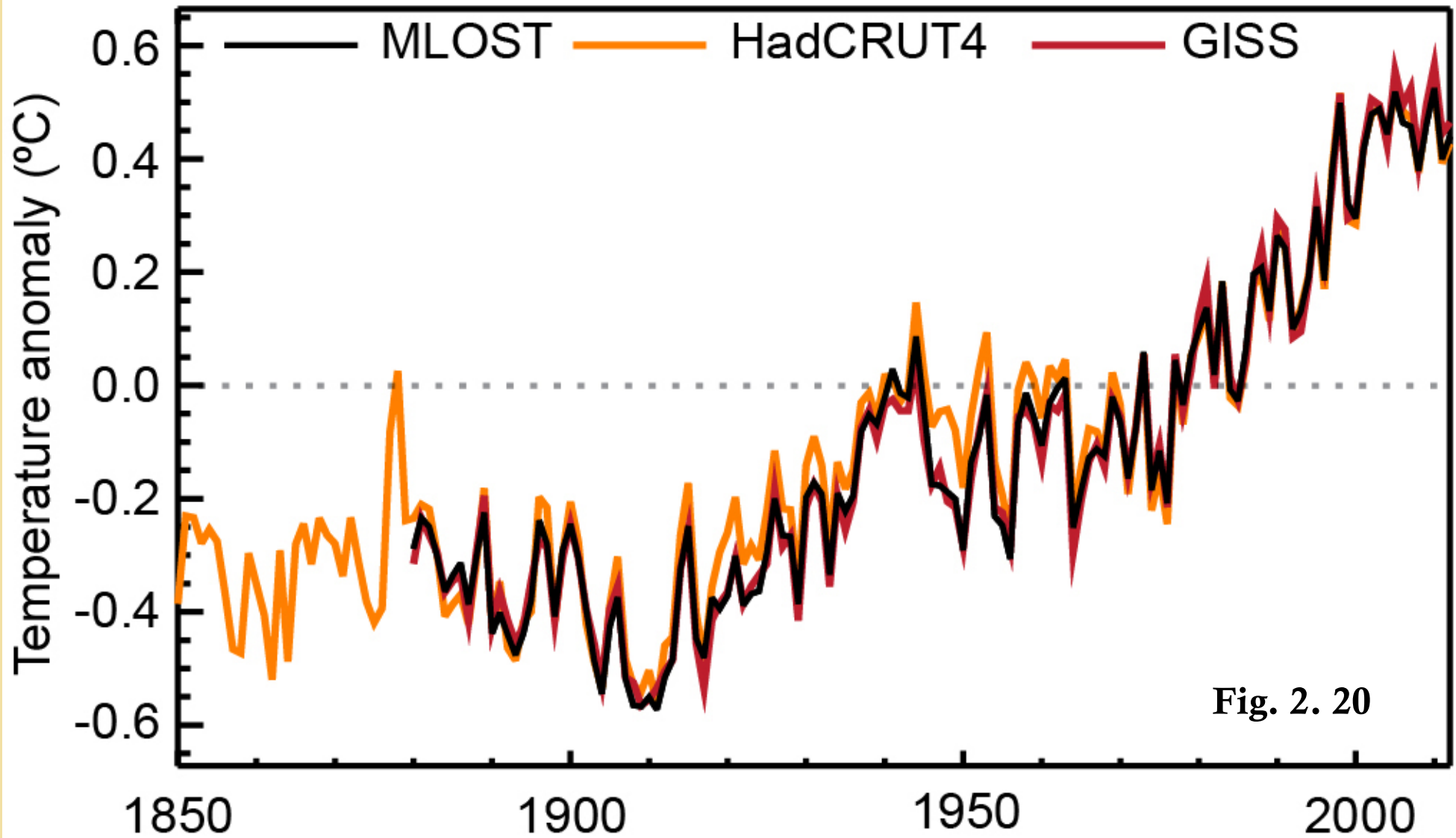


Fig. 2. 19

3. Changes in Temperature

Combined Land and Sea Surface Temperature



3. Changes in Temperature

Combined Land and Sea Surface Temperature

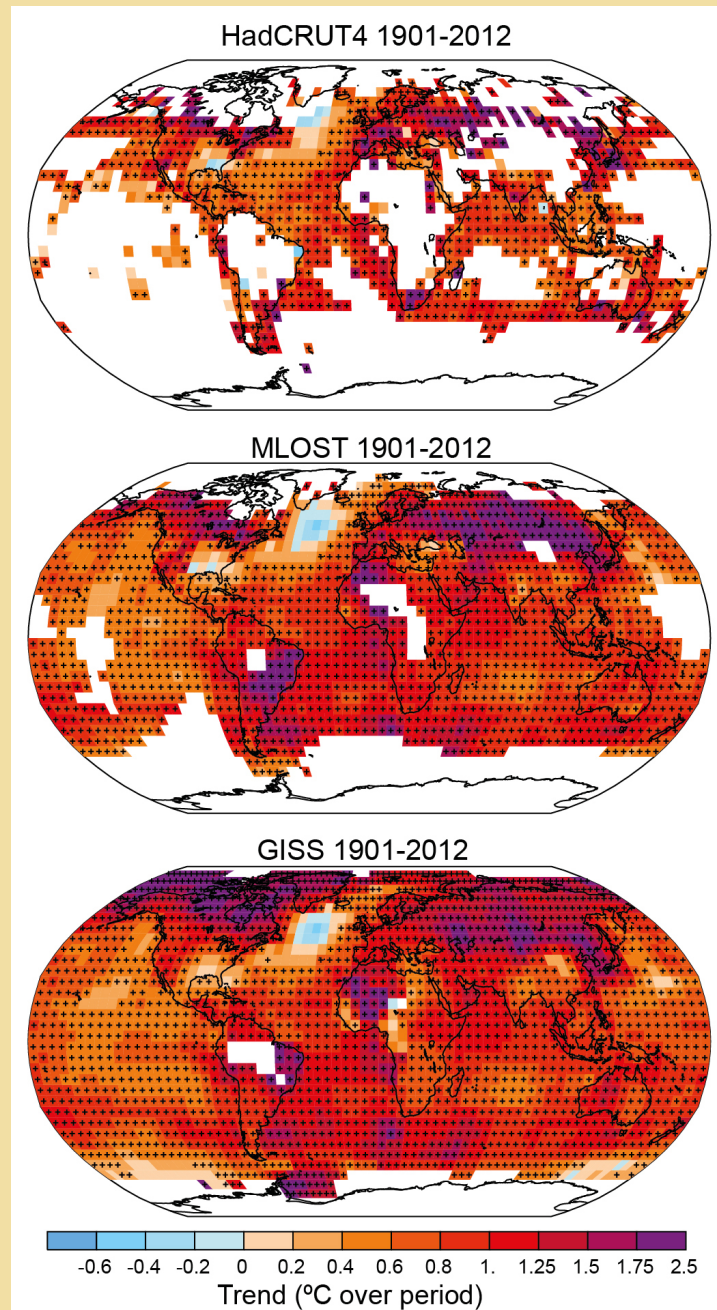


Fig. 2. 21

3. Changes in Temperature

Combined Land and Sea Surface Temperature

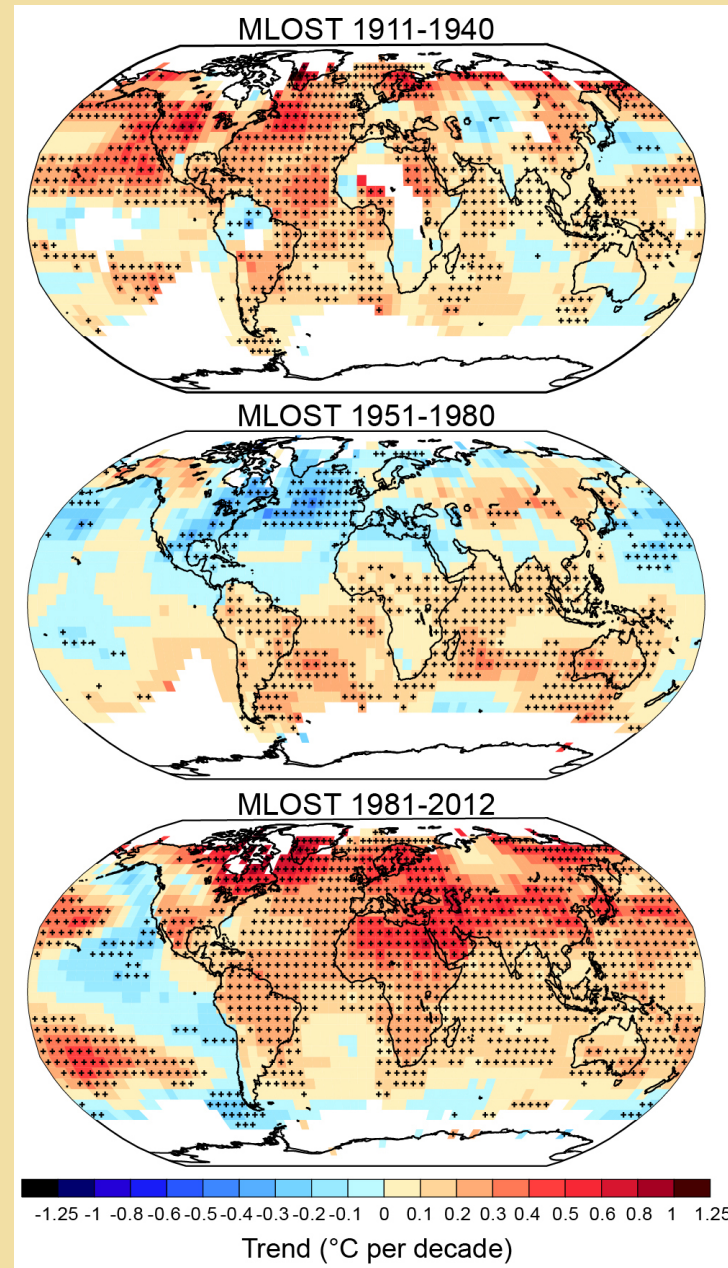


Fig. 2. 22

3. Changes in Temperature

Upper Air Temperature

Radiosondes
Satellites

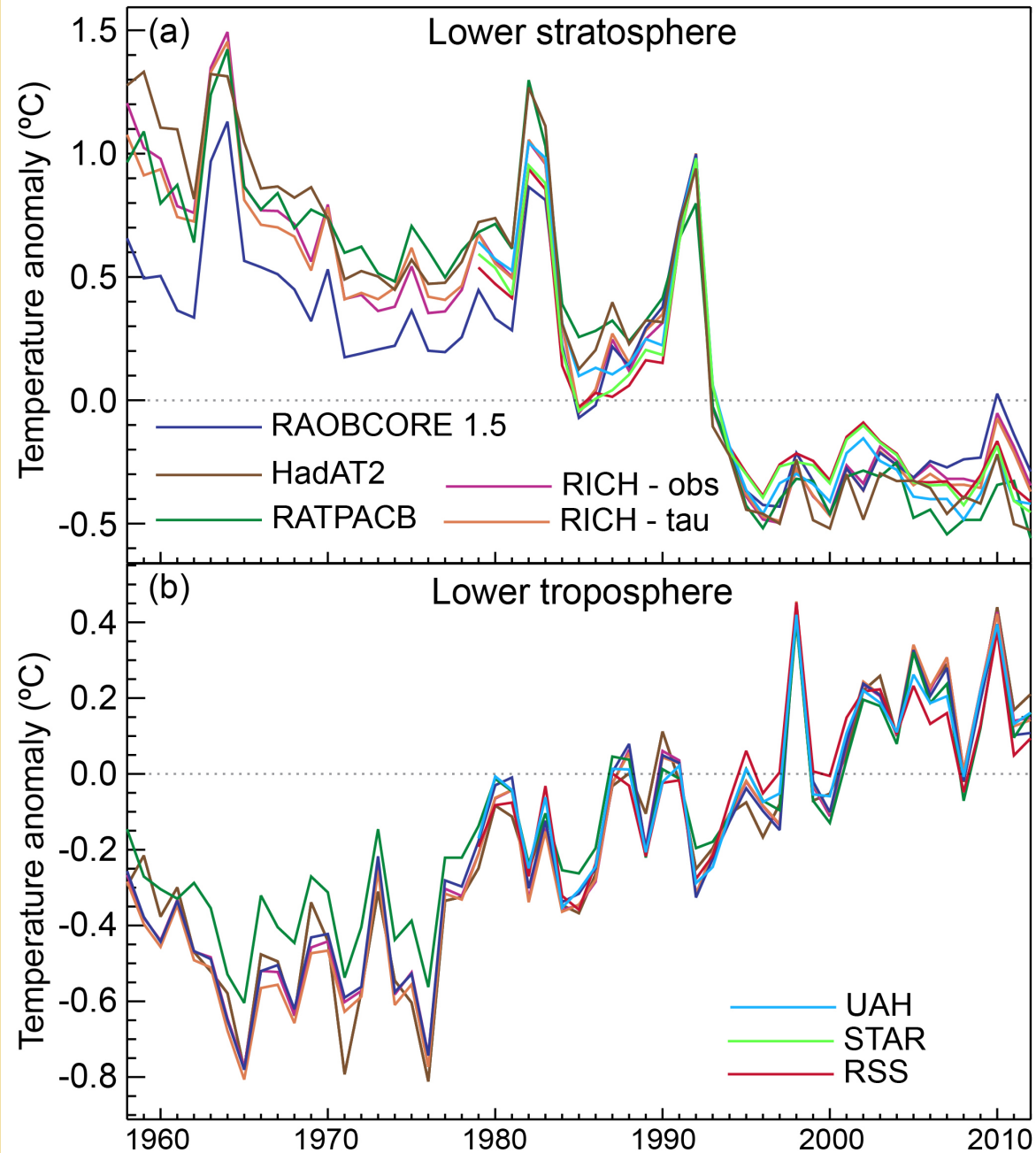


Fig. 2. 24

Reading Assignment

WG1AR5_Chapter02_FINAL