CLIMATE CHANGE 2014
Synthesis Report

Observed Changes and their Causes

Vicente Barros, Co-Chair WGII
Gian-Kasper Plattner, Head WGI TSU

for the SYR Core Writing Team

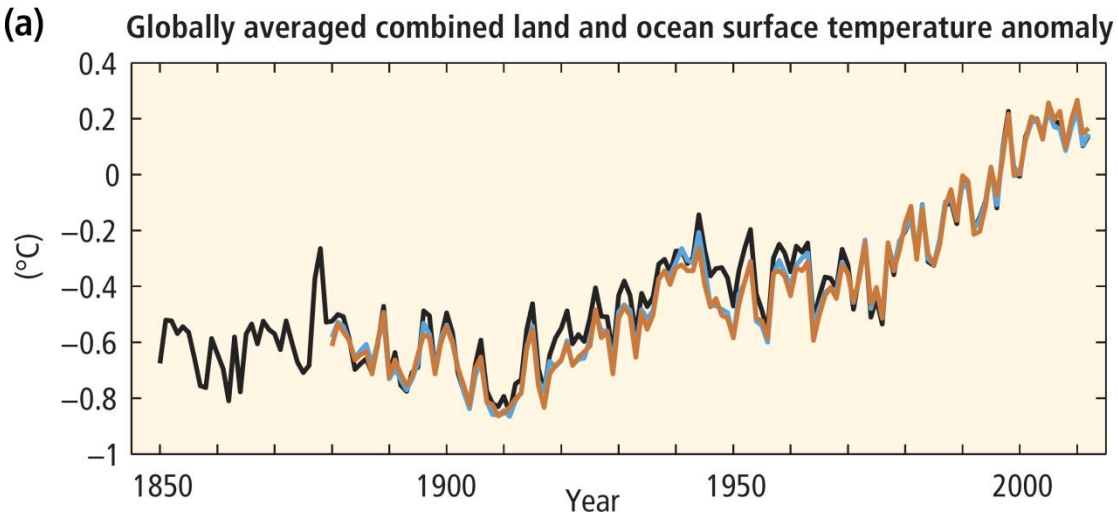
Human influence on the climate system is clear.

Recent climate changes have had widespread impacts on human and natural systems

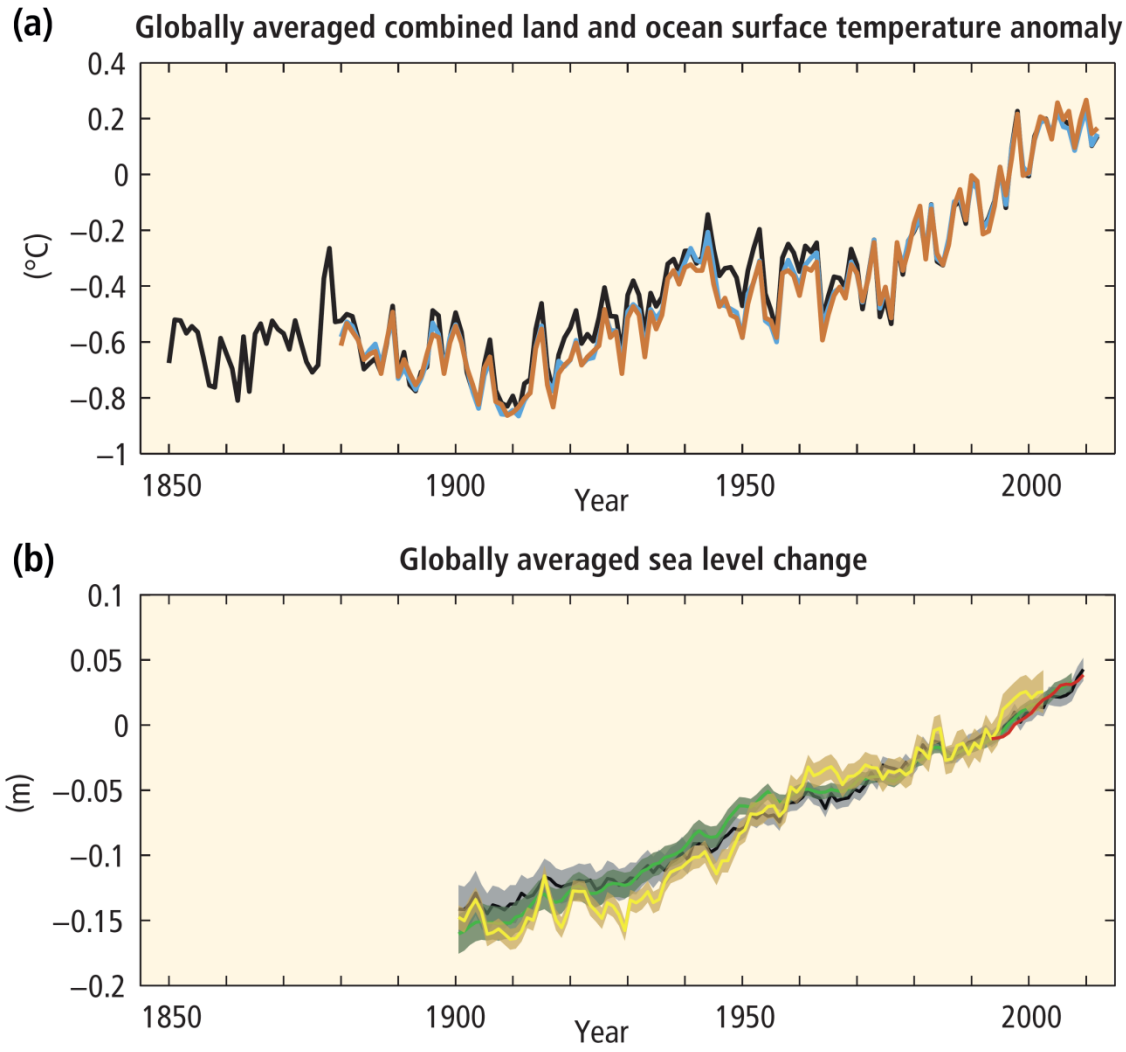
Recent anthropogenic emissions of greenhouse gases are the highest in history

IPCC Synthesis Report
Climate Change 2014

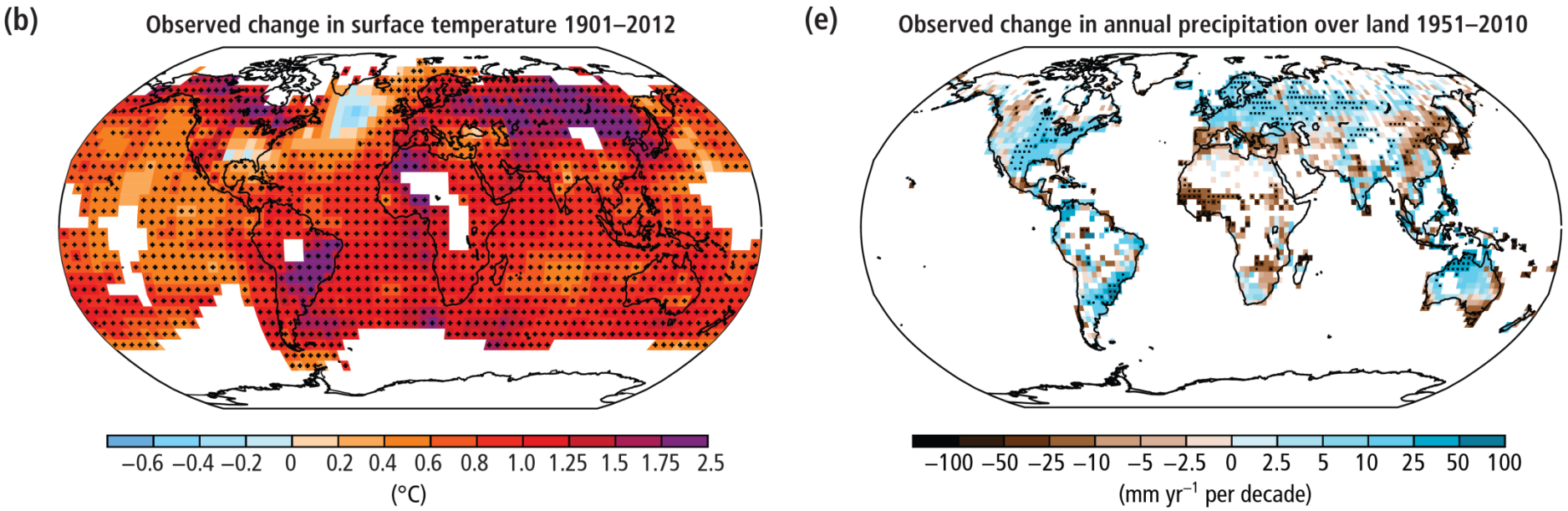
Observed Changes in the Climate System



AR5 SYR, Fig. SPM.1a

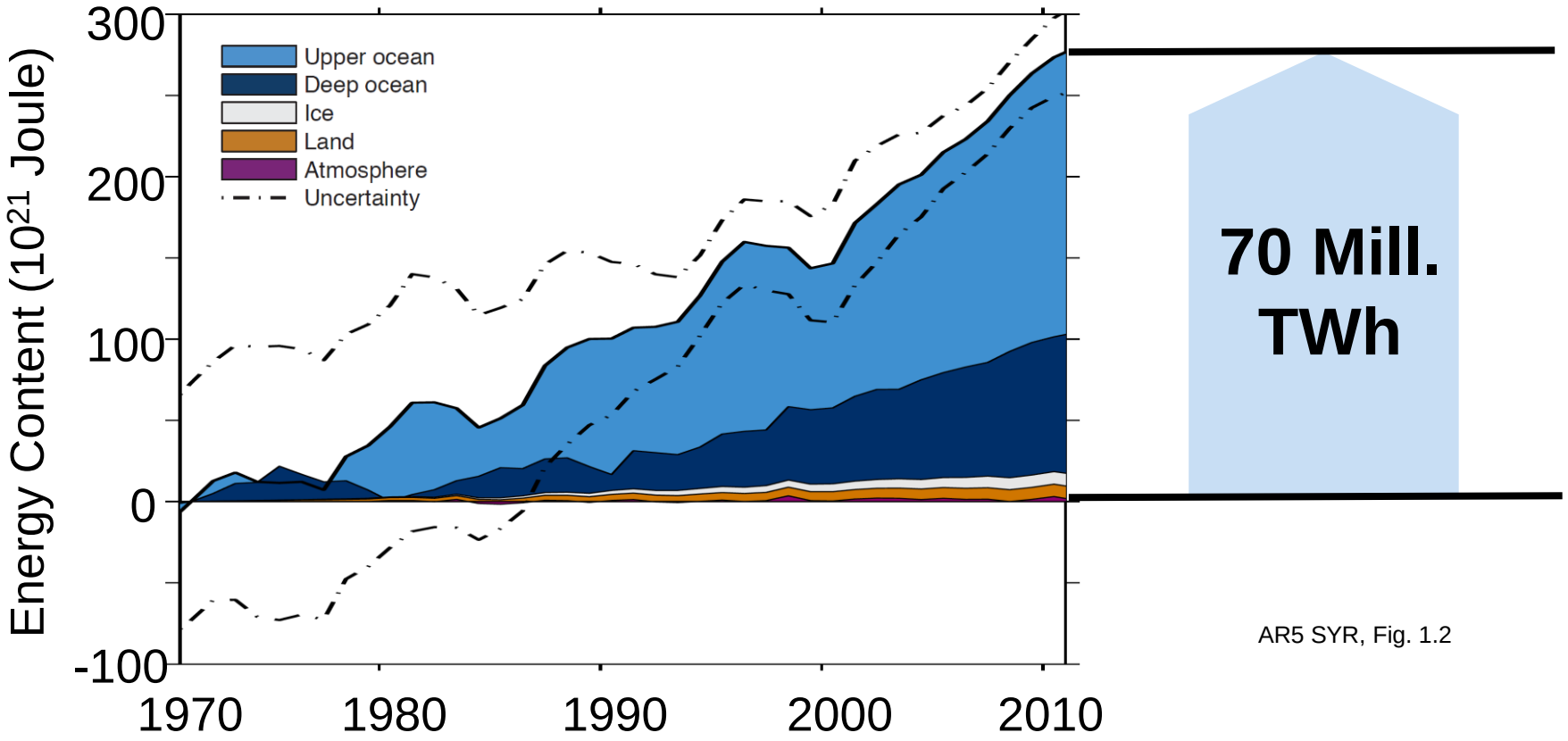


AR5 SYR, Figs. SPM.1a/b



AR5 SYR, Figs 1.1 b/e

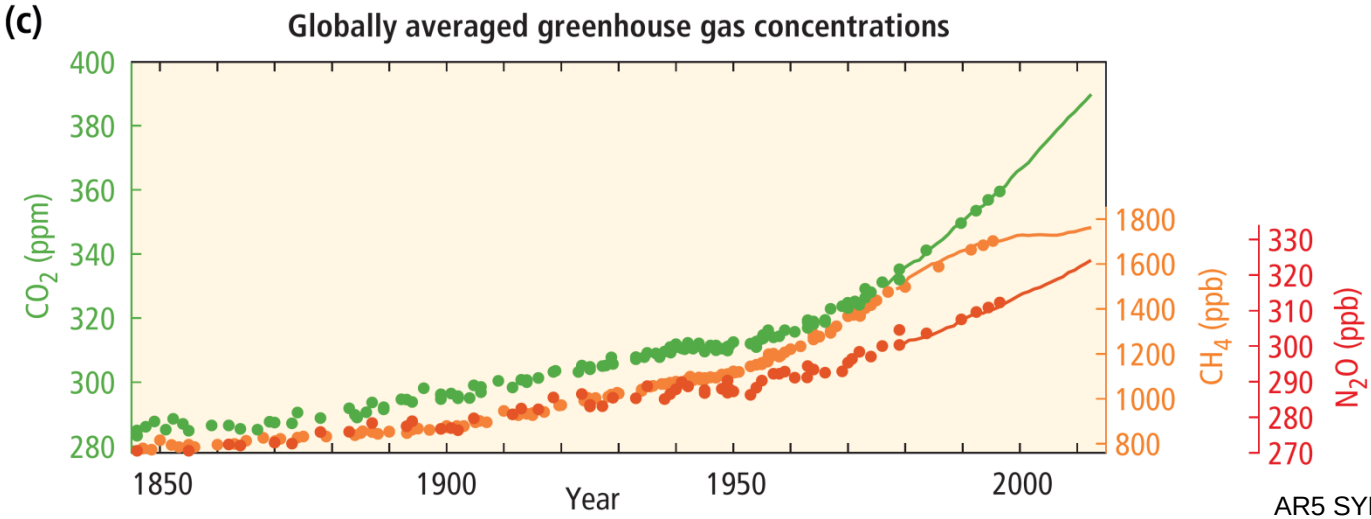
Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia



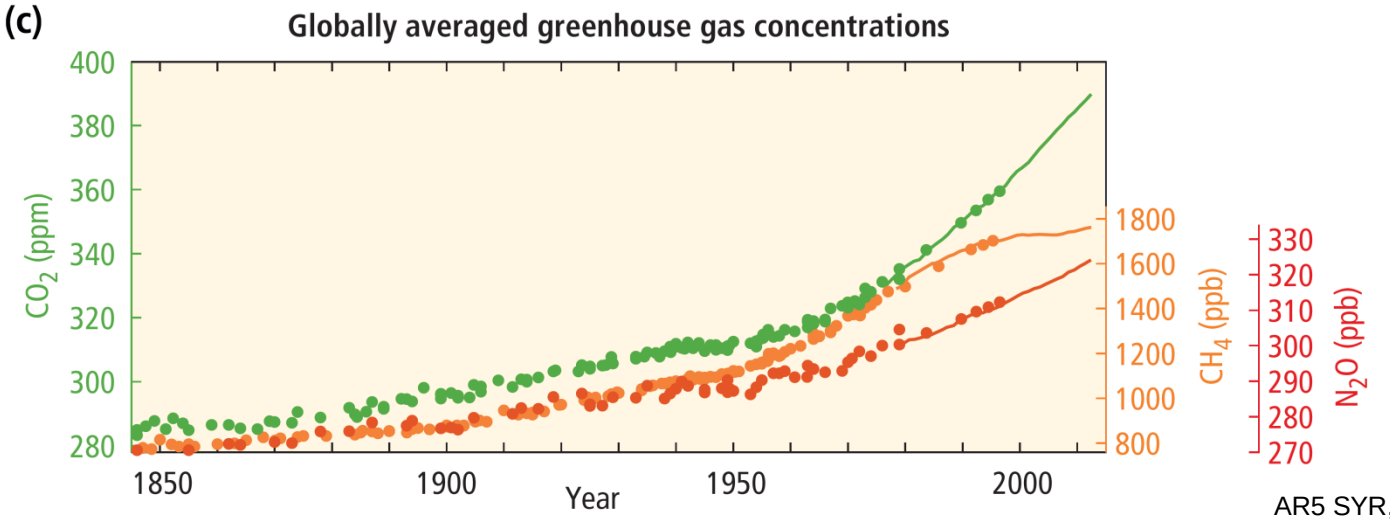
AR5 SYR, Fig. 1.2

Ocean warming dominates the increase in energy stored in the climate system

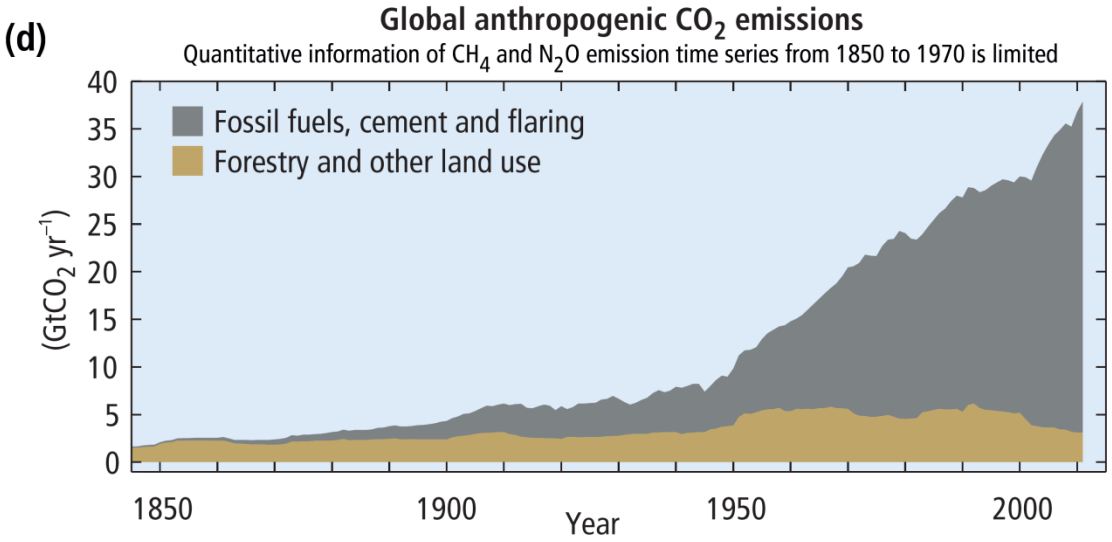
Causes of Climate Change

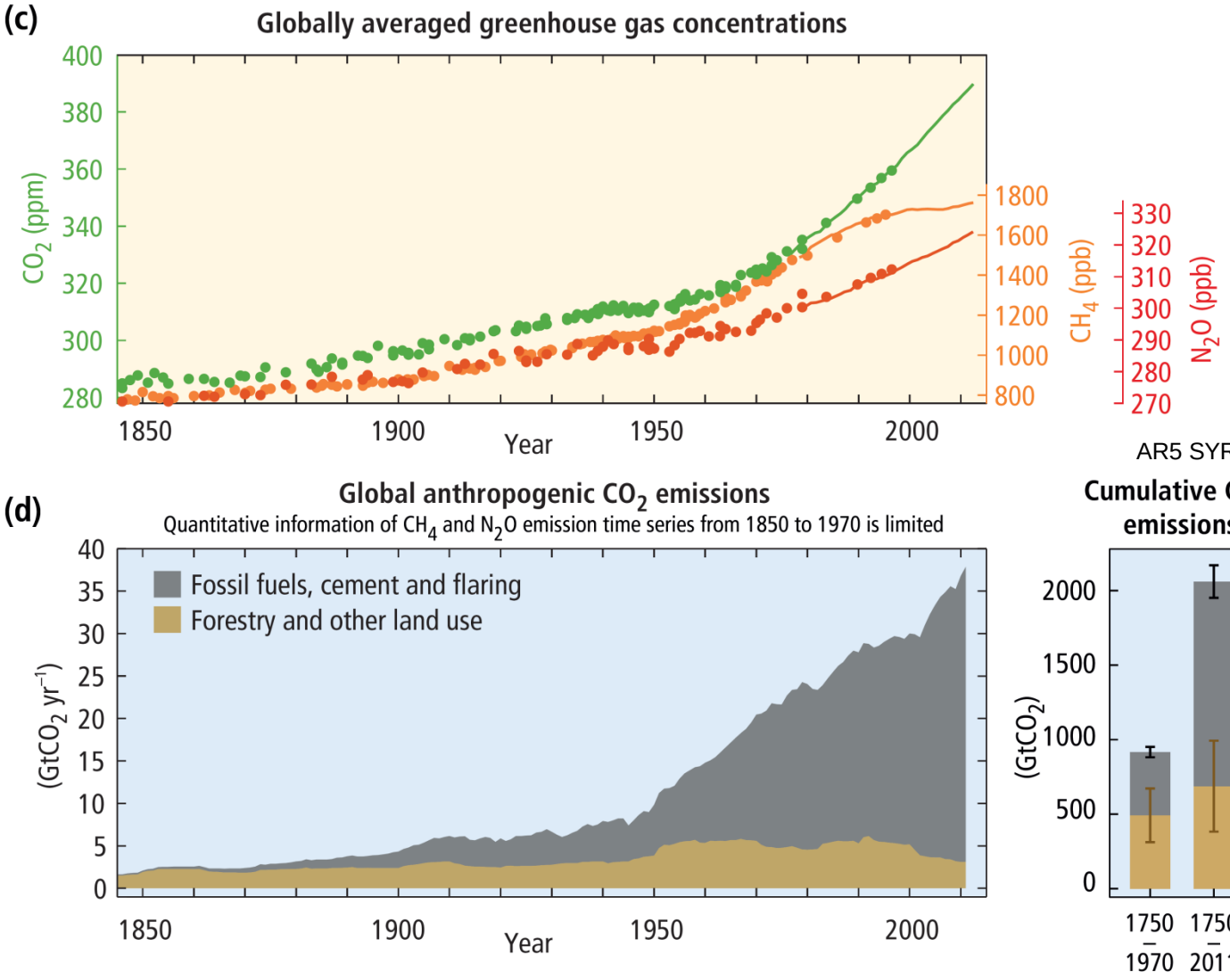


AR5 SYR, Fig. SPM.1c



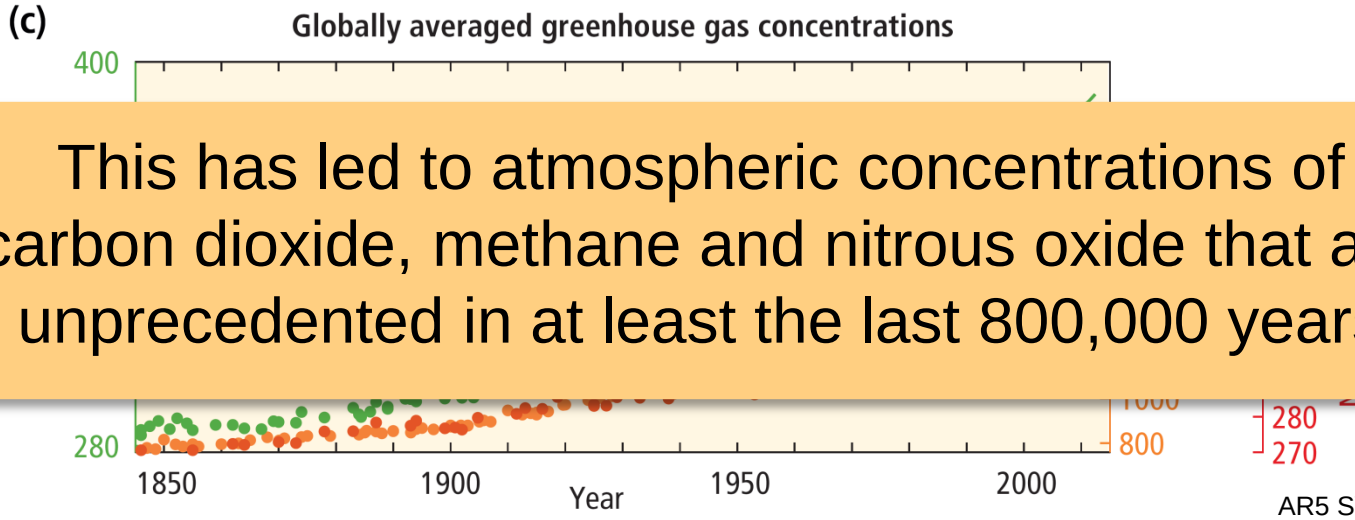
AR5 SYR, Figs. SPM.1c/d





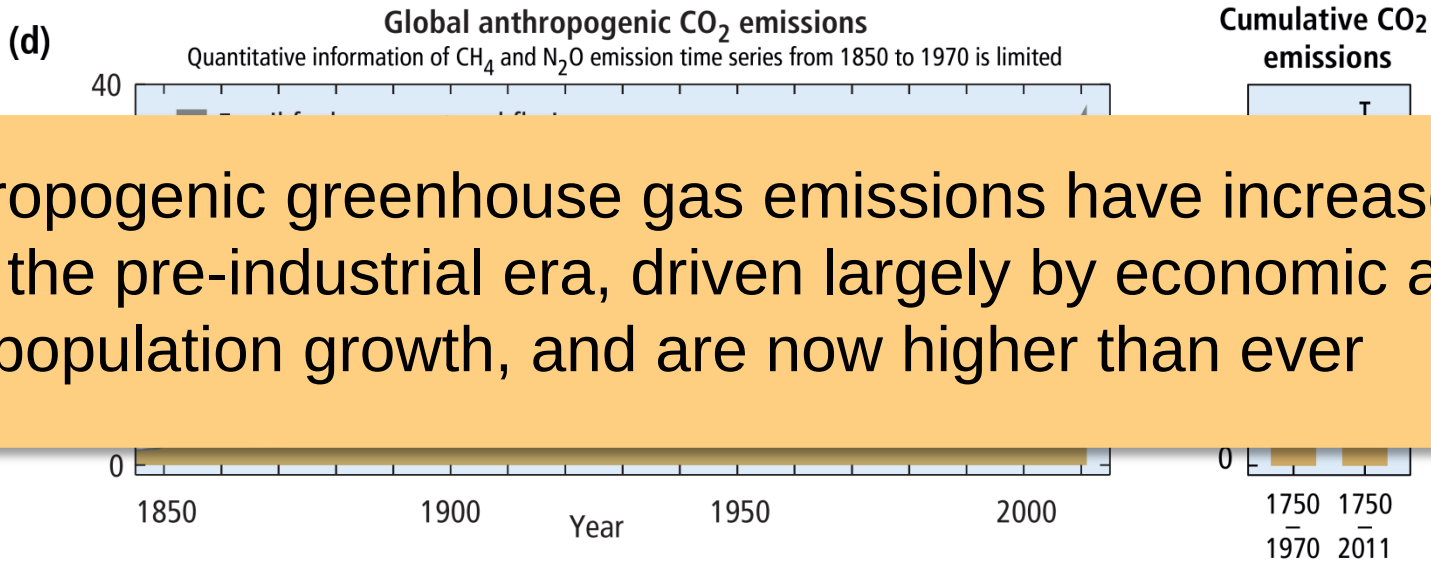
AR5 SYR, Figs. SPM.1c/d

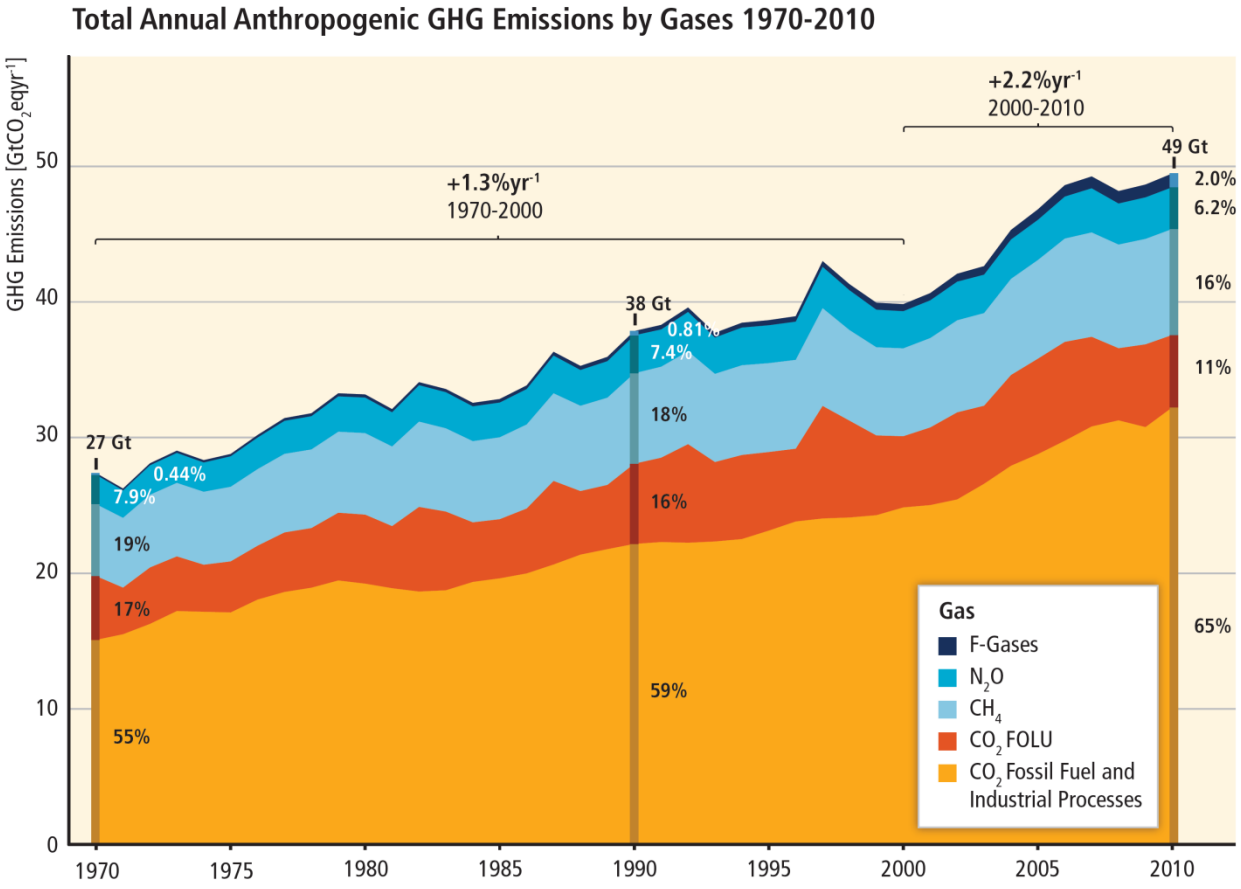
This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years



AR5 SYR, Figs. SPM.1c/d

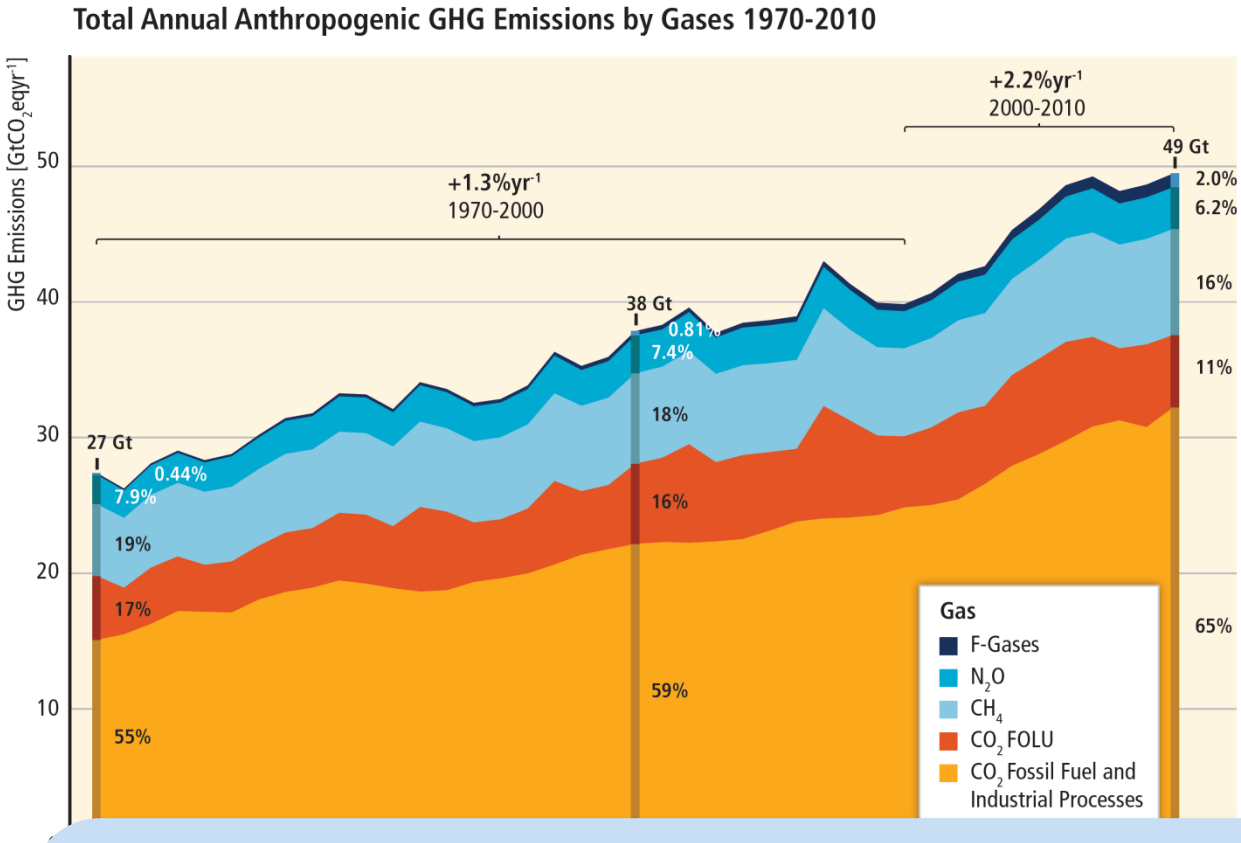
Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever





AR5 SYR, Figs. SPM.2

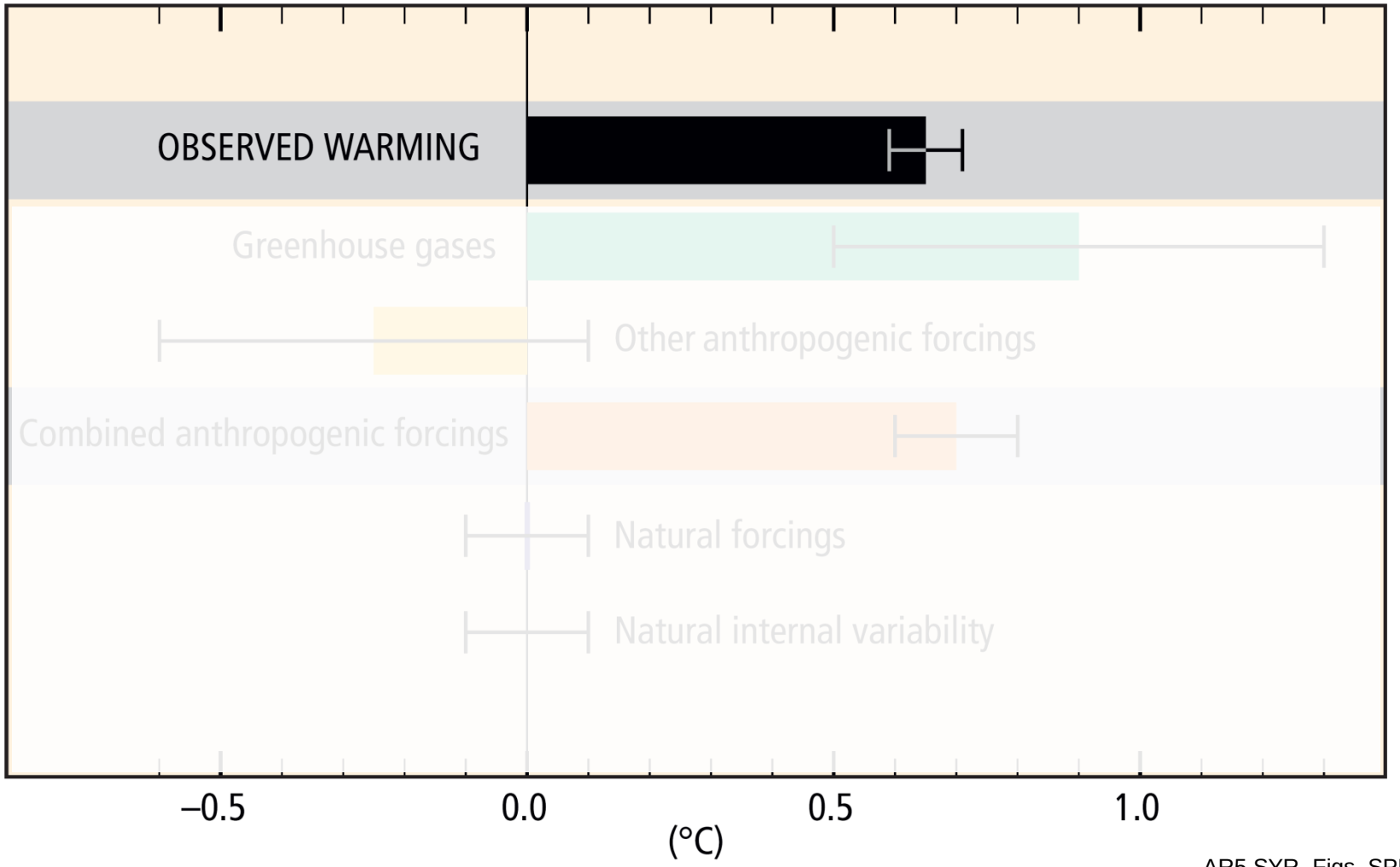
* Emissions of non-CO2 gases are shown as their contributions to "CO_2-equivalent" emissions – a common "currency" established by considering what the integrated radiative effect of emissions would be over 100 years



AR5 SYR, Figs. SPM.2

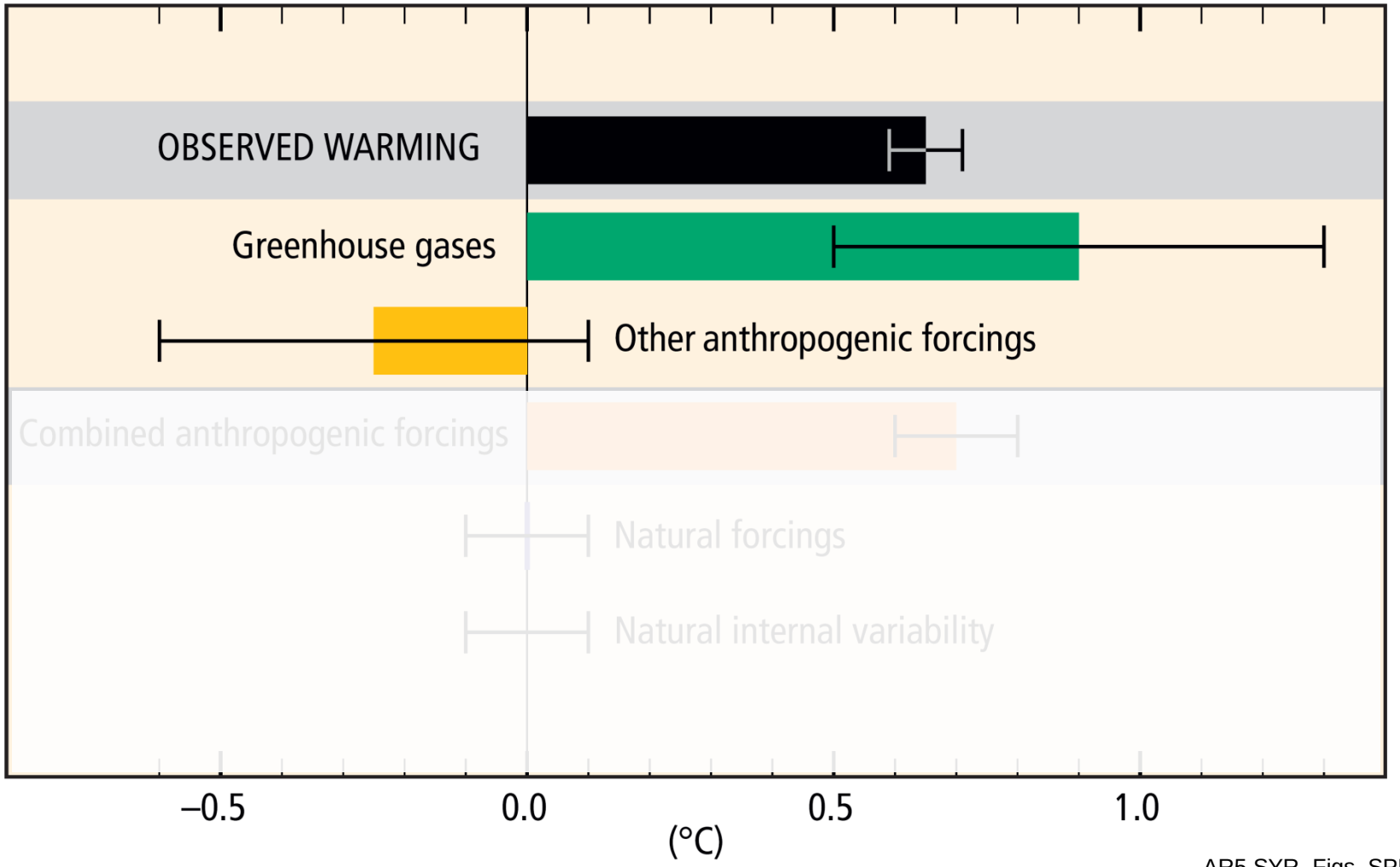
Emissions of CO_2 from fossil fuel combustion and industrial processes contributed about 78% of the total greenhouse gas emissions increase from 1970 to 2010, with a similar percentage contribution for the increase during the period 2000 to 2010 (*high confidence*)

Contributions to observed surface temperature change over the period 1951-2010



AR5 SYR, Figs. SPM.3

Contributions to observed surface temperature change over the period 1951-2010



AR5 SYR, Figs. SPM.3

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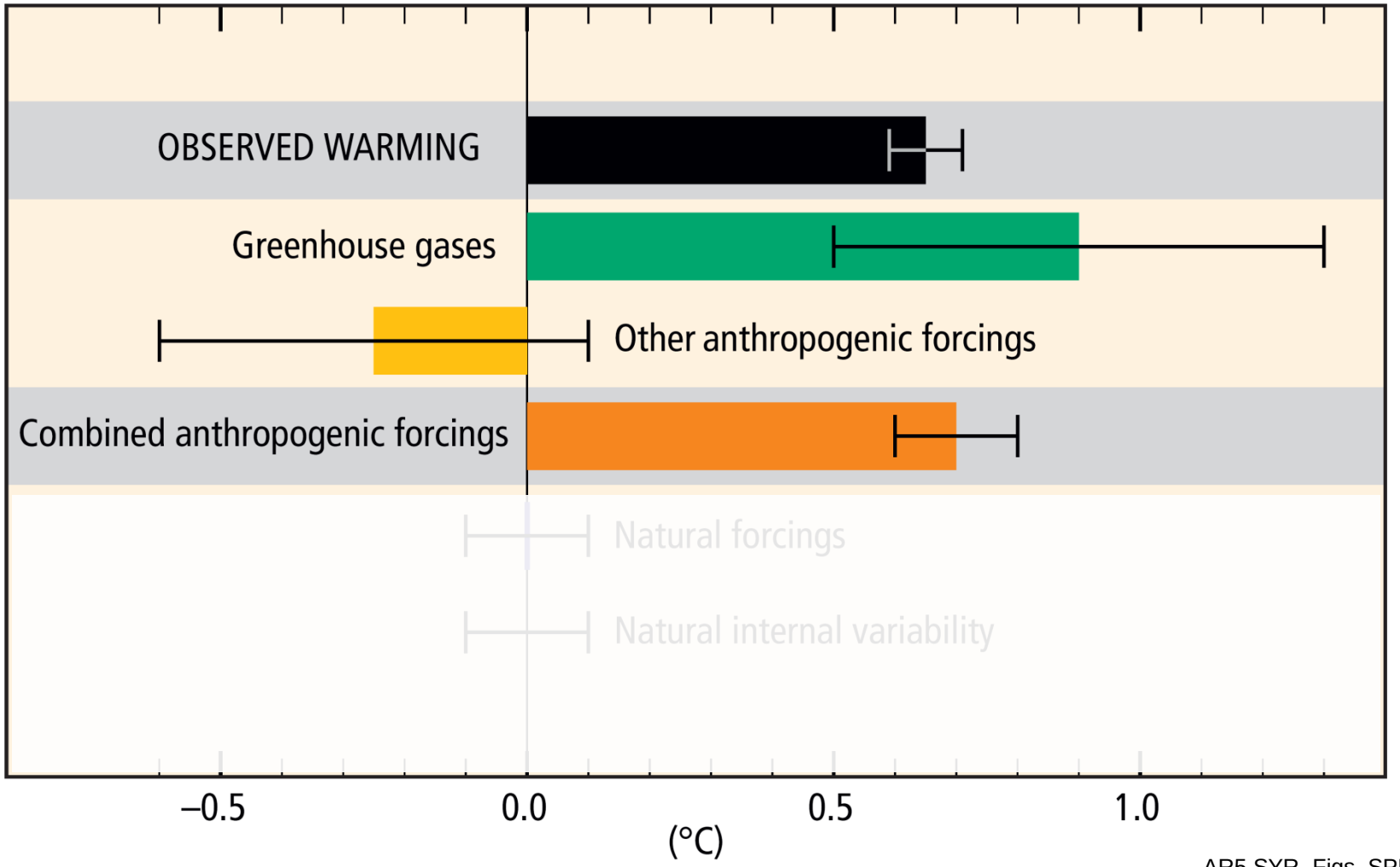

AR5 SYR, Figs. SPM.3

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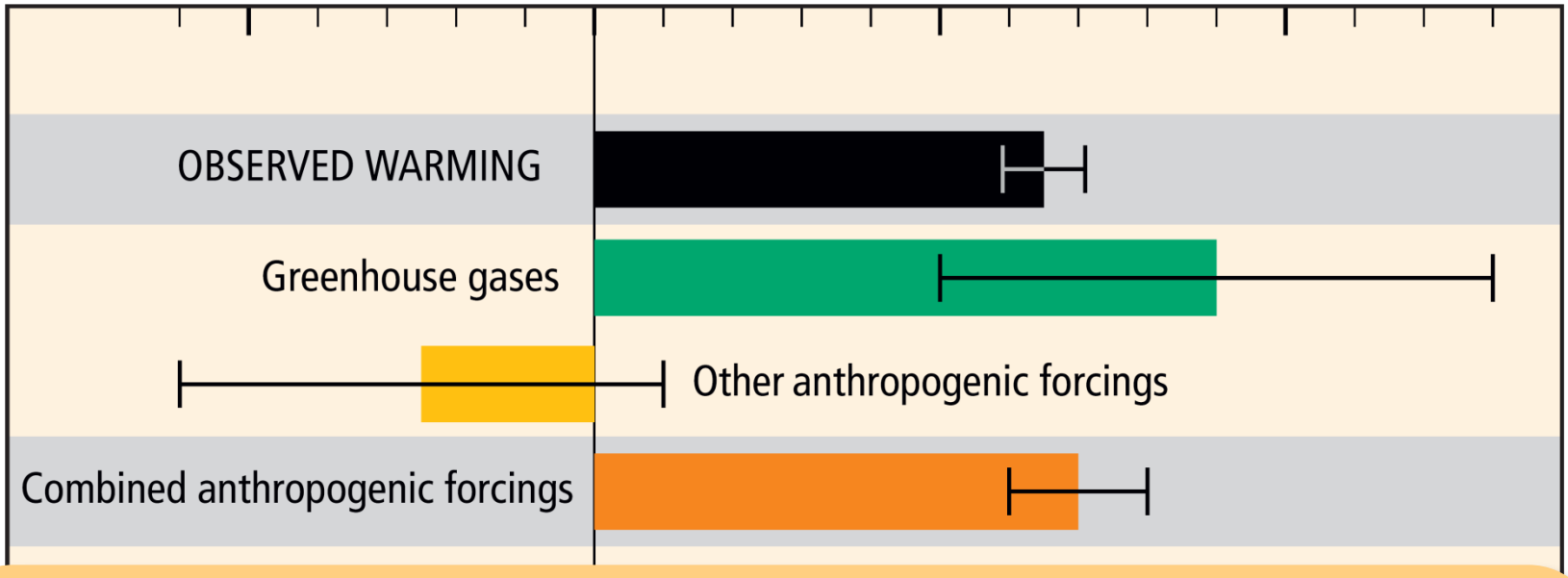

Their effects [i.e., those of anthropogenic greenhouse gas emissions], together with those of other anthropogenic drivers, have been detected throughout the climate system and are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century

AR5 SYR, Figs. SPM.3

Impacts of Climate Change

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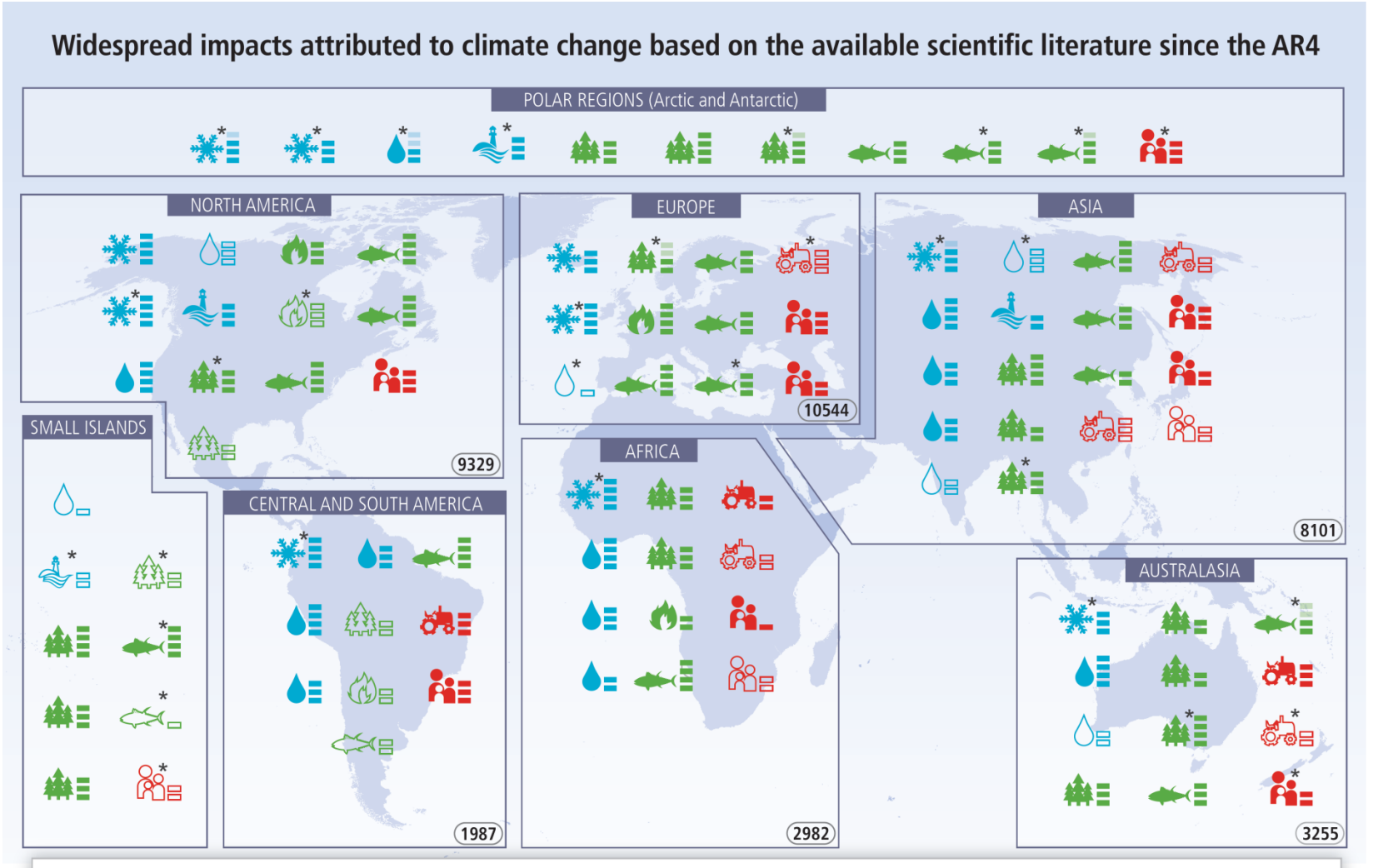
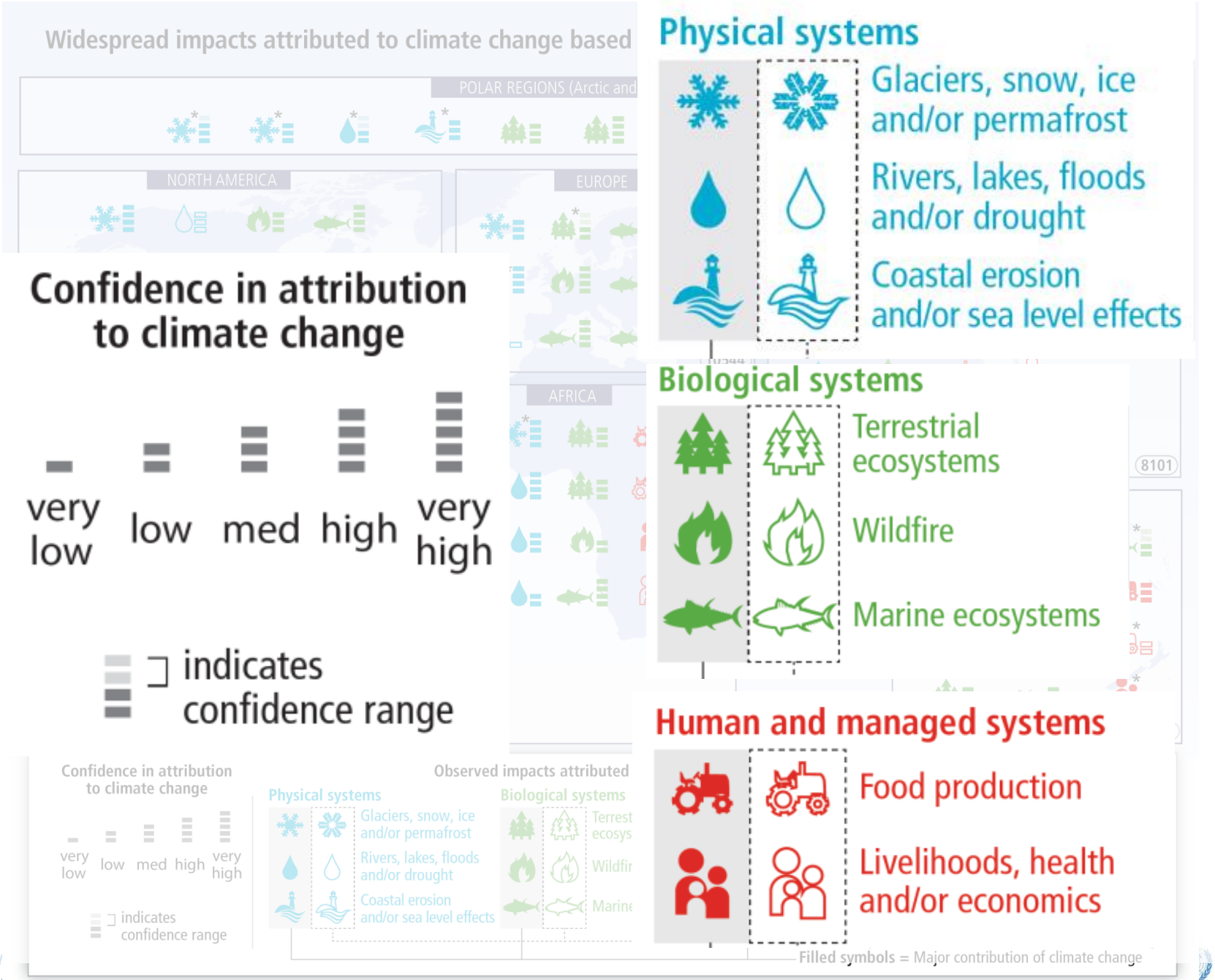
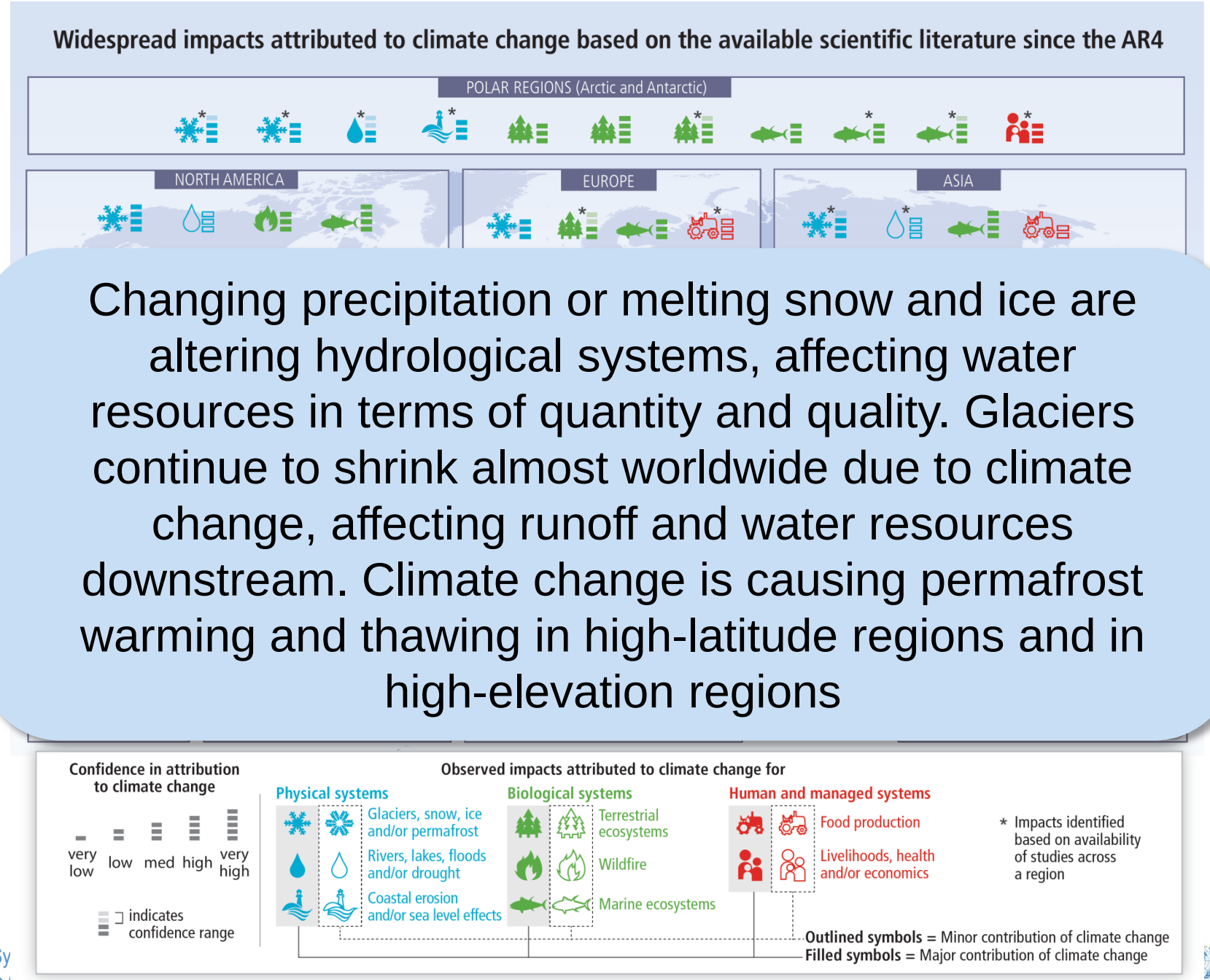


AR5 SYR, Figs. SPM.4

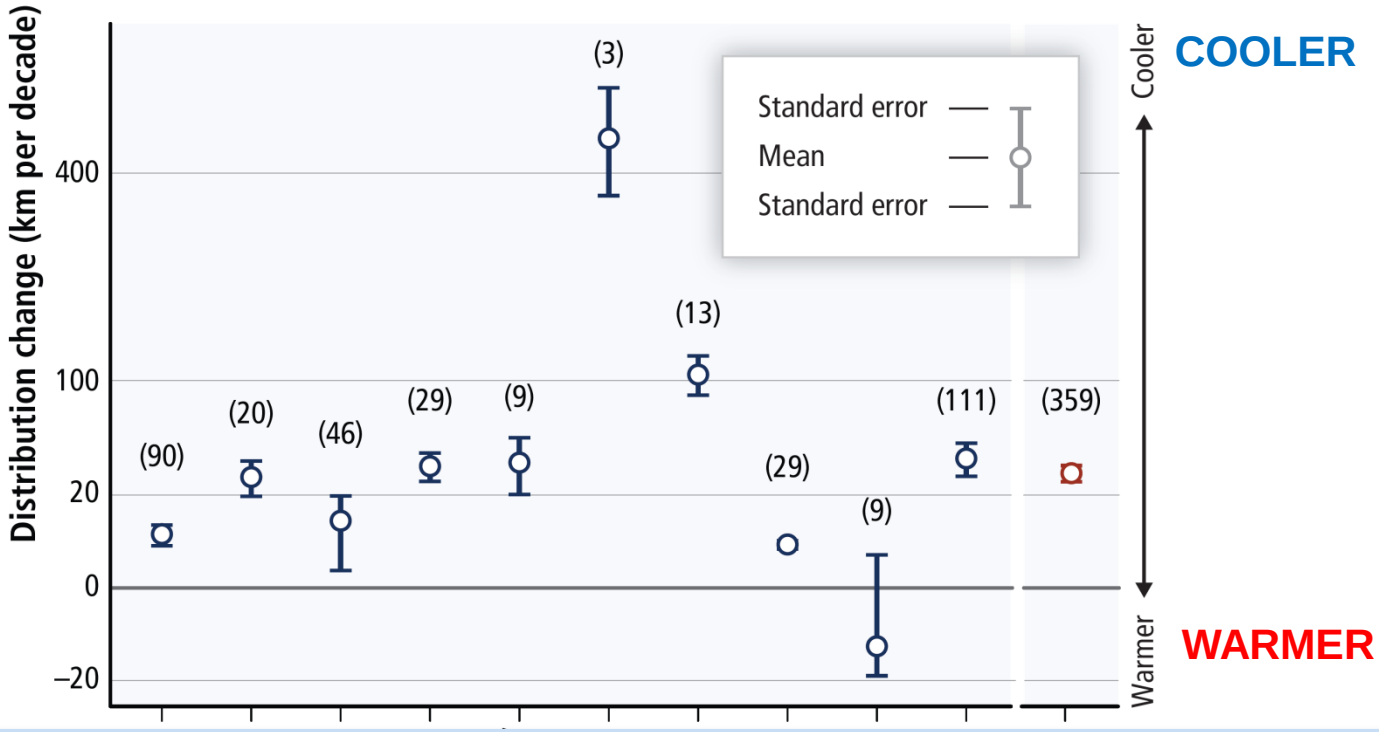


AR5 SYR, Figs. SPM.4



Changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality. Glaciers continue to shrink almost worldwide due to climate change, affecting runoff and water resources downstream. Climate change is causing permafrost warming and thawing in high-latitude regions and in high-elevation regions

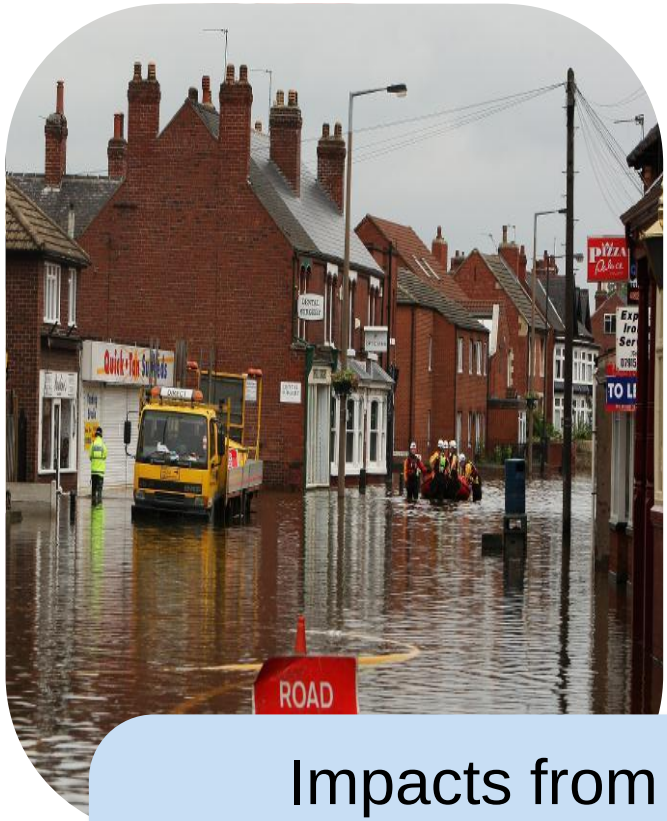
AR5 SYR, Figs. SPM.4



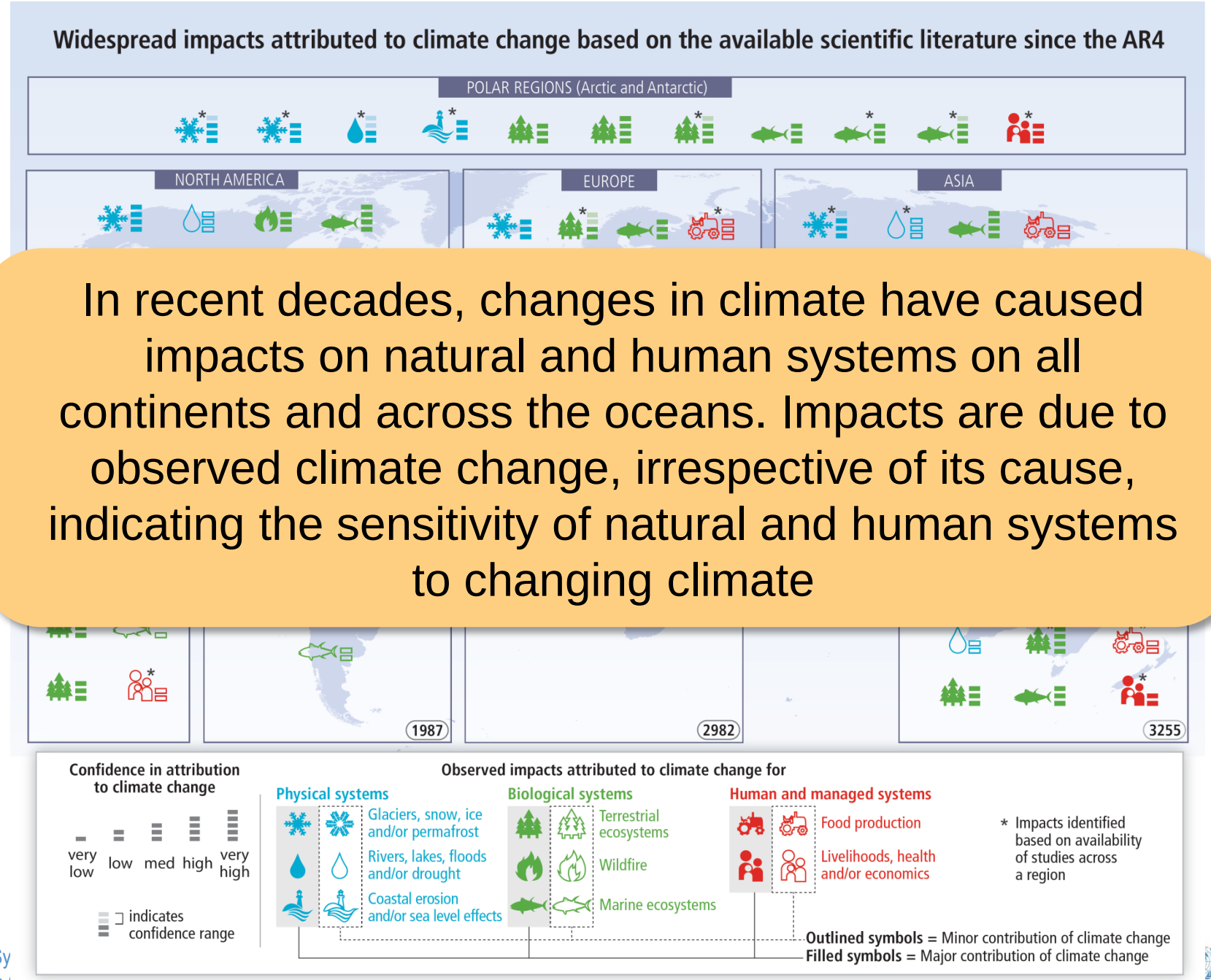
AR5 SYR, Fig. 1.11b

Many terrestrial, freshwater, and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change

Extreme Events

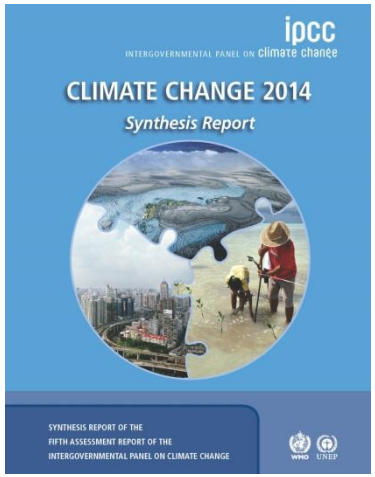


Impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability



In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to changing climate

AR5 SYR, Figs. SPM.4



SPM Headline Statement

Observed Changes and their Causes

Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems

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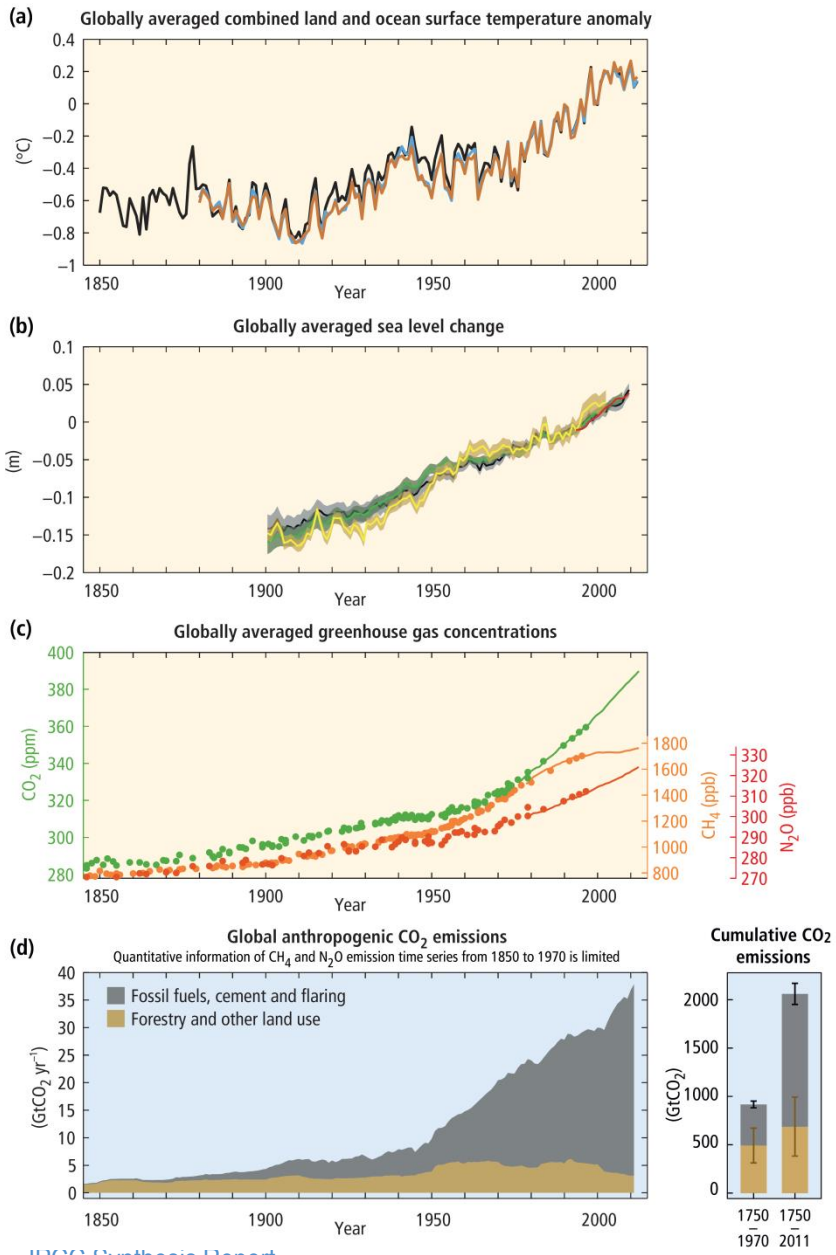
AR5 SYR Figure SPM.1



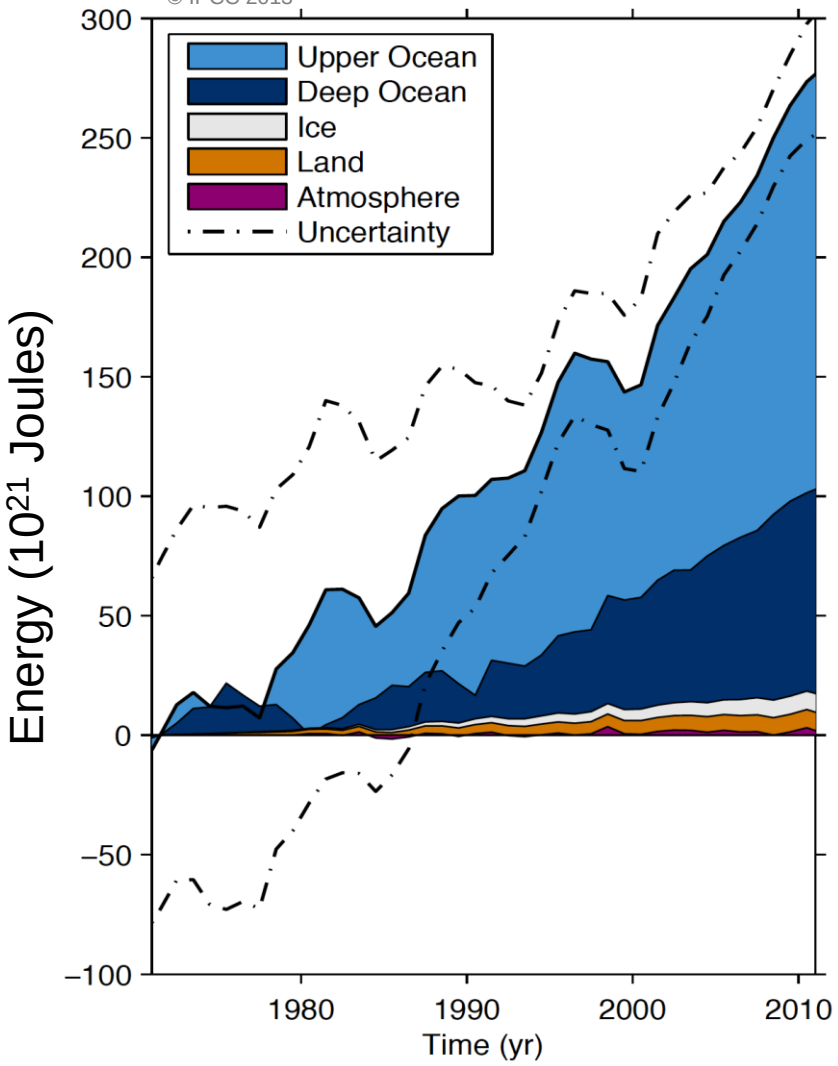
Globally averaged temperature anomaly

Globally averaged sea-level change

Globally averaged greenhouse gas concentrations

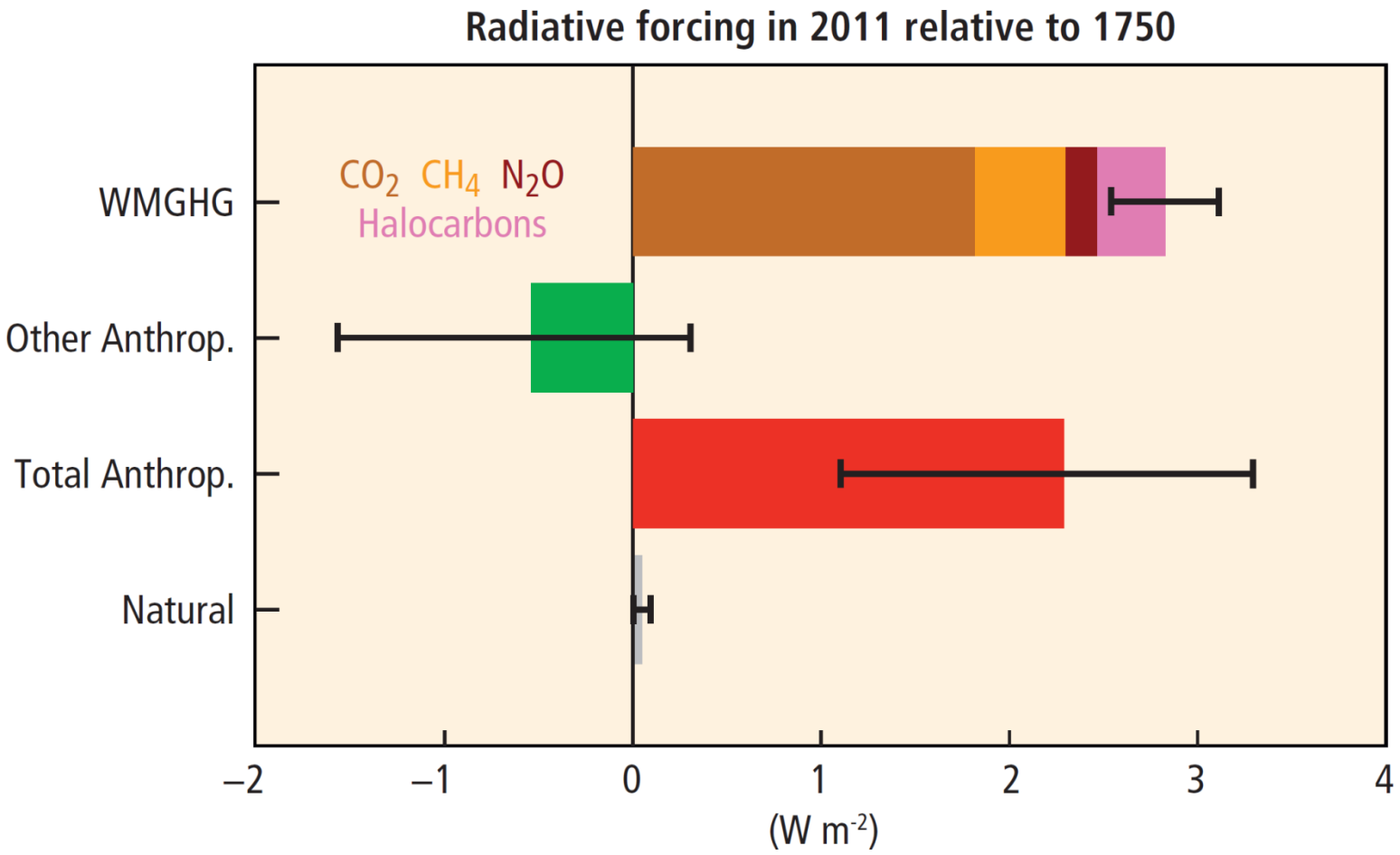
Global anthropogenic CO_2 emissions

AR5 SYR Fig. SPM.1

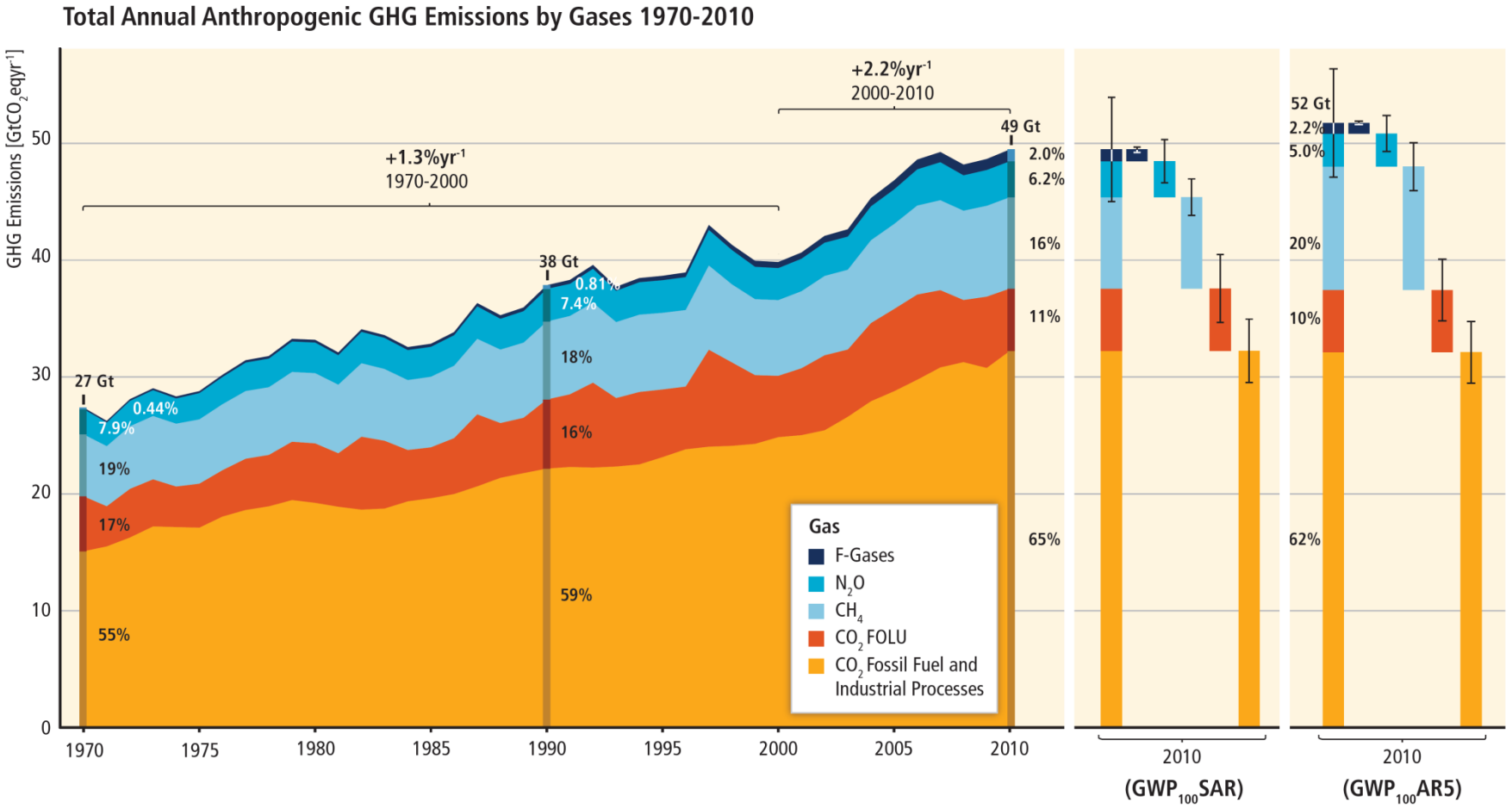


AR5 SYR, Fig. 1.2

Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (*high confidence)* with only about 1% stored in the atmosphere



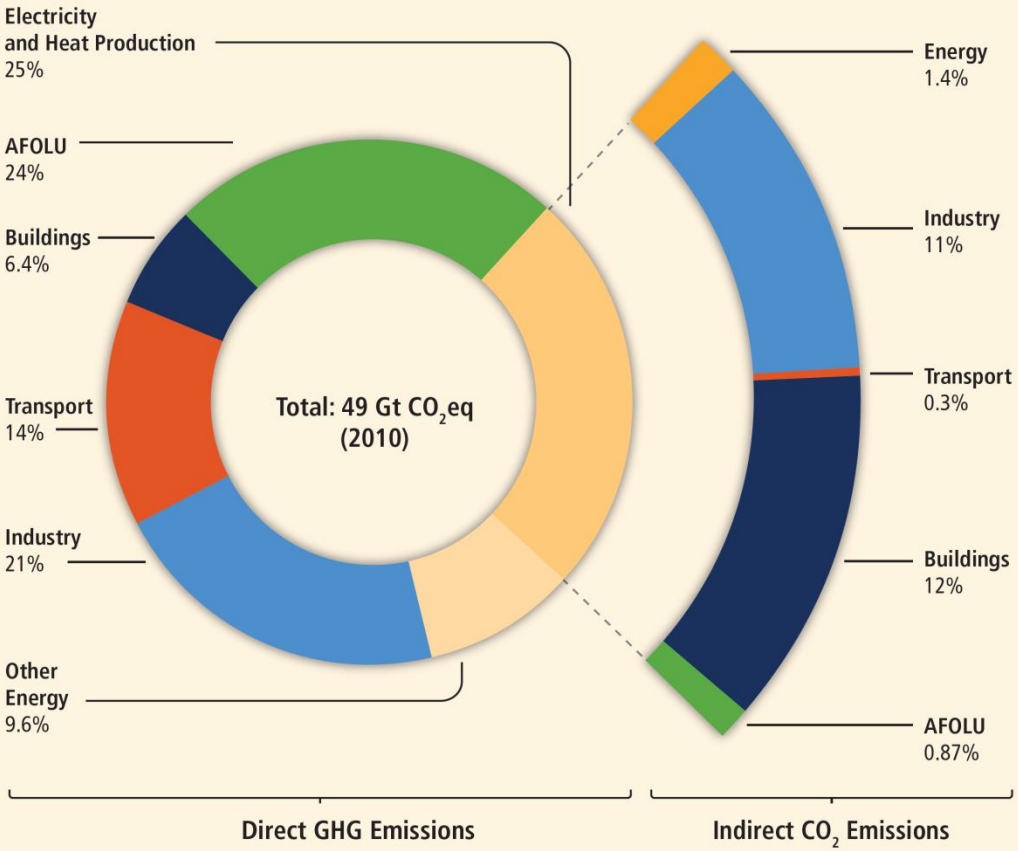
AR5 SYR, Fig. 1.4



AR5 SYR, Figs. SPM.2

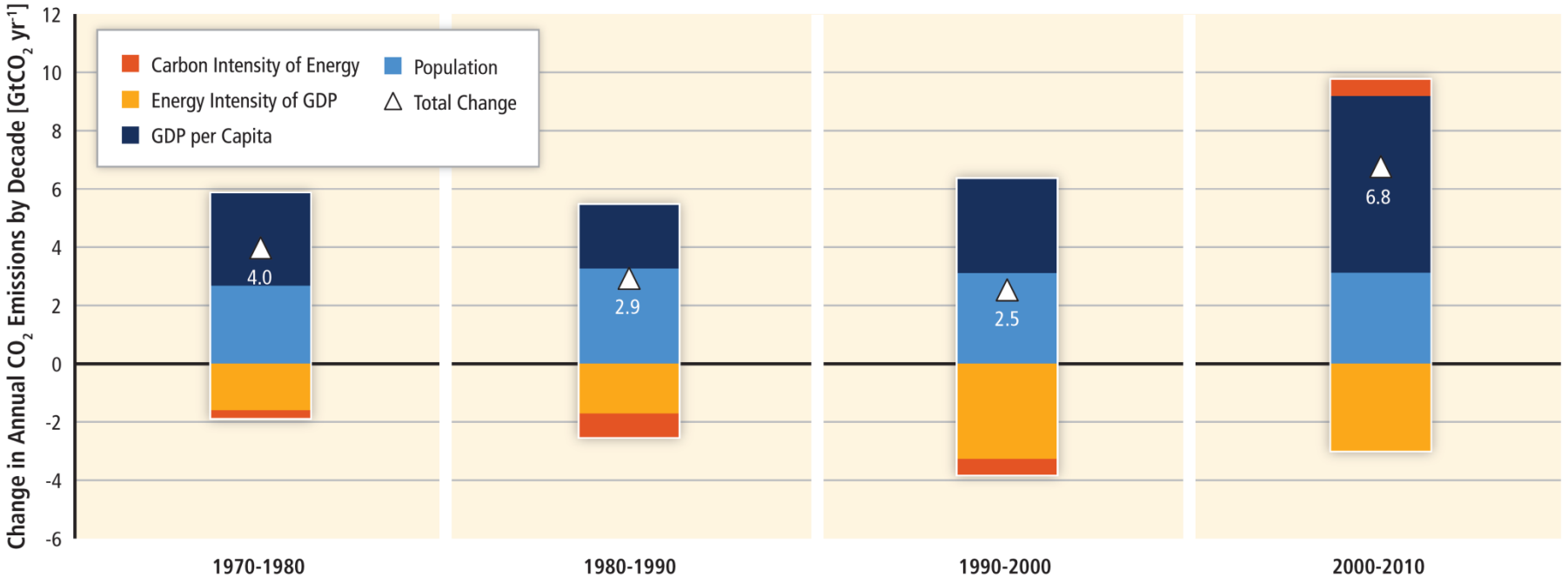
* Using the AR5 GWP-100 values results in higher total annual greenhouse gas emissions (52 vs 49 $GtCO_2$-eq/yr), but does not change the long term trend significantly

Greenhouse Gas Emissions by Economic Sectors

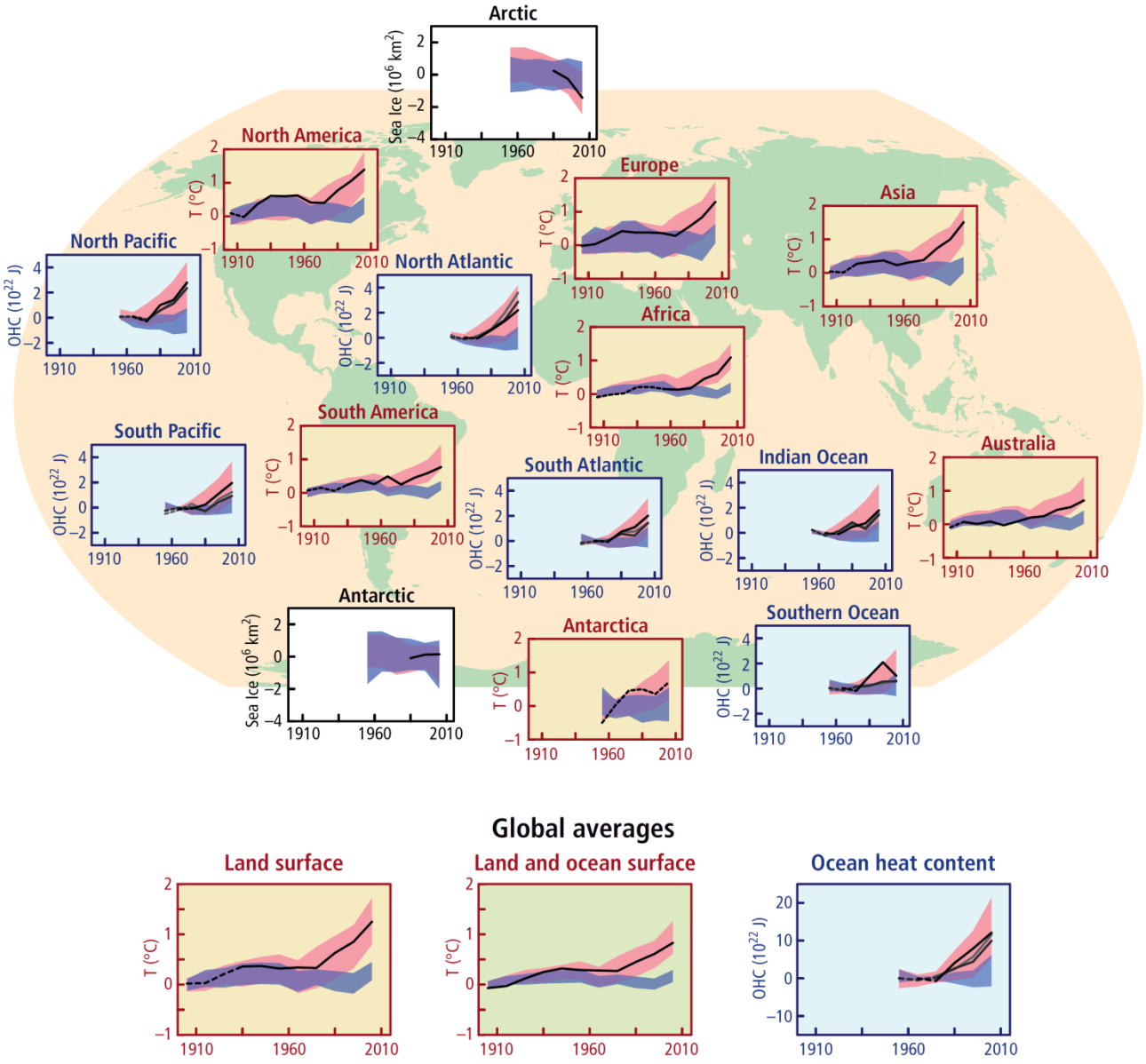


AR5 SYR, Fig. 1.7

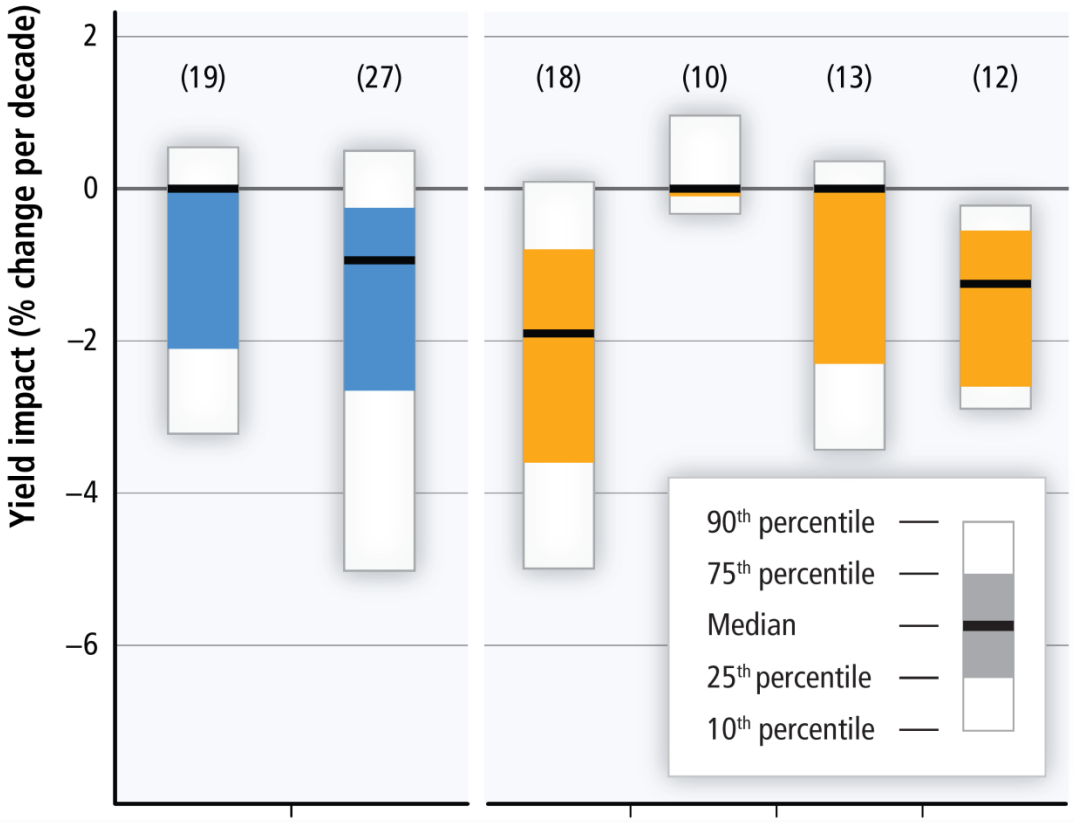
Decomposition of the Change in Total Global CO_2 Emissions from Fossil Fuel Combustion by Decade



AR5 SYR, Fig. 1.8



AR5 SYR, Fig. 1.10



AR5 SYR, Fig. 1.11c

Assessment of many studies covering a wide range of regions and crops shows that negative impacts of climate change on crop yields have been more common than positive impacts

Extreme Events

Extreme Events

Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions

Impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability

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