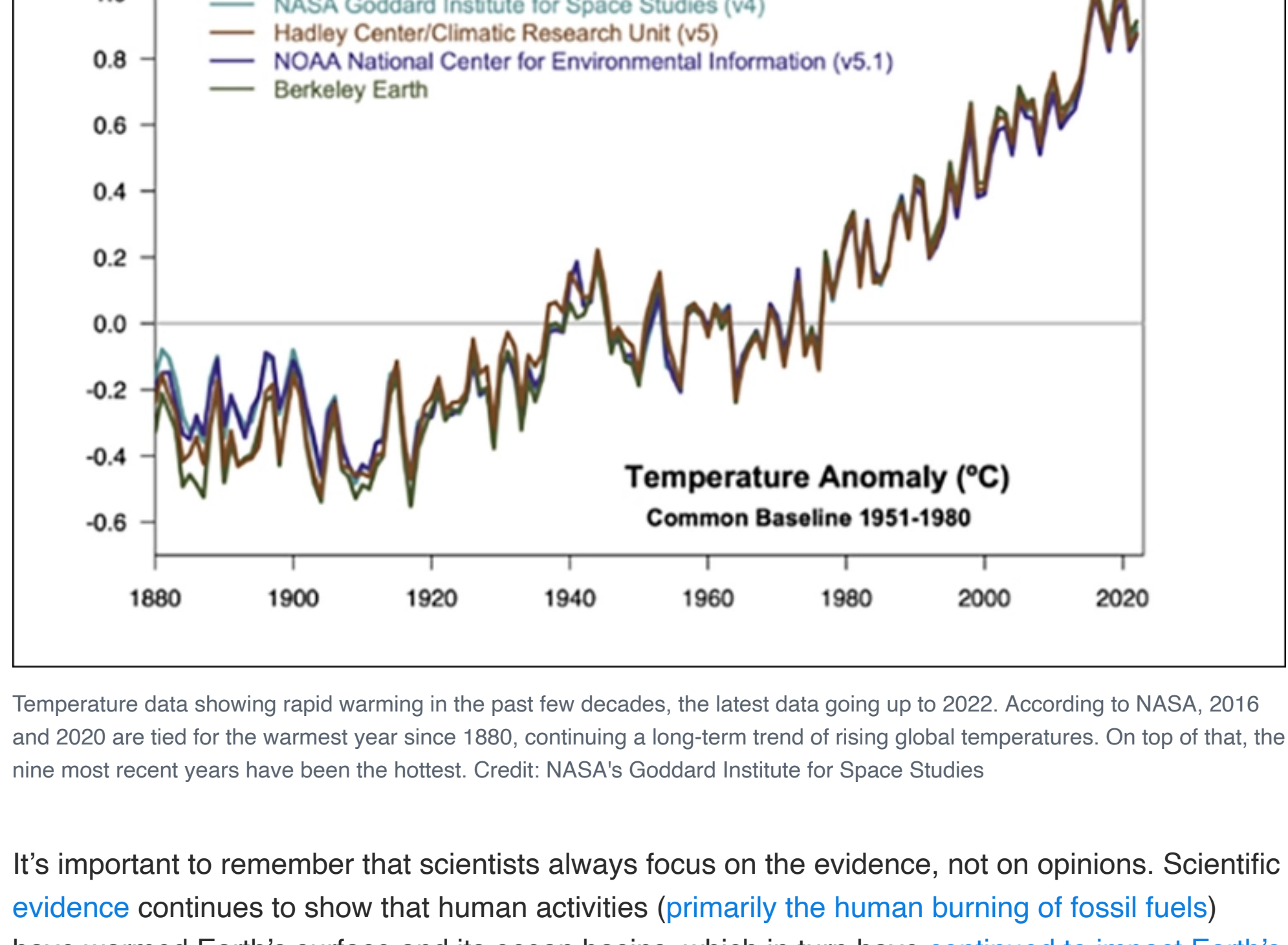


Scientific Consensus: Earth's Climate Is Warming

Facts > Scientific Consensus



Temperature data showing rapid warming in the past few decades, the latest data going up to 2022. According to NASA, 2016 and 2020 are tied for the warmest year since 1880, continuing a long-term trend of rising global temperatures. On top of that, the nine most recent years have been the hottest. Credit: NASA's Goddard Institute for Space Studies

Latest Resources

- [Video: Global Warming from 1880 to 2022](#)
- [Video: Annual Arctic Sea Ice Minimum 1979-2022 with Area Graph](#)
- [Video: Ozone Watch 2018](#)

It's important to remember that scientists always focus on the evidence, not on opinions. Scientific evidence continues to show that human activities (primarily the human burning of fossil fuels) have warmed Earth's surface and its ocean basins, which in turn have continued to impact Earth's climate. This is based on over a century of scientific evidence forming the structural backbone of today's civilization.

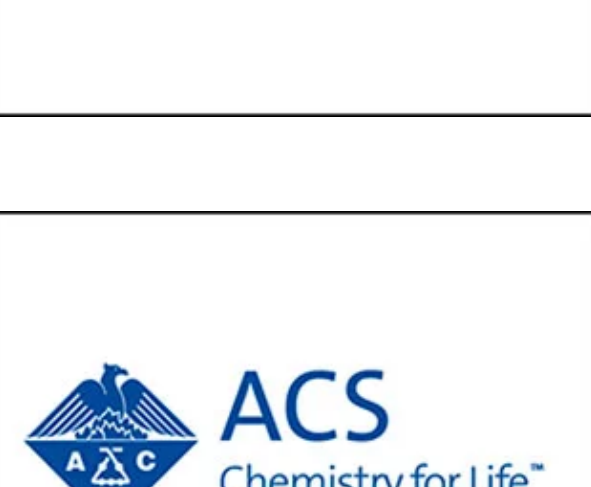
NASA Global Climate Change presents the state of scientific knowledge about climate change while highlighting the role NASA plays in better understanding our home planet. This effort includes citing multiple peer-reviewed studies from research groups across the world, illustrating the accuracy and consensus of research results (in this case, the scientific consensus on climate change) consistent with NASA's scientific research portfolio.

With that said, multiple studies published in peer-reviewed scientific journals¹ show that climate-warming trends over the past century are extremely likely due to human activities. In addition, most of the leading scientific organizations worldwide have issued public statements endorsing this position. The following is a partial list of these organizations, along with links to their published statements and a selection of related resources.

AMERICAN SCIENTIFIC SOCIETIES

Statement on Climate Change from 18 Scientific Associations

"Observations throughout the world make it clear that climate change is occurring, and rigorous scientific research demonstrates that the greenhouse gases emitted by human activities are the primary driver." (2009)²



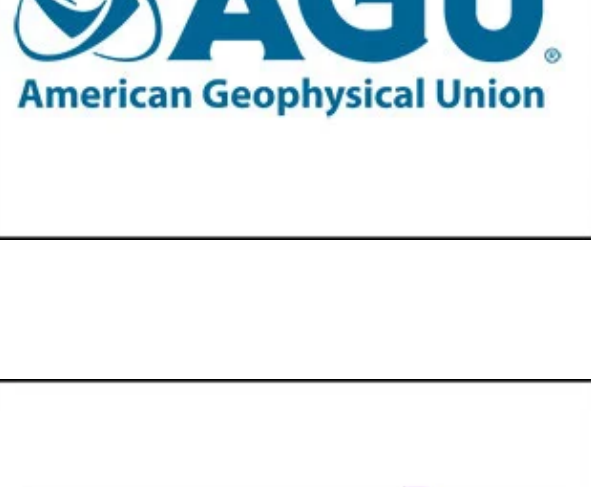
American Association for the Advancement of Science

"Based on well-established evidence, about 97% of climate scientists have concluded that human-caused climate change is happening." (2014)³




American Chemical Society

"The Earth's climate is changing in response to increasing concentrations of greenhouse gases (GHGs) and particulate matter in the atmosphere, largely as the result of human activities." (2016-2019)⁴



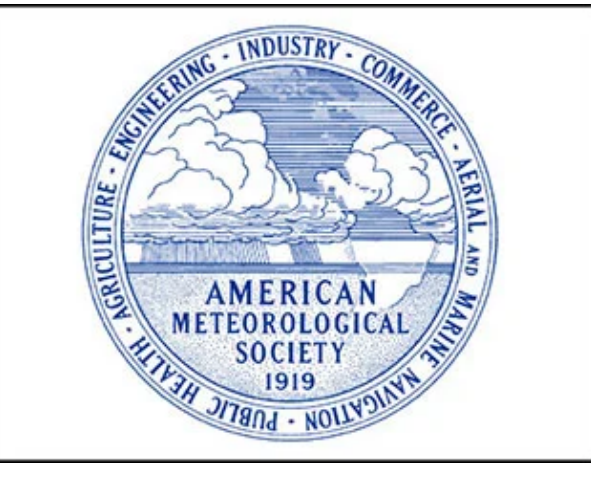
American Geophysical Union

"Based on extensive scientific evidence, it is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century. There is no alternative explanation supported by convincing evidence." (2019)⁵



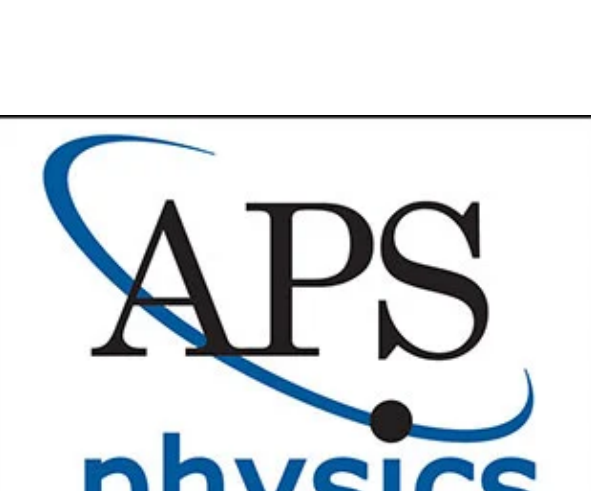
American Medical Association

"Our AMA ... supports the findings of the Intergovernmental Panel on Climate Change's fourth assessment report and concurs with the scientific consensus that the Earth is undergoing adverse global climate change and that anthropogenic contributions are significant." (2019)⁶




American Meteorological Society

"Research has found a human influence on the climate of the past several decades ... The IPCC (2013), USGCRP (2017), and USGCRP (2018) indicate that it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-twentieth century." (2019)⁷



American Physical Society

"Earth's changing climate is a critical issue and poses the risk of significant environmental, social and economic disruptions around the globe. While natural sources of climate variability are significant, multiple lines of evidence indicate that human influences have had an increasingly dominant effect on global climate warming observed since the mid-twentieth century." (2015)⁸




The Geological Society of America

"The Geological Society of America (GSA) concurs with assessments by the National Academies of Science (2005), the National Research Council (2011), the Intergovernmental Panel on Climate Change (IPCC, 2013) and the U.S. Global Change Research Program (Mellillo et al., 2014) that global climate has warmed in response to increasing concentrations of carbon dioxide (CO₂) and other greenhouse gases ... Human activities (mainly greenhouse-gas emissions) are the dominant cause of the rapid warming since the middle 1900s (IPCC, 2013)." (2015)⁹

SCIENCE ACADEMIES

International Academies: Joint Statement


"Climate change is real. There will always be uncertainty in understanding a system as complex as the world's climate. However there is now strong evidence that significant global warming is occurring. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. It is likely that most of the warming in recent decades can be attributed to human activities (IPCC 2001)." (2005, 11 international science academies)¹⁰



U.S. National Academy of Sciences

"Scientists have known for some time, from multiple lines of evidence, that humans are changing Earth's climate, primarily through greenhouse gas emissions."¹¹


U.S. GOVERNMENT AGENCIES



U.S. Global Change Research Program

"Earth's climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities." (2018, 13 U.S. government departments and agencies)¹²

INTERGOVERNMENTAL BODIES



Intergovernmental Panel on Climate Change

"It is unequivocal that the increase of CO₂, methane, and nitrous oxide in the atmosphere over the industrial era is the result of human activities and that human influence is the principal driver of many changes observed across the atmosphere, ocean, cryosphere, and biosphere."

"Since systematic scientific assessments began in the 1970s, the influence of human activity on the warming of the climate system has evolved from theory to established fact."¹³⁻¹⁷

OTHER RESOURCES

List of Worldwide Scientific Organizations

The following page lists the nearly 200 worldwide scientific organizations that hold the position that climate change has been caused by human action.
<http://www.opr.ca.gov/facts/list-of-scientific-organizations.html>

U.S. Agencies

The following page contains information on what federal agencies are doing to adapt to climate change.
<https://www.c2es.org/site/assets/uploads/2012/02/climate-change-adaptation-what-federal-agencies-are-doing.pdf>

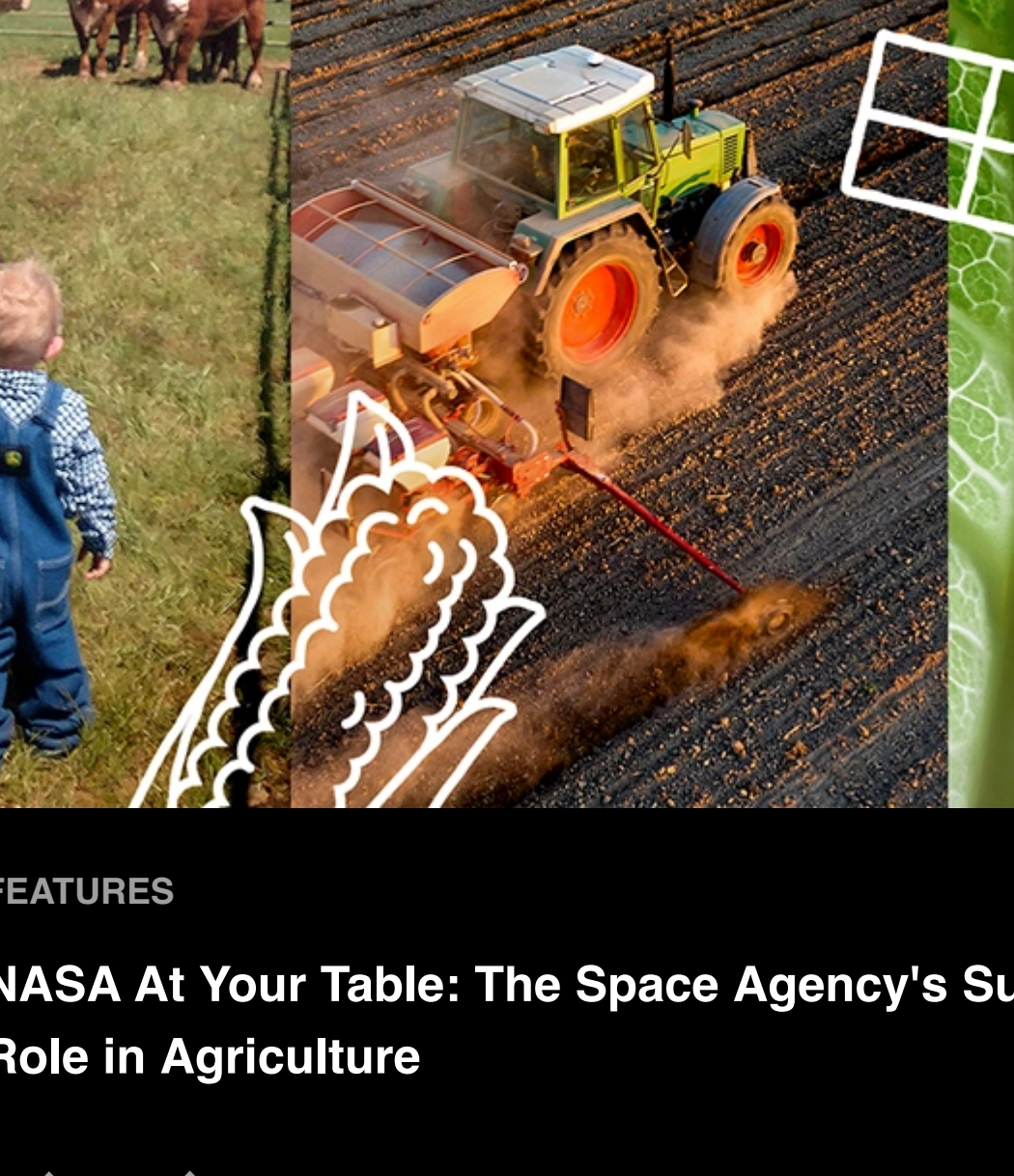
Technically, a "consensus" is a general agreement of opinion, but the scientific method steers us away from this to an objective framework. In science, facts or observations are explained by a hypothesis (a statement of a possible explanation for some natural phenomenon), which can then be tested and retested until it is refuted (or disproved).

As scientists gather more observations, they will build off one explanation and add details to complete the picture. Eventually, a group of hypotheses might be integrated and generalized into a scientific theory, a scientifically acceptable general principle or body of principles offered to explain phenomena.

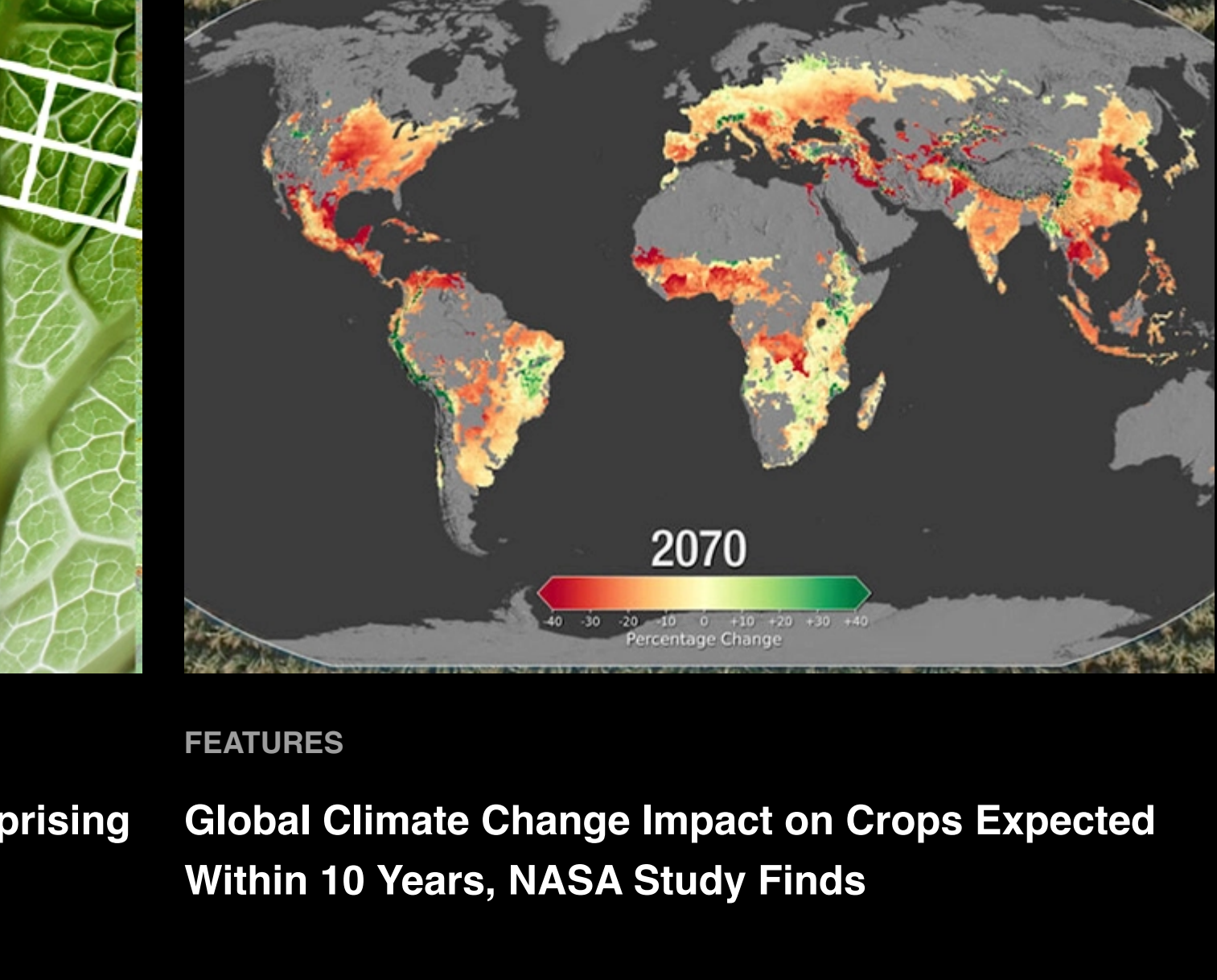
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- Statement on climate change from 18 scientific associations (2009)
- AAAS Board Statement on Climate Change (2014)
- ACS Public Policy Statement: Climate Change (2016-2019)
- Society Must Address the Growing Climate Crisis Now (2019)
- Global Climate Change and Human Health (2019)
- Climate Change: An Information Statement of the American Meteorological Society (2019)
- American Physical Society (2021)
- GSA Position Statement on Climate Change (2015)
- Joint science academies' statement: Global response to climate change (2005)
- Climate at the National Academies
- Fourth National Climate Assessment: Volume II (2018)
- IPCC Fifth Assessment Report, Summary for Policymakers, SPM 1.1 (2014)
- IPCC Fifth Assessment Report, Working Group 1 (2021)
- IPCC Sixth Assessment Report, Working Group 1 (2021)
- IPCC Sixth Assessment Report, Working Group 2 (2022)
- IPCC Sixth Assessment Report, Working Group 3 (2022)

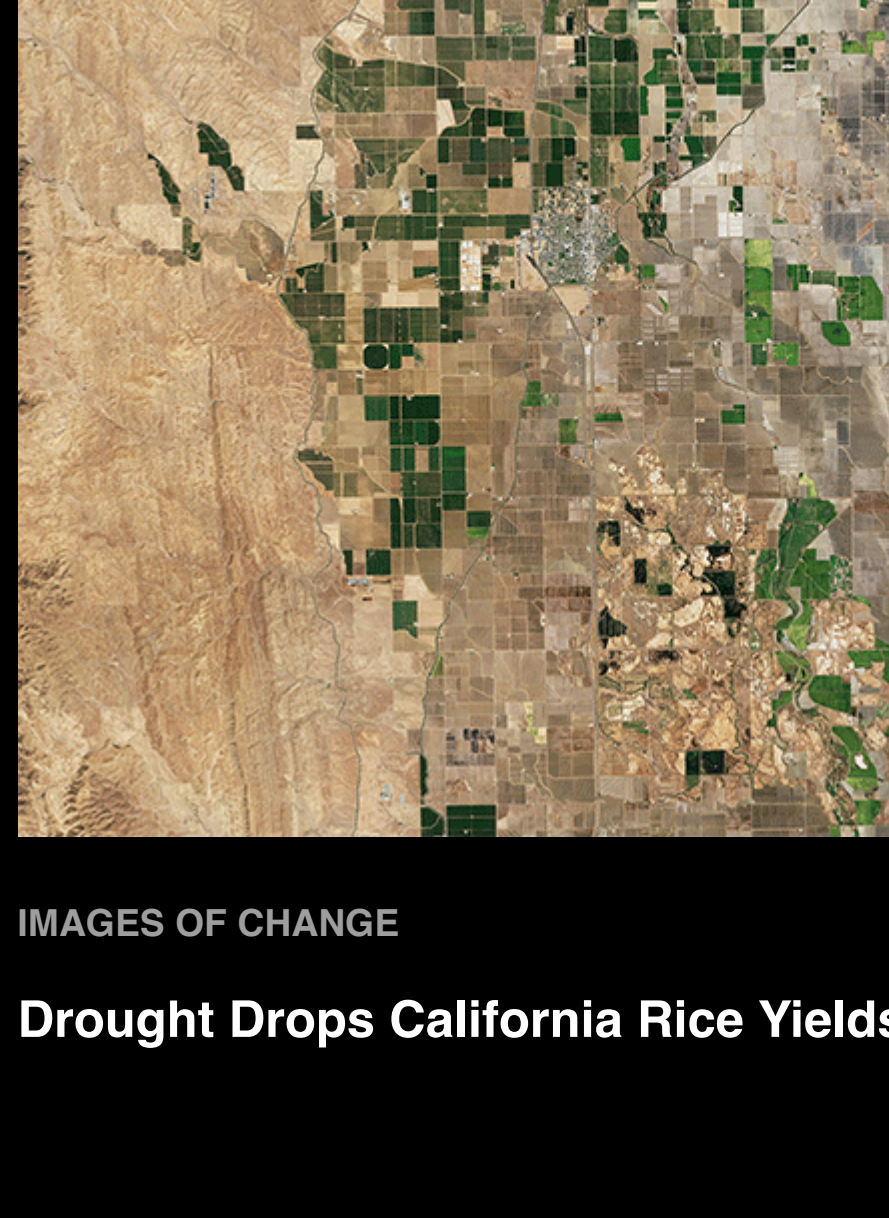
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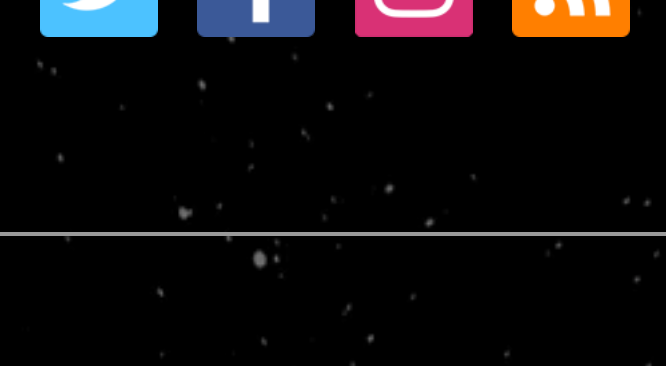
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