2023 Workshop: CEDAR and Climate Change

Long title
CEDAR and Climate Change
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Description

This workshop will provide a forum to continue discussion about ways that the CEDAR community might contribute to global efforts to address climate change. Such efforts could include whole atmosphere studies of climate change processes; contributions by the CEDAR community to national and international climate assessment processes; strategies to reduce uncertainties in observations to facilitate their use for longer-term comparisons; identification of aeronomy data sets and techniques that can also provide tropospheric information; and steps that our scientific community can take to mitigate climate change, in our conferences and other practices. We welcome participation from the tropospheric climate community, as well as the middle and upper atmospheric research community, to discuss further ways that our communities might collaborate to advance knowledge of climate science. We also welcome discussion relating to climate impacts, equity, and justice; as well as strategies for mitigating and adapting to climate change, promoting civic engagement, and for communicating climate science in educational settings and to the public.

Session Format:

We plan that this workshop will be a mixture of presentations with interactive time for questions, and more general discussion on topics related to CEDAR and climate change.

We also plan to hold this workshop using a hybrid format to facilitate interdisciplinary interaction with potential speakers from outside the CEDAR community; to include more members of the international community and to enable participation of those not able to travel to the CEDAR in-person meeting for a variety of reasons.

Agenda

Draft agenda for CEDAR and Climate Change workshop:

10-10:12
Welcome, Introductions, Overview of Session and Motivation

10:13- 10:30
Climate Responses Under an Extreme Quiet Sun Scenario, Hanli Liu - National Center for Atmospheric Research

10:30 - 10:55
Climate Absolute Radiance and Refractivity Observatory (CLARREO) Pathfinder, Yolanda Shea, NASA Langley Research Center

10:55- 11:14
Upper Atmosphere 21st Century Projections from WACCM-X, Joe McInerney, National Center for Atmospheric Research

11:15 - 11:45
Science in Action: Climate Communications & Advocacy, Kate Cell and Brady Watson, Union of Concerned Scientists

11:45 - noon
Discussion about ways that the CEDAR community might contribute to global efforts to address climate change.

We are grateful for your participation and look forward to learning together during the upcoming workshop!

Justification

The recent release of major climate assessments, including reports from the Intergovernmental Panel on Climate Change (IPCC), underscores the urgency of addressing climate change. The 2023 IPCC synthesis assessment warns that "Climate change is a threat to human well-being and planetary health (very high confidence). There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all (very high confidence)." The report further explains that "Rapid and far-reaching transitions across all sectors and systems are necessary to achieve deep and sustained emissions reductions and secure a liveable and sustainable future for all. These system transitions involve a significant upscaling of a wide portfolio of mitigation and adaptation options. Feasible, effective, and low-cost options for mitigation and adaptation are already available, with differences across systems and regions. (high confidence)," and that "Prioritising equity, climate justice, social justice, inclusion and just transition processes can enable adaptation and ambitious mitigation actions and climate resilient development." In summary, "The choices and actions implemented in this decade will have impacts now and for thousands of years (high confidence)." [IPCC 2023 AR6 Synthesis Report; https://www.ipcc.ch/report/ar6/syr/resources/spm-headline-statements/]

Summary

We were grateful to our speakers who addressed a variety of ways that the CEDAR community could contribute to efforts to address climate change.

Prior to the presentations from our speakers, we began by sharing brief context including conclusions from major scientific climate assessments published recently. These assessments underscore the urgency of addressing climate change.

- The 2023 IPCC synthesis assessment warns that "Climate change is a threat to human well-being and planetary health (*very high confidence*). There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all (*very high confidence*)."
- The 2023 IPCC report further explains that "Rapid and far-reaching transitions across all sectors and systems are necessary to achieve deep and sustained emissions reductions and secure a liveable and sustainable future for all."
- and that "Prioritizing equity, climate justice, social justice, inclusion and just transition processes can enable adaptation and ambitious mitigation actions

and climate resilient development.”

- In summary, “The choices and actions implemented in this decade will have impacts now and for thousands of years (*high confidence*).” [*IPCC 2023 AR6 Synthesis Report; https://www.ipcc.ch/report/ar6/syr/resources/spm-headline-statements/*]
- The United Nations 2022 Emissions Gap report concludes that “We are far from the Paris Agreement goal of limiting global warming to well below 2°C, preferably 1.5°C. ”
- The United Nations 2022 Emission Gap report further states that “The transformation towards zero greenhouse gas emissions in electricity supply, industry, transportation and buildings is underway but needs to move much faster.” [https://www.unep.org/resources/emissions-gap-report-2022]
- Project Drawdown (drawdown.org) provides information about an extensive range of strategies for reducing greenhouse gas emissions.

We then included a brief summary of some of the points made by Marty Mlynczek (NASA Langley) during his talk at the CEDAR long term trends workshop about the need for geospace data records and a new observing system to provide continuity of Geospace observations. This white paper to the Heliophysics Decadal Survey outlines considerations for continuity of observations in the geospace environment to accurately measure trends and changes in this region [Mlynczak et al., 2023; https://baas.aas.org/pub/2023n3i280/release/1]

Hanli Liu (NCAR High Altitude Observatory) discussed results of simulations with the NCAR Whole Atmosphere Community Climate Model with thermosphere and ionosphere extension (WACCM-X) under an Extreme Quiet Sun scenario [https://doi.org/10.1029/2022JD037626]. Such a scenario assists in separating the response of climate to solar variability from the large and complex climate variability.

The CEDAR community can learn much from the tropospheric climate community. Yolanda Shea (NASA Langley Research Center), project scientist of the Climate Absolute Radiance and Refractivity Observatory (CLARREO) Pathfinder, provided an overview of the mission and efforts to make climate measurements with unparalleled accuracy. The goals of the mission are to measure Earth-reflected sunlight with unparalleled accuracy and to serve as an on-orbit inter-calibration reference [https://clarreo-pathfinder.larc.nasa.gov/mission-overview/].

Joe McInerney (NCAR High Altitude Observatory) discussed simulations with the NCAR Whole Atmosphere Community Climate Model with thermosphere and ionosphere extension (WACCM-X) to project the climate in the upper atmosphere into the 21st century. The simulations were run with greenhouse gas emissions scenarios used in the 2023 Intergovernmental Panel on Climate Change assessment to investigate possible future tropospheric climate projections.

The workshop concluded with a presentation by Kate Cell and Brady Watson (Union of Concerned Scientists) about science to action and ways that CEDAR community members can contribute to non-partisan climate communication and advocacy. The presentation stressed the importance of talking about climate change and connecting to how climate change is affecting the people and places that people care about. Additionally, there are many ways for scientists to engage in advocacy related to climate policy. The Union of Concerned Scientists has many resources (https://www.ucsusa.org/).

Given the urgency indicated by the science and impacts of climate change, we plan to continue ongoing discussion about ways that the CEDAR community might contribute to global efforts to address climate change.

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Fuse the knowledge base across disciplines in the geosciences
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