



CLiMA

CLIMATE MODELING ALLIANCE

Reinventing Climate Modeling

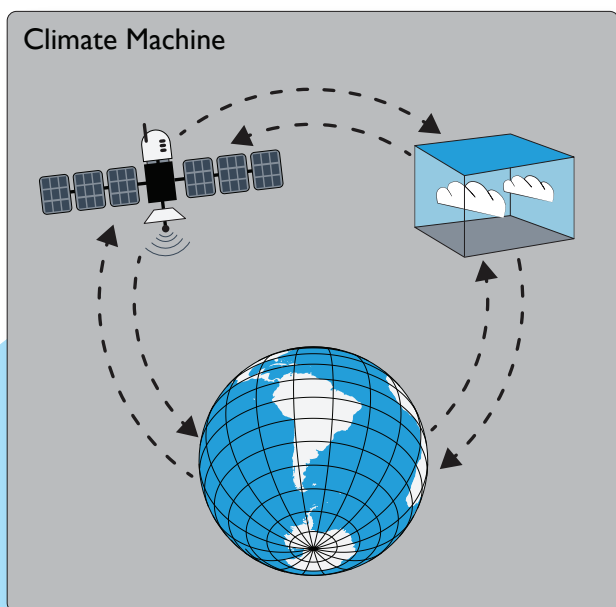
Enabling Data-Driven Decision Making in Response to Climate Change

Clima's Mission

Climate change will reshape our world, but we do not yet know precisely how. CliMA (clima.caltech.edu) was founded in 2018 with a mission to provide the accurate and actionable scientific information needed to face the coming changes—to mitigate what is avoidable, and to adapt to what is not. We aim to provide the predictions necessary for communities to plan resilient infrastructure, adapt supply chains, devise efficient climate change mitigation policies, and assess the risks of climate-related hazards to those most vulnerable.

Our Strategy

Spanning Caltech, MIT, the Naval Postgraduate School, and NASA's Jet Propulsion Laboratory, CliMA's unique coalition of scientists, engineers, and applied mathematicians is building a new type of Earth system model. Our model will learn directly from the wealth of available Earth observations and will exploit the latest advances in computing and the data sciences. It will harness more data than ever before, providing a new level of accuracy to predictions of droughts, floods, heat waves, and rainfall extremes.



The Science

The Climate Machine

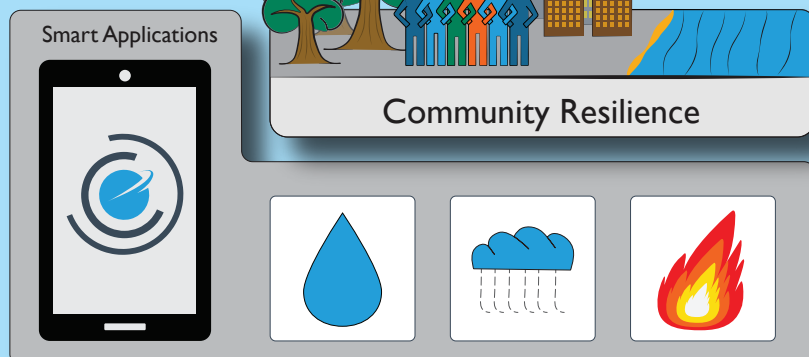
Our model will be first-in-class, consisting of models for climate system components such as atmosphere, oceans, and land that will learn jointly and automatically from diverse data sources. It will exploit advances in machine learning and data assimilation to learn from observations and targeted high-resolution simulations of the Earth system, from clouds to ocean turbulence. In this way, we will be able to quantify and dramatically reduce uncertainties in climate predictions.

A Scalable Platform

Our modeling platform exploits state-of-the-art algorithms to run on the world's fastest supercomputers and on the cloud. It will be scalable to ever finer resolution globally, and its targeted high-resolution simulations will provide detailed local climate information to communities across the globe.

The Impact

Our model is open source, and our results are available to the public. We will provide interfaces to our modeling platform so that it can become the anchor of an ecosystem of user-oriented applications. These apps will enable detailed predictions of flood risks, risks of extreme heat, crop yields, and other climate impacts to facilitate resiliency in the face of climate change.





Our Progress

In the two years since its inception, CliMA has engaged more than 70 leading researchers. Together, we are building a climate model from the ground up that will set new standards in computational performance and learning from data. Within three years from now, the CliMA team will be positioned to accomplish what many in the wider climate modeling community

believed would take a decade. Built flexibly, our new model will not only couple the key elements of the Earth system — land, ocean, ice, and atmosphere — but it will also have the capacity to evolve as new data become available, with new information from ice flows to plant photosynthesis. Crucially, the model will serve as a backbone for a suite of apps to enable risk assessment and planning at the national, regional, and community level, the first prototypes of which we will develop in 2021.

Our Plans

In a very short time, CliMA has reached a significant juncture. With the near-completion of the model's core computational infrastructure, we are transitioning our efforts to enable the model to begin learning from data and providing climate projections.

2020-2021

In the coming year, we will integrate the distinct elements of the Climate Machine, coupling atmosphere, ocean, and land models into a cohesive whole. We will begin calibrating the Climate Machine with Earth observations from space and from the ground and with high-resolution simulations of clouds and turbulence, and we will provide the first global climate projections with quantified uncertainties. We will pair these research and development endeavors with outreach to the diverse communities of users who will benefit from improved climate projections.

Support

CliMA has been fortunate to partner with like-minded and generous supporters committed to advancing the science of climate modeling. With the release of our first climate projections expected in 2021, CliMA needs support to build out a climate modeling platform to anchor an ecosystem of end-user apps to empower stakeholders and communities to respond to climate change.

Beyond

We will continue to build partnerships with downstream users to build end-user apps that translate climate predictions into actionable information for diverse stakeholders. We will scale up our climate modeling such that we can provide climate predictions at ever higher resolution, enabling us to support decision-making by local communities across the globe.

We welcome partnership.

To learn more or get involved, please contact CliMA at clima@caltech.edu or 626-395-6920.





Press and Media



A powerful new model could make global warming estimates less vague

"[Clima] are building a climate model that will use machine learning, powerful computing, and petabytes of data to help resolve some of the unknowns around how, why, and where clouds form, produce precipitation, or dissipate. The goal: to cut the uncertainty in current predictions of carbon dioxide's impact on the planet in half."



The CHRISTIAN SCIENCE
MONITOR

Meet the team shaking up climate models

"They have gathered some of the brightest experts from around the world to start to build a new, modern climate model. They hope to corral the vast flow of data from sensors in space, on land, and in the ocean, and enlist "machine learning," a kind of artificial intelligence, to bring their model alive and provide new insight into what many believe is the most pressing threat facing the planet."



Science
JOURNALS AAAS

The Earth Machine: Science Insurgents Plot a Climate Model Driven by Artificial Intelligence

Later this summer, an academic consortium ... will launch an ambitious project to create a new climate model. Taking advantage of breakthroughs in artificial intelligence (AI), satellite imaging, and high-resolution simulation, that as-yet-unnamed model—the Earth Machine is one candidate—aims to change how climate models render small-scale phenomena such as sea ice and cloud formation that have long bedeviled efforts to forecast climate.