The Climate Program Office Modeling, Analysis, Predictions and Projections (MAPP) Program funding opportunity, through the Inflation Reduction Act, supports 13 three-year projects to support NOAA efforts to advance models that predict tropical storms, extreme heat and ocean changes.

- **Constraining near-term U.S. hydroclimate and extreme-event projections with SST pattern storylines:** The project will enhance our understanding of how Pacific sea surface temperature patterns influence U.S. hydroclimate. The focus will be on the Colorado River Basin, where water resource management is vital to the economy. The project aims to reduce uncertainty in hydroclimate projections, engage with local stakeholders for informed decision-making, and collaborate with Indigenous tribes.
    - Project PI: Maria Rugenstein, Colorado State University (Fort Collins, CO 80523-1371)
        - Co-PI: Russ Schumacher, Colorado State University (Fort Collins, CO 80523-1371)
        - Co-PI: Ming Zhao, NOAA Geophysical Fluid Dynamics Laboratory (Princeton, NJ 08540)
    - Award amount: $588,299

- **Near-term climate and extreme weather projections derived from stratosphere-troposphere coupling in Earth System Models:** This project aims to improve the accuracy of future climate projections, especially regarding temperature and precipitation extremes by focusing on the connections between Earth's stratosphere and troposphere and the impact of that connection on climate projection uncertainty. The project plans to use various simulations and historical data to evaluate and quantify uncertainties in climate models, potentially leading to more reliable climate projections, in alignment with NOAA's climate program goals.
    - Project PI: Amy Butler, NOAA Chemical Sciences Laboratory (Boulder, CO 80305)
    - Award amount: $520,649

- **Confronting climate model trends with observations: Extratropical storm tracks and their associated extreme events:** The project will analyze trends in storm tracks and associated extreme events across seasons and regions using various datasets. It aims to assess the impact of factors like sea surface temperature and model resolution. The goal is to improve the reliability of Earth system information and climate predictions.
    - Project PI: Tiffany Shaw, The University of Chicago (Chicago, IL 60610)
        - Co-PI: Isla Simpson, National Center for Atmospheric Research (Boulder, CO 80307)
    - Award amount: $573,328

- **Understanding future projections of tropical cyclone landfall and precipitation:** The project will evaluate SPEAR's tropical cyclone landfall statistics, identify model biases and assess uncertainties in future projections.

    - Project PI: Jorge Garcia Franco, Lamont-Doherty Earth Observatory, Columbia University (New York, NY 10027-7922)
        - Co-PI: Chia-Young Lee, Lamont-Doherty Earth Observatory, Columbia University (New York, NY 10027-7922)
        - Co-PI: Suzana Camargo, Lamont-Doherty Earth Observatory, Columbia University (New York, NY 10027-7922)
        - Co-PI: Michael Tippett, Lamont-Doherty Earth Observatory, Columbia University (New York, NY 10027-7922)
    - Funding amount: $599,934

- **Projecting Compound Tropical Cyclone-Heat Extremes in a Changing Climate:** The project will estimate the emerging risk of compound extreme events involving tropical cyclones and climate change induced extreme heat using the GFDL SPEAR modeling system, which simulates tropical cyclones and their interactions with heat extremes. The research will provide important insights for public health and power system resilience.
    - Project PI: Jane Baldwin, University of California, Irvine (Irvine, CA 92697-3100)
        - Co-PI: Suzana Camargo, Lamont-Doherty Earth Observatory, Columbia University (New York, NY 10027-7922)
        - Co-PI: Chia-Young Lee, Lamont-Doherty Earth Observatory, Columbia University (New York, NY 10027-7922)
        - Co-PI: Mona Hemmati, Lamont-Doherty Earth Observatory, Columbia University (New York, NY 10027-7922)
    - Funding amount: $598,457

- **Impacts of Regional Aerosol Emissions Uncertainty on Societally-Relevant Climate Hazard Projections over the Continental U.S. in GFDL-SPEAR:** The project will improve decadal climate projections in the U.S. by considering the significant influence of rapidly changing human-caused particulate pollution on climate hazards. It will also compare SPEAR's performance with other models to identify improvements. The findings will enhance the accuracy of climate projections and contribute to climate readiness efforts.
    - Project PI: Geeta Persad, University of Texas at Austin (Austin, TX 78712)
    - Funding amount: $460,397

- **Developing projections of El Nino Southern Oscillation activity and associated coastal hazards: An application to the Hawaiian and US-affiliated Pacific Islands:** The project aims to improve multi-decadal projections of ENSO and its associated coastal hazards along the Pacific rim. The project has three main goals: (1) Develop dynamic methods for ENSO projections. (2) Combine refined ENSO projections with observed relationships to predict coastal risks. (3) Extend the approach to vulnerable Pacific Islands.
    - Project PI: Fei-Fei Jin, University of Hawaii (Honolulu, HI 96822)
        - Co-PI: Zhaoqing Yang, Pacific Northwest National Laboratory (Richland, WA, 99354)

        - Co-PI: Malte Stuecker, University of Hawaii (Honolulu, HI 96822)
        - Co-PI: Ning Li, University of Hawaii (Honolulu, HI 96822)
        - Co-PI: Andrew Wittenberg, NOAA Geophysical Fluid Dynamics Laboratory (Princeton, NJ 08540)
    - Funding amount: $597,833

- **Future projections of extreme heat events in SPEAR ensemble simulations:** The project will evaluate the capability of NOAA's SPEAR system model to simulate historical extreme heat events in the contiguous U.S. and Europe. The research will examine how to attribute these events to factors such as atmospheric warming, high-pressure systems and jet streams. This study will provide valuable insights into the causes of extreme heat events and model biases in SPEAR and recent GFDL models.
    - Project PI: Ping Liu, State University of New York at Stony Brook (Stony Brook, NY 11794)
        - Co-PI: Kevin Reed, State University of New York at Stony Brook (Stony Brook, NY 11794)
        - Co-PI: Levi Silvers, State University of New York at Stony Brook (Stony Brook, NY 11794)
    - Funding amount: $502,292

- **Multi-decadal projections of extratropical cyclones and their associated extreme precipitation, snowfall, and surface winds:** The project will use three large climate model ensembles to project extratropical cyclones, which typically occur in the mid-latitudes. Extratropical cyclone behavior and their storm-scale characteristics in a warming climate are currently uncertain, and large ensembles are needed to separate those that are part of a climate change trends from those caused by natural variability. The research will assess model performance, investigate the influence of large-scale climate patterns, and determine when climate change signals emerge from natural variability. Collaboration with civil engineers on this project will aid in incorporating climate change into engineering decisions.
    - Project PI: Rachel McCrary, National Center for Atmospheric Research (Boulder, CO 80305)
        - Co-PI: Melissa Bukovsky, National Center for Atmospheric Research (Boulder, CO 80305)
        - Co-PI: Mari Tye, National Center for Atmospheric Research (Boulder, CO 80305)
        - Co-PI: Colin Zarzycki, The Pennsylvania State University (University Park, PA 16802)
    - Funding amount: $599,436

- **Improving Climate Predictions by Rigorously Assessing Model Fidelity and Biases:** The project will assess how well various climate models drivers (greenhouse gases, solar radiation, aerosols, etc.) are represented in SPEAR, Coupled Model Intercomparison Project Phase 6 (CMIP6) climate model, and large ensembles, with a

focus on El Nino, North Atlantic, and Pacific sea surface temperatures. The project also examines connections between ocean and land temperature and precipitation. The findings will inform model development for improved climate prediction systems.
    - Project PI: Timothy DelSole, George Mason University (Fairfax, VA 22030)
        - Co-PI: Michael Tippett, Columbia University (New York, NY 10027)
    - Funding amount: $599,194

- **Detection of Atlantic Meridional Overturning Circulation changes and their potential impact on sea level and storm surges along the U.S. east coast:** The project will explore the connection between Atlantic Meridional Overturning Circulation, mean sea level, and extreme sea level events on decadal timescales, using observational data and GFDL SPEAR model simulations. It will assess AMOC's role in driving extreme sea level events, investigate multiyear to decadal sea level predictability, analyze model resolutions, and study extreme sea level case studies to improve understanding and prediction of sea level changes.
    - Project PI: Liping Zhang, NOAA Geophysical Fluid Dynamics Laboratory (Princeton, NJ 08540)
        - Co-PI: Thomas Delworth, NOAA Geophysical Fluid Dynamics Laboratory (Princeton, NJ 08540)
    - Funding amount: $374,072

- **Understanding the Evolving Threat of Snow Loads and Rain on Snow Events to Structural Safety:** The project will enhance our understanding of how extreme snow loads and rain-on-snow events evolve in a changing climate in the contiguous United States. The researchers will use SPEAR and other climate model data to simulate factors affecting snow accumulation and rain on snow incidents, like temperature and precipitation.
    - Project PI: Brennan Bean, Utah State University (Logan, UT 84322)
        - Co-PI: Wei Zhang, Utah State University (Logan, UT 84322)
        - Co-PI: Benjamin Hatchett, Desert Research Institute (Reno, NV 89512)
        - Co-PI: Abbie Liel, University of Colorado –Boulder (Boulder, CO 80309)
        - Co-PI: Marc Maguire, University of Nebraska - Lincoln (Omaha, NE 68182)
    - Funding amount: $593,492

- **Bridging Predictions and Projections: Understanding Predictability from Initialized Multi-Year to Decadal Predictions for High-Impact Climate Futures:** The funded project will determine whether the North Atlantic Subtropical High can serve as a source of predictability for multi-year to decadal climate futures in areas such as hydrology, extreme temperatures, and coastal inundation. It will investigate whether initialized multi-year to decadal predictions offer better accuracy for predicting these high-impact climate events compared to uninitialized projections, which has not been thoroughly explored in previous research.
    - Project PI: Kathleen Pegion, University of Oklahoma (Norman, OK 73072-7307)

        - Co-PI: Emily Becker, University of Miami (Miami, FL 33149)
    - Funding amount: $561,514