National and International Assessments and Multimodel Intercomparison Projects (MIPs)

Prepared by Vaishali Naik
on behalf of the lab-wide contributions to Assessments and MIP activities

Q3: How can GFDL research and modeling be further utilized to meet NOAA stakeholder needs and enhance research partnerships to ensure GFDL's success?

Why does GFDL contribute to Assessments and MIPs?

- Aid in fulfilling **NOAA's role** in the <u>Global Change Research Act of 1990</u> to develop and coordinate "a comprehensive and integrated United States research program which will assist the Nation and the world to <u>understand, assess, predict, and respond to human-induced and natural processes of global change</u>",

- Address **NOAA's mission** of Service - "<u>communication of NOAA's research, data, information and knowledge</u> for use by the nation's businesses, communities and people's daily lives",

- Address **OAR's mission** to "Conduct research to <u>understand and predict</u> the Earth system; develop technology to improve NOAA science, service, and stewardship; and <u>transition the results so they help us meet the challenges faced by society</u>."

Quick Summary of GFDL participation in Assessments and MIPs

- GFDL has a **long history of engagement and leadership in national and international assessments** to communicate policy-relevant information on Climate and Earth System Science to stakeholders, decision-makers, and the public. GFDL scientists play key roles
  - As leaders, authors, and reviewers of the state of knowledge
  - In advancing scientific understanding through peer-reviewed publications

- GFDL has continued to be a **key contributor to MIPs** by playing major roles in
  - Leadership of the Coupled Model Intercomparison Project (CMIP) process and community MIPs
  - Guiding experimental design
  - Supporting the work of climate forcing data providers to QC and test the datasets
  - Building models, running experiments, and preparing and serving model output
  - Producing peer-reviewed research on analysis of multi-model output

- GFDL has been an **indispensable team member in national and international prediction systems** that form the basis of annual-to-decadal state of the climate assessments

GFDL contributions to International Assessments (2020-2024)

GFDL scientists contributed to several international assessments, including the IPCC AR6, to provide state of knowledge of climate, extreme events, and atmospheric composition
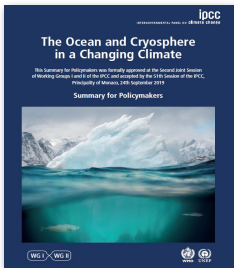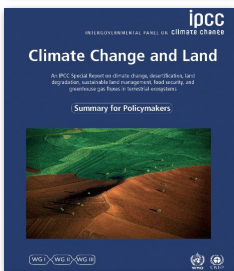
Lead Author
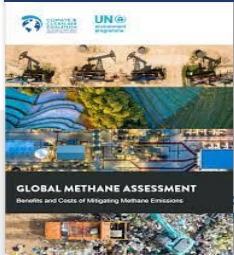Robert Hallberg
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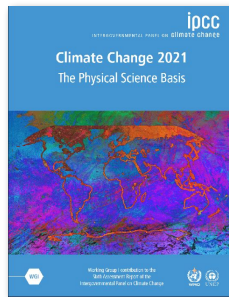**Lead Authors**
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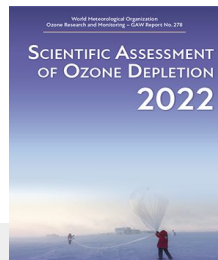Fabien Paulot
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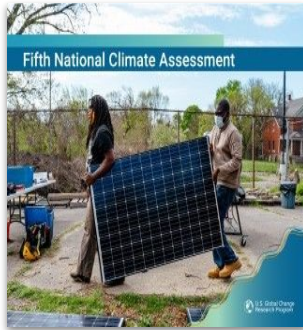Vaishali Naik

* Former GFDL post-doc

# GFDL contributions to National Assessments (2020-2024)

GFDL scientists contributed to national assessments and reports, including the Fifth US National Climate Assessment (NCA5) that analyzed the impacts of climate and global change in the United States relying on multi-model output

Chapter Author
Vaishali Naik

Member, USGCRP expert group on downscaled climate data in NCA5
Keith Dixon
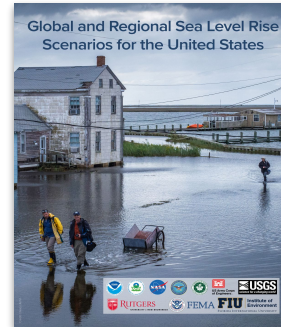
Author
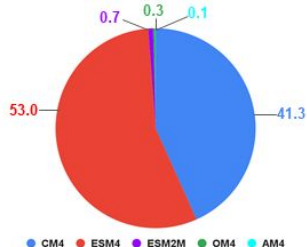John Krasting

GFDL contributions to CMIP6 and its endorsed MIPs

- GFDL labwide effort to <u>build models</u>, <u>run simulations</u> following MIP protocols, <u>post-process</u> and <u>quality-check</u> model output, <u>upload data</u> on server, and <u>analyze and write</u> peer-reviewed journal articles.

- Analysis and scientific understanding gained from model output form the basis of science and impacts assessments informing societal decisions.
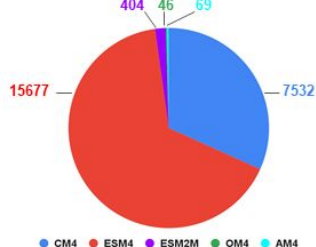

Figure Courtesy: Chris Blanton and Kris Rand, MSD, GFDL
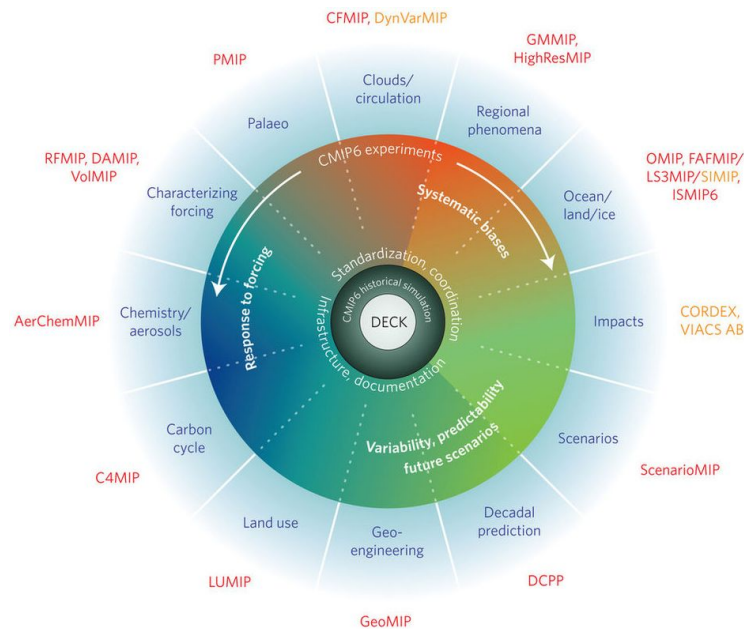
Over ~250 journal articles citing CMIP6 GFDL model output
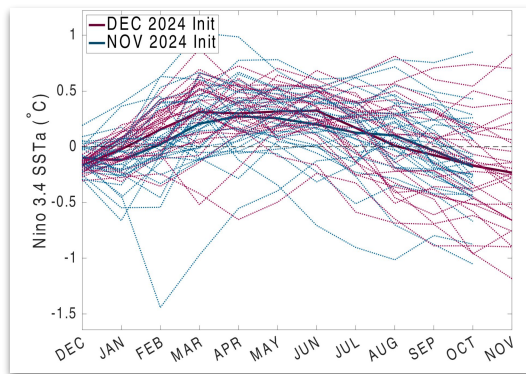
GFDL's real-time seasonal and decadal predictions provide actionable guidance for operational centers and decision-makers

GFDL is one of five centers contributing real-time seasonal predictions to the **North American Multi-Model Ensemble** each month

GFDL SPEAR Seasonal ENSO Prediction

12-month ENSO (Niño-3.4 SSTA index) forecast from GFDL's SPEAR seasonal prediction system from the 1 Dec 2024 initialization, including the previous month's forecast. Solid lines = ensemble means & dotted lines = individual ensemble members.

GFDL SPEAR 2024-2028 Surface Air Temperature Prediction
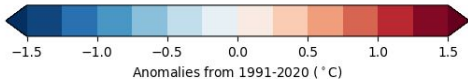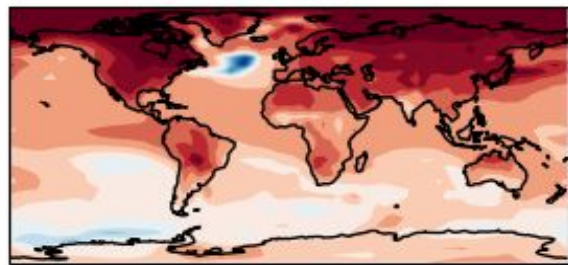
GFDL is also one of 20 centers that annually delivers decadal predictions to the UKMO, the WMO Lead Centre for Annual-to-Decadal Climate Prediction

GFDL scientists play leading role in coordination of international climate research

GFDL scientists play prominent leadership roles in the World Climate Research Programme (WCRP)'s coordination of international climate research aimed at developing, sharing and applying climate knowledge for societal well-being

CLIVAR
Ocean Model Development Panel Co-Chair
Alistair Adcroft

CliC Climate and Cryosphere
Scientific Steering Group Member
Olga Sergienko

ESMO Earth System Modelling and Observations

CMIP Coupled Model Intercomparison Project
Panel Co-Chair
John Dunne

Climate Forcings Task Team Co-Chair
Vaishali Naik

Data Access Task Team Member
Aparna Radhakrishnan

WCRP Lighthouse Activities
EPESC Co-Chair
Kirsten Findell

Explaining and Predicting Earth System Change (EPESC)
Member Working Group I, Observing and Modeling Earth System Change
Feiyu Lu

GEWEX
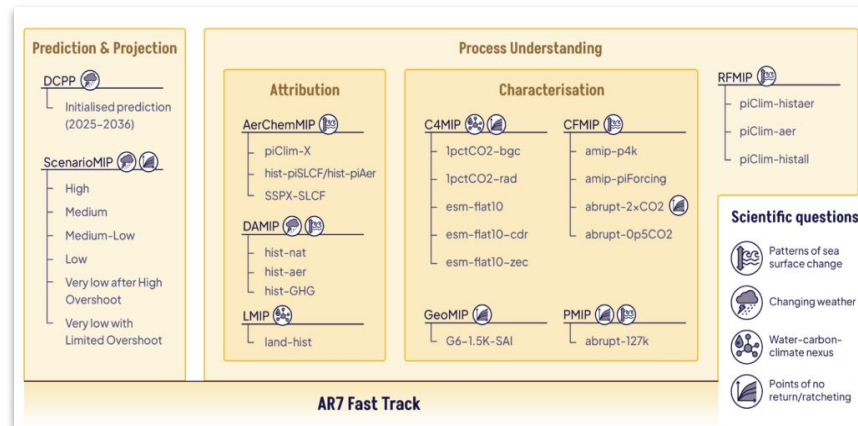Global Land-Atmosphere System Studies Panel Co-Chair (2019-2023)
Kirsten Findell

Future Outlook

- GFDL will continue to inform scientific assessments, participate in MIPs, and share knowledge through development of models, advancing scientific understanding, sharing of model predictions and projections, and leadership of community activities.

- However, there are challenges to continued engagement, which include possible diversion of NOAA priorities, competition across multiple model development and research priorities impacting human and computational resources, and GFDL's ability to recruit and retain diverse scientists and cultivate collaborations to advance the scientific understanding of the Earth System and provide solutions for societal challenges.

WCRP
World Climate
Research Programme

TOAR
tropospheric
ozone
assessment
report *Phase* II

MethaneMIP: investigate the near-term climate & health impacts of methane mitigation

AeroCom

CMIP7

CMIP Coupled Model Intercomparison Project
Climate Forcings

Dunne et al., submitted GMD

LRTAP Long-range Transboundary Air Pollution

Task Force on Hemispheric Transport of Air Pollution