

Modeling the Earth System

Overview

**Presented by
Michael Winton**

Geophysical Fluid Dynamics Laboratory Review

October 29-31, 2019



We're on a Mission

NOAA's Mission: Science, Service and Stewardship

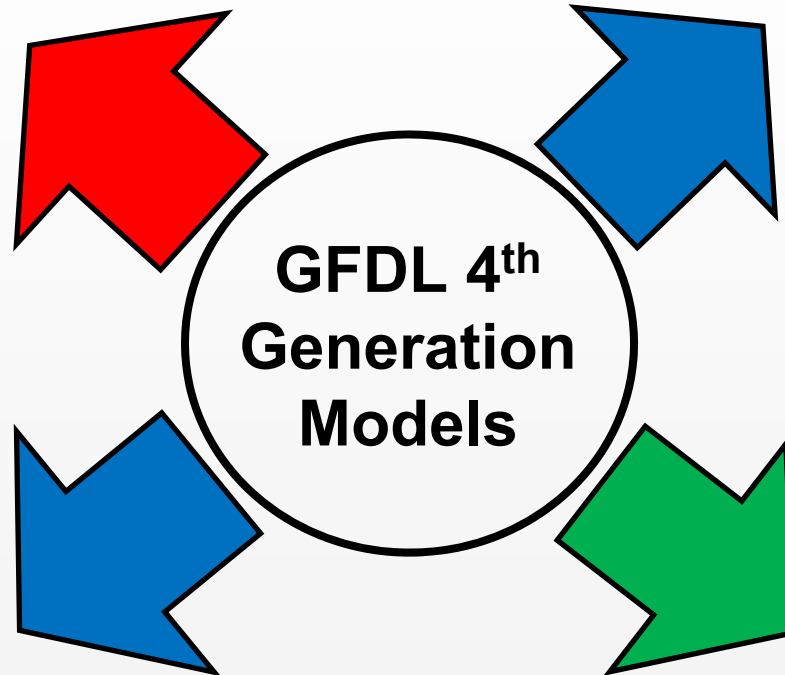
- 1. To understand and predict changes in climate, weather, oceans and coasts;**
2. To share that knowledge and information with others; and
3. To conserve and manage coastal and marine ecosystems and resources.

The **GFDL mission** is to **be a world leader in** the development of **comprehensive, integrated and unified models of the Earth system** comprising the atmosphere, oceans, land, biosphere, cryosphere, and ecosystems; and application of these models for the **seamless understanding, predictions and projections of the Earth system**, from hours to decades and from global-to-regional spatial scales, accounting for natural variations and forced changes.

Broadening GFDL Model Customer Base

**Climate Projections
and Assessments
(CMIP6, ...)**

**Experimental Climate
Prediction (NCEP NMME)**

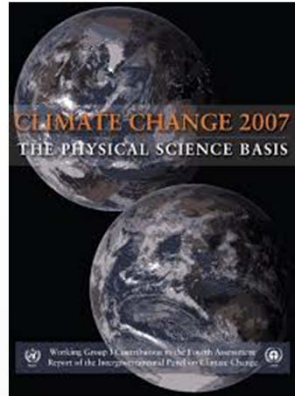


**US Weather Prediction
(NOAA NGGPS)**

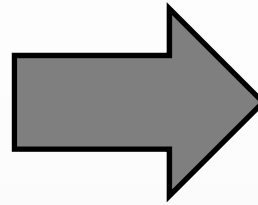
**Community Support
(NCAR, NASA, ...)**

Some History: Divergence to Convergence

2007: CM2



2013: CM3, ESM2



*High atmos. res.
CMs for seasonal
forecasting*

HiRAM

*High res. AM for
sub-seasonal to
seasonal forecasting*

**FLOR
HiFLOR**

**CM2.5
CM2.6**

*High ocean
res. CMs*

CM3

*CM with Atmos. chem.
Aerosol indirect effect*

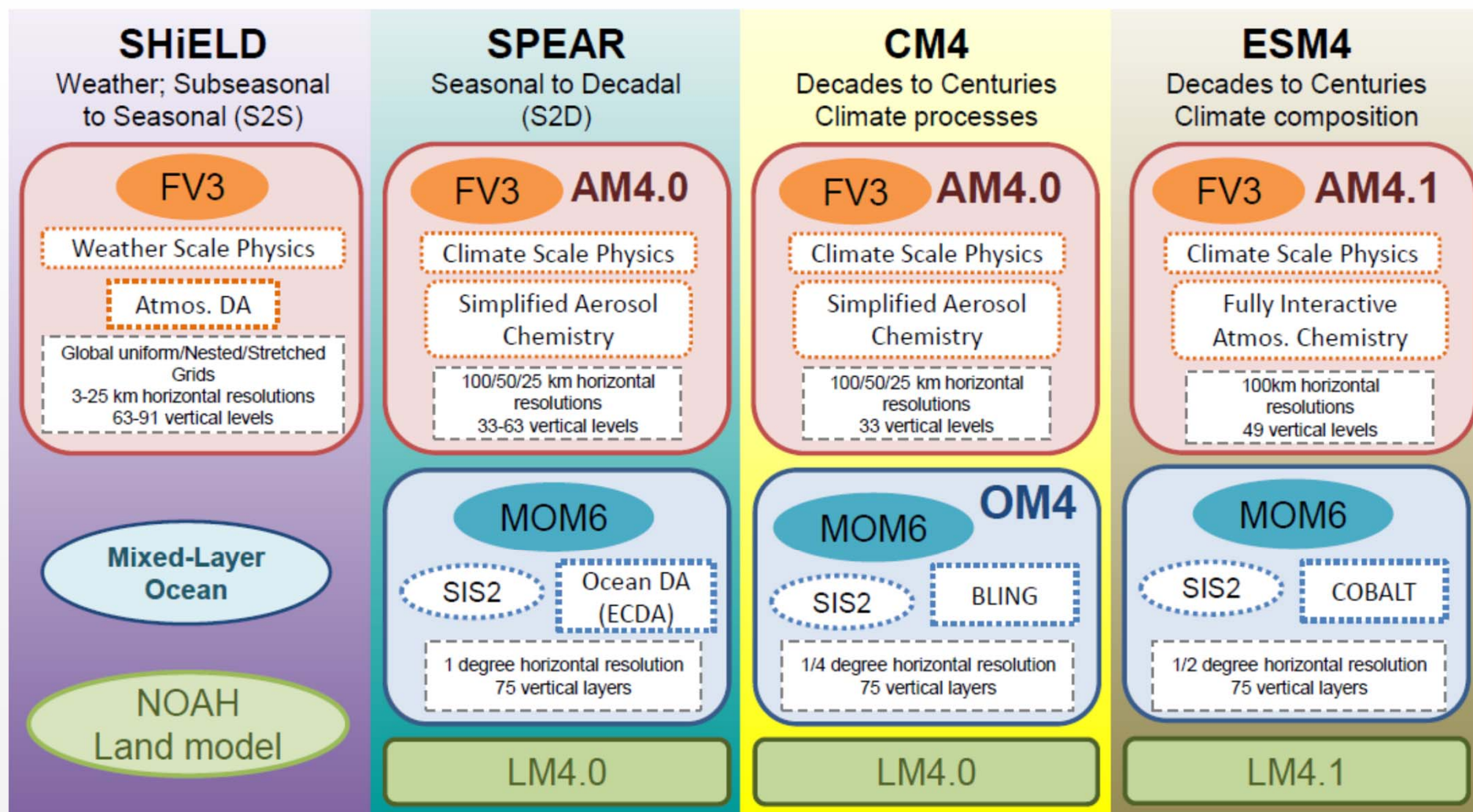
**ESM2M
ESM2G**

*Carbon cycle; ocean
vertical coordinate*

**The 2011 GFDL Strategic Science Plan
outlined a unification of this model suite**

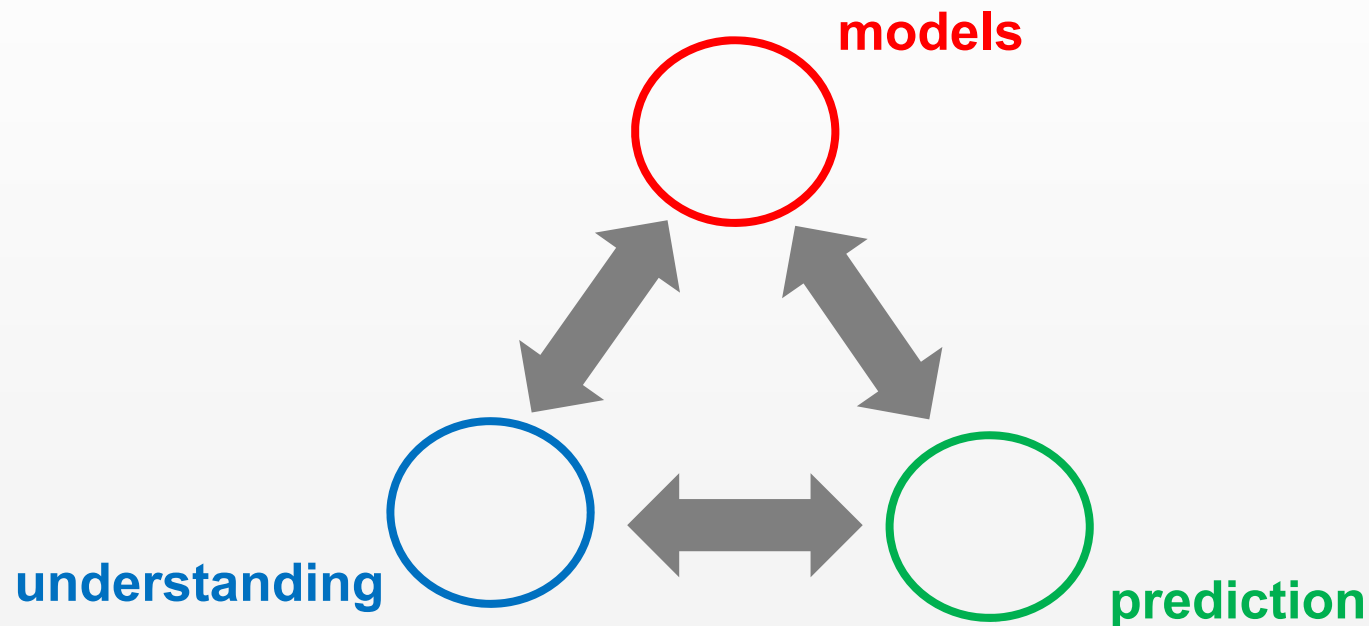


Our Fourth Generation Model Configurations



Session Connections

The 2019 GFDL Strategic Science Plan outlines the use of our new model suite for understanding, predictions, and projections



Coming Up

9:35 **FV3 at GFDL and beyond** – Lucas Harris

9:55 **MOM6, SIS2 and OM4** – Alistair Adcroft

10:15 **New generation atmospheric model AM4 and Cloud-Climate Initiative** – Ming Zhao

10:35 **Break**

10:55 **Land-climate interactions and GFDL's new land model LM4** – Elena Shevliakova

11:15 **Atmospheric chemistry-composition in GFDL Models** – Vaishali Naik

11:35 **GFDL's fourth generation CM4 and ESM4** – John Dunne

12:05 **Discussion** (Leaders: Isaac Held and Mike Winton)