2A.6 THE NOAA ENVIRONMENTAL MODELING SYSTEM AT NCEP

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1. INTRODUCTION

In working toward streamlining the interaction of analysis, forecast, and post-processing systems within NCEP, development of a common modeling framework called the NOAA Environmental Modeling System (NEMS) has been underway for several years within the Environmental Modeling Center (EMC). The foundation of the NEMS architecture is the Earth System Modeling Framework (ESMF) (http://www.esmf.ucar.edu) marking NCEP's first general use of the ESMF superstructure. Currently the forecast component of the Global Forecast System (GFS) and the B-grid version of the Nonhydrostatic Multiscale Model (NMM-B) have been placed together under the NEMS framework. Shared methods of input, output and post-processing are being constructed for use within the framework. The inclusion of additional parts of the production suite such as the Gridded Statistical Interpolation analysis system (GSI) is also envisioned. While NEMS is providing a means of unifying an increasing number of operational systems within NCEP it will also provide the opportunity to expedite the exchange of various systems within NOAA and with the general community. One specific example is the work by NOAA/ESRL/GSD toward placement of the Flow-following Finite-volume Icosahedral Model (FIM) under NEMS. Although the framework is currently under development and continues to evolve, the most fundamental aspects of its structure are described below.

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2. THE GENERAL DESIGN

A notable advantage of ESMF is the considerable freedom it offers the developer in deciding how to use it in any particular application. As additional systems are placed under NEMS the framework will naturally become more intricate but a primary goal is to produce as simple a structure as possible in order to facilitate more rapid understanding by those users who need to work within it. The general design is shown in Figure 1. More specifically, below the main program lies the so-called atmospheric or ATM gridded component. That component in turn creates separate gridded subcomponents for the model's dynamics and physics as well as a coupler component through which information is passed between the dynamics and physics. There are additional gridded components controlled by the ATM component which handle the asynchronous production and writing of output. Any number of these output components may be used depending on how many groups of MPI tasks are assigned to this function. A single NEMS-IO system is partially in place and controls both the input and output files consisting of pure binary data, binary data with metadata, or GriB data. The addition of NetCDF as an option will follow. A general post-processor for the models under NEMS is being incorporated into the framework. The eventual coupling to ocean models will produce a full atmosphere-landsurface-ocean prediction system under the single framework.

Along with the Navy and Air Force, NOAA is one of the operational centers making up the National Unified Operational Prediction Capability (NUOPC) effort with the intent of accelerating the improvement of the nation's forecasting skill. NUOPC guidelines will thus play a role in ongoing NEMS development.

3. SUMMARY

Construction of an ESMF-based common modeling superstructure governing the forecast component of the GFS and the NMM-B is underway. This will simplify the effort of placing models under a single framework and streamline subsequent evolution of applications. NEMS-IO has been incorporated to handle I/O needs and a general post-processor will be inserted soon. Coupling to the GSI analysis system and to ocean models will follow.

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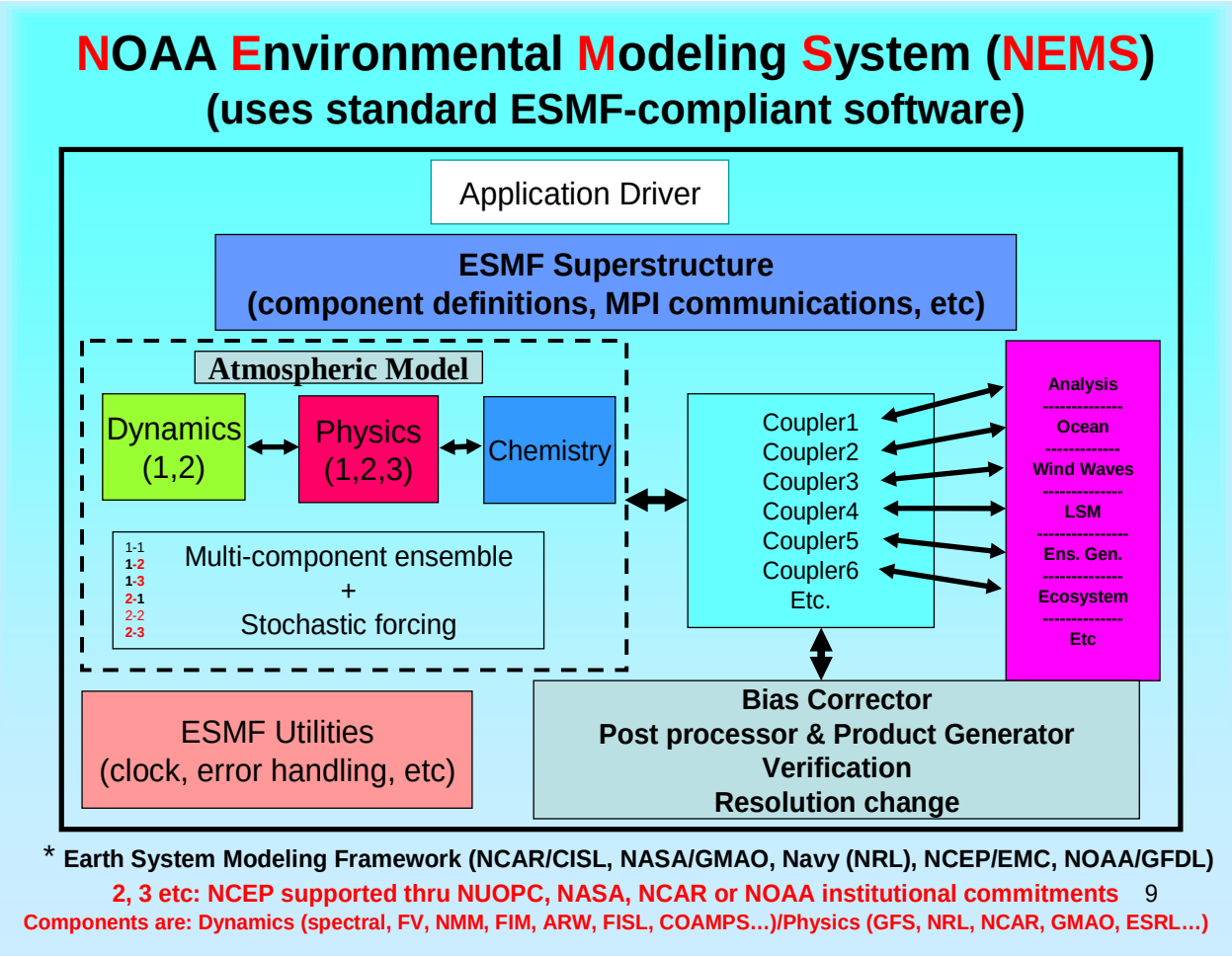

Fig 1. Schematic of the NEMS framework.