The Earth System Prediction Capability Program

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The Earth System Prediction Capability (ESPC) Inter-Agency program was established in 2010 as a coordinating effort to improve collaboration across the federally sponsored environmental research and operational prediction communities for the scientific development and operational implementation of improved global prediction at the weather to climate interface. Rather than a single implementation of an air/land/sea/ice forecast system, ESPC is initially focused on identifying and developing sources of extended range predictability from synoptic to intraseasonal/interannual (ISI) timescales (NRC, BASC 2010) with the future addition of a multiannual to multi-decadal focus. Additionally, ESPC advocates for and supports the development of the basic architectural foundations such as common coupled modeling architectures, data and archive standards, computational efficiency and standardized forecast skill metrics. It is expected that these supporting technologies will expand the scope of collaborative model development and that common case studies and evaluation data sets will aid improved understanding of underlying physical processes. Towards these goals, a set of five demonstration projects are under development and researchers are invited to participate in the definition and execution of these projects.

In 2012, volunteer working groups across the weather and climate prediction communities have been established to develop and execute demonstrations starting in 2013, or to assess and coordinate with ongoing efforts where appropriate. The goals of these five-year efforts are to provide a unifying theme for developing the common modeling environment, establishing a community model repository of common data sets & test cases, and assess forecast skill at the ranges of interest against potential ESPC stakeholder information needs. Ultimately these efforts will identify where sources of extended range predictability are sufficiently understood and reliable for use in future operational prediction with quantifiable uncertainty (NRC, BMSA 2012), at skill levels better than traditional approaches such as using long term climatological averages. Through this effort it is expected that critical path science and technology issues will be identified as future research challenges.

The ESPC Demonstration topics are:
- Episodic Weather Extremes: Predictability of Blocking Events and High Impact Weather at Lead Times of 1-6 Weeks;
- Seasonal Tropical Cyclone Threat: Predictability of Tropical Cyclone Likelihood, Mean Track, and Intensity from Weekly to Seasonal Timescales;
- Arctic Sea Ice Extent and Seasonal Ice Free Dates: Predictability from Weekly to Seasonal Timescales;
- Coastal Seas: Predictability of Circulation, Hypoxia, and Harmful Algal Blooms at Lead Times of 1-6 Weeks;
- Open Ocean: Predictability of the Atlantic Meridional Overturning Circulation (AMOC) from Monthly to Decadal Timescales.

Informed by the our current understanding of the underlying science of predictability in environmental processes, it is expected that ESPC efforts will result in more accurate and longer range prediction for use in policy, investment, and implementation decisions affecting the economy and protection of the US population. As largely a coordinating activity across the ESPC stakeholder agencies (NOAA, Navy, Air Force, DoE, NASA and NSF) this effort will seek to coordinate and enhance sponsor-level multi-year investments from basic science through acquisition and operations.