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The Model Web: Enhancing model interoperability for ecological forecasting and other disciplines

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Ecological forecasting–making predictions about the ecological consequences of various types of change–is constrained by a variety of factors, including computer model interoperability. This, in turn, is limited by technical barriers, such as semantic and format consistency, and non-technical ones, such as model isolation that results when sponsors use a "stovepiped" funding approach rather than an integrated one. Because these constraints limit the types of ecological questions that can be addressed, they need to be overcome if decision makers are to obtain the information they require to make informed decisions. The problem of limited model interoperability exists, to varying degrees, in all disciplines that rely on computer models, including hydrology, air quality, and the ocean sciences, among others.

One solution is being called the Model Web, a concept for an open-ended system of interoperable computer models and databases communicating via Service Oriented Architectures. The Model Web would consist of a distributed, multidisciplinary network of independent, interoperating models (plus related datasets and sensors). Like the World Wide Web it would grow organically, without central control, within a framework of broad goals and data exchange standards or guidelines. These are under discussion but they should emerge naturally from the modeling community; no single

standard will be enforced as different disciplines have different needs and histories. Models and datasets would be maintained, operated, and served independently by a voluntary and dynamic network of participants.

This type of Model Web could not be planned and built, it must instead be encouraged, facilitated, and gradually converged upon. It will not happen quickly–perhaps 5-10 years, because adapting existing models requires significant effort, and barriers can only be lowered gradually. In fact, the non-technical barriers will probably take the longest to lower: most technical barriers have solutions in varying stages of maturity, but non-technical barriers require cultural change, generally a slow process. Regardless of speed, the growth of such a system of models fits well with the concept and architecture of the Global Earth Observing System of Systems (GEOSS) as well as the Semantic Web.

A demonstration system is underway that will exercise the concept and provide a core onto which further components can be added. This system will be an extension of a GEOSS pilot (called GEOSS GBIF IP3) that uses models to predict the geographic distribution of species under various future climate scenarios. Regionalized climate scenarios will be provided by a NASA model called TOPS. Fire and phenology models are being considered as some of the initial expansion areas for the prototype system; other suggestions are welcomed.