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How GEOSS IP3 explores and enables interdisciplinary science

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Earth scientists are engaged in integrating knowledge stemming from different disciplines concerned with the constituent parts of the complex Earth system. The goal is to understand Earth's properties as a whole and thereby deliver benefits to society. The scope and complexity of Earth system investigations demand the formation of distributed, multidisciplinary collaborative teams, which presents both scientific and technological challenges. The information systems used by the different disciplines are characterized by heterogeneous and distributed data and metadata models, different semantics and expertise, diverse protocols and interfaces, and different data policies and security levels. We describe how the Global Earth Observation System of Systems (GEOSS) infrastructure facilitates the formation of these distributed, multidisciplinary and collaborative teams.

Initiated in 2005 by the GEO Architecture and Data Committee, the GEOSS Interoperability Process Pilot Project (IP3) is a medium for reaching interoperability between disparate components contributed to GEOSS from multi-disciplinary Earth and Space Science communities. In 2007 one of IP3's key successes was an end-to-end demonstration that combined biological species data, accessed through the GBIF (Global Biodiversity Information Facility) contribution to GEOSS, and climate model output data, part of the WMO's Information System's contribution to GEOSS, accessed through NCAR, and seamlessly fed the data stream into an ecological niche model (ENM). The ENM runs in an open modeling framework to produce a new product displaying the impacts of climate change on the geographic distribution of selected

species.

A central aspect of this demonstration was the creation of a catalog service that was able to distribute queries to heterogeneous catalogs. In addition, this catalog service implemented mediation capabilities, using the declared “special arrangements” interoperability that enable heterogeneous communities contributing to GEOSS to interoperate via the prototype IP3 information framework. The biodiversity community was an eager participant and valuable test case.

In 2008, the IP3 will extend this effort by incorporating additional disciplines and data sources, as well as helping to develop a framework for model interoperability. Through this, it will further the stated goals of the IP3 which are to address interdisciplinary interoperability, standards implementations and the need to enable disparate users communities to work together.

The presentation will address the system design in the context of several science scenarios. The main components of the system will be described outlining the effective distributed discovery and access capabilities of the overall system throughout heterogeneous community specifications. This includes the discussion of the adopted solutions for metadata and data model reconciliation among different Earth and Space Sciences communities. A use scenario for model interoperability will also be presented. In fact, the IP3 will begin implementing the first elements of an interoperable model framework called the Model Web, which is being advanced by NASA JPL. This will consist of a distributed, multidisciplinary network of independent, interoperating models, plus related datasets and sensors.