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COMPASS: A Geospatial Knowledge Infrastructure Managed with Ontologies

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The research and decision-making process in any discipline is supported by a vast quantity and diversity of scientific resources, including journal articles; scientific models; scientific theories; data sets and web services that implement scientific models or provide other functionality. Improved discovery and access to these scientific resources has the potential to make the process of using and developing scientific knowledge more effective and efficient.

Current scientific research or decision making that relies on scientific resources requires an extensive search for relevant resources. Published journal papers may be discovered using web searches on the basis of words that appear in the title or metadata, but this approach is limited by the need to select the appropriate words, and does not identify articles that may be of interest because they use a similar approach, methodology or technique but are in a different discipline, or that are likely to be helpful despite not sharing the same keywords.

The COMPASS project is developing a knowledge infrastructure that is intended to enhance the user experience in discovering scientific resources. This is being achieved with an approach that uses ontologies to manage the knowledge infrastructure in two ways:
1. A set of ontologies describe the resources in the knowledge infrastructure (for example, publications and web services) in terms of the domain concepts to which they relate, the scientific theories and models that they depend on, and the characteristics of the resources themselves. These ontologies are provided to users either directly or with assisted search tools to aid them in the discovery process. OWL-S ontologies are being used to describe web service resources.
2. The knowledge infrastructure is supported by an ontology-registry that provides the traditional function of a registry to support a spatial data infrastructure, but that is implemented as a set of OWL ontologies. The architecture does not duplicate the content of the registry and ontologies, the ontologies are the registry. An OWL application profile for the CSW OGC registry standard is being developed to provide an OGC compliant solution for this unique architecture.

The knowledge infrastructure is being developed with a set of use cases from coastal science, based around marine instrumentation. Distributed resources will be incorporated using a range of different standards with varying degrees of semantic richness, and dynamic user annotation is being included to allow both a formal ontology and an informal tagging view to be taken over the resources in the infrastructure. Discovery will combine options based on ontology concepts, user annotation, geography and temporality to provide users with an enhanced set of tools to assist their scientific endeavours.