

Virtual Observatories in Geosciences

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Motivated by the Electronic Geophysical Year (eGY; www.egy.org), which is one of four international celebrations of the 50th anniversary of the International Geophysical Year which occurred in 1957–1958, the first ever conference devoted to Virtual Observatories in Geosciences (VOiG) was held in Denver, Colorado, USA between June 11 and 14, 2007. The conference was sponsored by National Aeronautics and Space Administration (NASA), United States Geological Survey (USGS), eGY, National Center for Atmospheric Research (NCAR), and National Science Foundation (NSF), and was attended by 74 people from nine countries. Of the many contributed presentations from the conference, initially six were reviewed and selected to appear in this volume of Earth Science Informatics. These contributions are clustered under the broad discipline of space physics and largely sponsored by the innovative Virtual Observatories for Heliophysics Data program from the U.S. National Aeronautical and Space Administration. As is noted in all the contributed papers, the virtual observatory paradigm which was originated in the astronomy and astrophysics community, was quickly adopted into solar physics and space physics. More recently, other fields such as environmental science, aeronomy, oceanography, seismology, volcanology, hydrology, and ecology are embracing the paradigm to serve their diverse community needs.

The papers represent an excellent cross-section of the developments that have taken place for solar and space

physics virtual observatories, and the needs that have emerged and the developed solutions.

Modern data frameworks involve multi-tiered architecture (King et al.) and the new virtual observatories are no exception. Deciding on topologies for how best to update loose federations of VOs so that accuracy, currency, relevance and scalability are satisfied is one of the present challenges. How do virtual observatories communicate their holdings to each other? For space physics, the Developing a Space Physics Archive Search and Extract (SPASE) Query Language contribution (Narock et al.) indicates how a community vocabulary, and existing standards developed in the astronomy community, are being brought together to solve the exchange problem in three space physics virtual observatories. In contrasting the differences between astronomical VO needs and those of solar and space physics (Harvey et al.), another contribution lays out the categories of VO participants and their characteristics which drive the interoperability needs of VOs and in particular, the development of the aforementioned, community-based SPASE effort. The practical implementation of the SPASE vocabulary (Merka et al.) in a modern data framework setting, so that users can query and access interdisciplinary data sources via distributed searches from both web portals and web services, demonstrates the substantial and science-relevant application of virtual observatories to space science. In assessing the relevance of searches returned from the “Brave New World” of VOs being implemented (King et al.), it is clear that while some of the techniques for ranking used in general internet searches apply, many do not, and new scoring methods are required, in addition to the importance of faceted search, in order to lead the user to the accurate source of information. The paper on the Virtual Earth–Sun Observatory describes

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how several interdisciplinary data streams are made available in real-time (Cifuentes-Nava et al.). The integrated, near-real time display of the data, which cover the Sun at radio wavelengths, through interplanetary space, and cosmic rays, to the Earth's geomagnetic field is changing the way Mexican scientists are studying the Sun-Earth system. These six papers are likely to be of common interest to other disciplines as well. As the main science organizer for VOiG 2007 and guest editor for these papers, I invite you to read these papers, contact the authors and consider becoming involved in future meetings (watch for VOiG 2008; www.voig.net) and

initiatives, and most of all, documenting and submitting your work in areas like this to this journal.

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