

ISDC Services: Data Management, Catalog Interoperability and International Cooperation

**B. Ritschel, V. Mende, H. Palm, R. Kopischke,
Ch. Bruhns, L. Gericke, S. Freiberg ⁽¹⁾**
GeoForschungsZentrum Potsdam
Data Centre
14473 Potsdam, Germany

The new GFZ Information System and Data Center (ISDC) portal is integrating important data management services for satellite missions like CHAMP, GRACE and TerraSAR-X as well as for geodetic projects like Global Geodetic Project (GGP) and GPS data reprocessing (GPS-PDR) [1], [2], [3], [4]. According to the work package (WP) 170 of the German Geotechnologien program "Observation of System Earth from Space", main components of the ISDC portal system, like portal framework and content management (WP 171), user management (WP 172) and product management, monitoring and statistic (WP 174) are developed and in operation. The enhancement of the ISDC product philosophy (WP 173) using parent and child DIF XML documents [5], [6] for the documentation of product type and product (data file) specific metadata is in progress.

The entrance to the main functions and features of the new ISDC portal (<http://isdc.gfz-potsdam.de>) realized by a three-tier graphical user interface (GUI) is shown in figure 1. The portal frame work is realized by the open source software Postnuke. In addition to the portal frame and standard components, like user registration, content management and a user forum, most of the components are developed by the ISDC team.

At present the ISDC is managing almost 290 different product types covering different geoscience domains like geodesy, geophysics as well as atmosphere and ionosphere physics. More than one third of these product types are accessible by public users and user groups. The other product types are used for operational, restricted and internal use only. More than 10 terra byte and 16 millions data products are long-term stored at the ISDC product archive and online accessible via the ISDC online product archive. Since the start of the new ISDC portal in March 2006, the number of international users and user groups has been increasing exponentially. Whereas figure 2 is representing the increase of registered users and user groups within the

¹ Email: rit@gfz-potsdam.de, vmende@gfz-potsdam.de, palm@gfz-potsdam.de,
roko@gfz-potsdam.de, cbruhns@gfz-potsdam.de, lg@gfz-potsdam.de, sebast@gfz-potsdam.de

last seven years, figure 3 gives an overview about the actual and international use of the ISDC data, headed by users from China, United States, India and Japan.

The ISDC is providing solutions for almost all parts of a science data lifecycle management. Due to a standardized ISDC product philosophy, the management of almost 300 different product types has been possible. As mentioned in the introduction already, all product types are described by standardized parent DIF (NASA's Directory Interchange Format) metadata documents (figure 4). This means, all product type dependent information, like entry id (unique identifier), entry title, parameters (science keywords), topic category, data center, summary, personnel, instrument, quality as well as the temporal and spatial coverage of the whole data set are recorded in parent DIF files. In order to deal with single products (data files) of a specific product type, a further development of the DIF standards was necessary. In comparison to the old ISDC metadata standards, the product dependent metadata of all new ISDC product types are stored in separate child DIF metadata documents. Detailed information about the new ISDC product philosophy based on XML structures are available in the "ISDC Metadata Management" article [1]. The input of data into the ISDC as well as the output of data is realized by ISDC data pumps, which are not only responsible for the transfer of data but also for the filling of the ISDC product catalog (figure 4). In order to guaranty the sustainability of data in the GFZ ISDC, there are not only appropriate archive structures and techniques necessary but also scheduled science driven data review processes, which are not realized by now. These review processes are part of the data lifecycle management, and assure the keeping of the operational status and the enhancement of data interoperability over a long-term period.

In order to improve the integration and the interoperability of the ISDC catalog, which is consisting of product type and product related data, the usage of standardized Service Oriented Architecture (SOA) driven concepts is necessary. The decision to use XML as representation language for the documentation of ISDC product type and product dependent metadata, provides the opportunity to transform metadata documents via XSLT processes (figure 5). Appropriate XSLT documents are containing the mapping specifications for the transformation process of documents from one metadata standard to another one. As shown in figure 5, the ISDC is using the Open Geospatial Committee (OGC) ISO 19115 metadata standard [7] in order to become interoperable. In addition to the metadata transformation process, SOA compliant catalog software is necessary in order to provide a standardized Catalog Web Service (CSW) interface. The ISDC is using the open source software "degree" (<http://www.degree.org>) [8], [9], which is providing an OGC compliant CSW 2.0 catalog service. Complementary to this OGC ISO catalog web service, it is planned to network main parts of the ISDC catalog via techniques, based on the Protocol for Metadata Harvesting (PMH) developed by the Open Archives Initiative (OAI).

Most of the ISDC connection to the Internet is based on committee driven standards and techniques. As illustrated in figure 6, additionally, there are a lot of community driven activities and developments, which are composing the interactive Web 2.0. Recently the ISDC team is studying such Web 2.0 techniques, like tagging and social navigation for the usage at the ISDC, and appropriate user interfaces are in development already. Now and in future it is necessary to validate Web 2.0

techniques for the capability within the ISDC in order to improve the general and specific knowledge about the ISDC products on one hand and to enhance the distribution of products on the other hand.

Due to the capabilities of the ISDC system as well as the active work of the ISDC team within important international organizations, like the Committee on Data for Science and Technology (DATA), the Electronic Geophysical Year (eGY) and the Working Group on Information Systems and Services (WGISS), the GFZ ISDC not only has become a part of the NASA's International Directory Network (IDN) and GEO's Global Observing System of Systems (GEOSS) but also an accepted partner within the Earth and Space Science Informatics (ESSI) community related to European and American Geophysical Unions (EGU, AGU).

The screenshot displays the ISDC portal interface. At the top, the GFZ logo and 'POTSDAM' are on the left, and 'INFORMATION SYSTEMS AND DATA CENTER' and 'Global Earth Science Data' are on the right. A navigation menu on the left includes sections for Home, Information, Data Access, Collaboration, and a search bar. The main content area features a 'Welcome to the Information System and Data Center for geoscientific data' header, followed by a satellite image and a detailed text block. Below this are several news items, each with a title, a brief description, a date, and a 'Read full article' link. The right sidebar contains a 'Forum' section with 'LAST FORUM POSTS', a 'Personal Block' with 'favorite product types', 'Request Limits (24h)', 'Data Flow (last 60d)' with a line graph, and 'Product Statistics'.

Figure 1: ISDC portal GUI

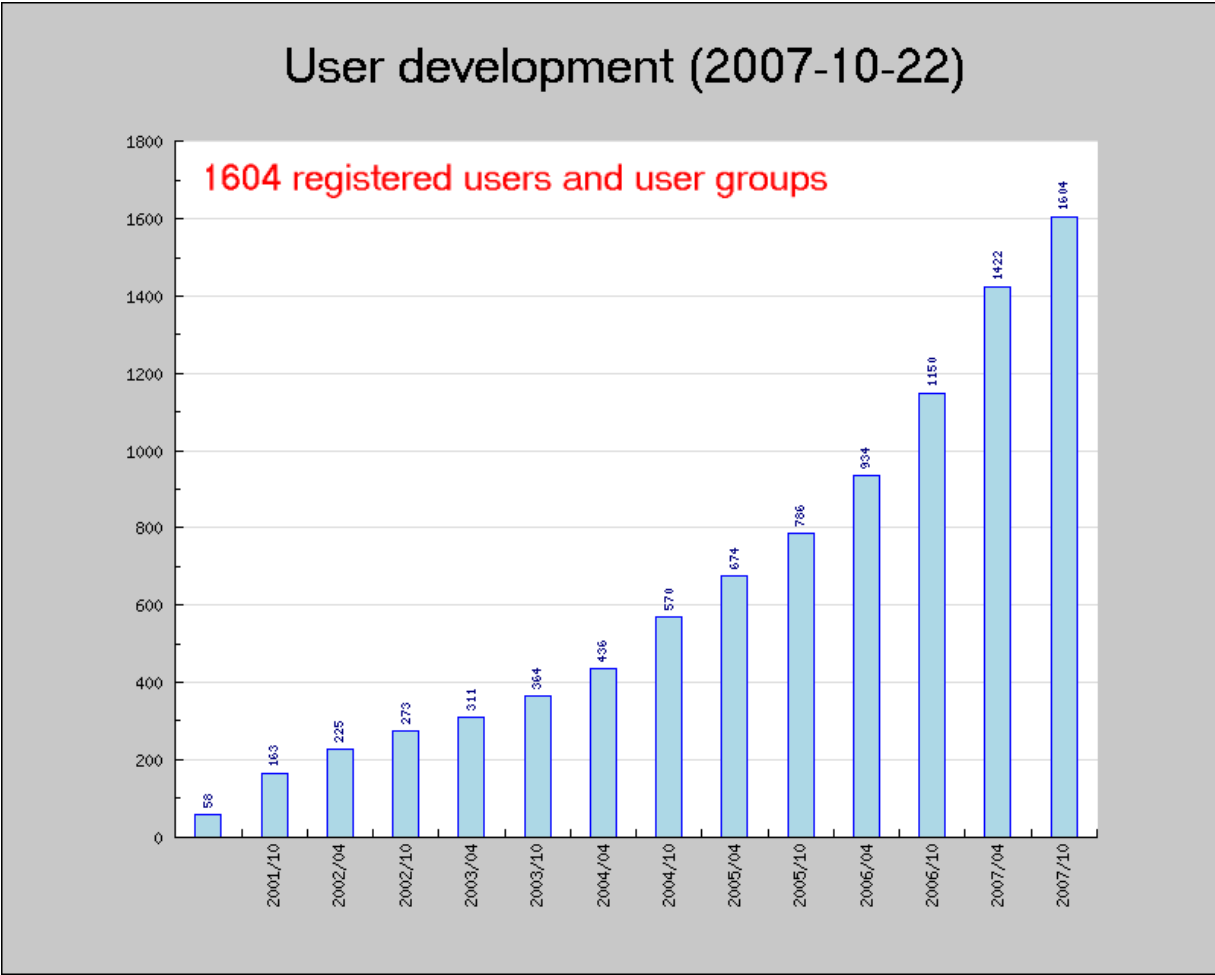


Figure 2: ISDC user development

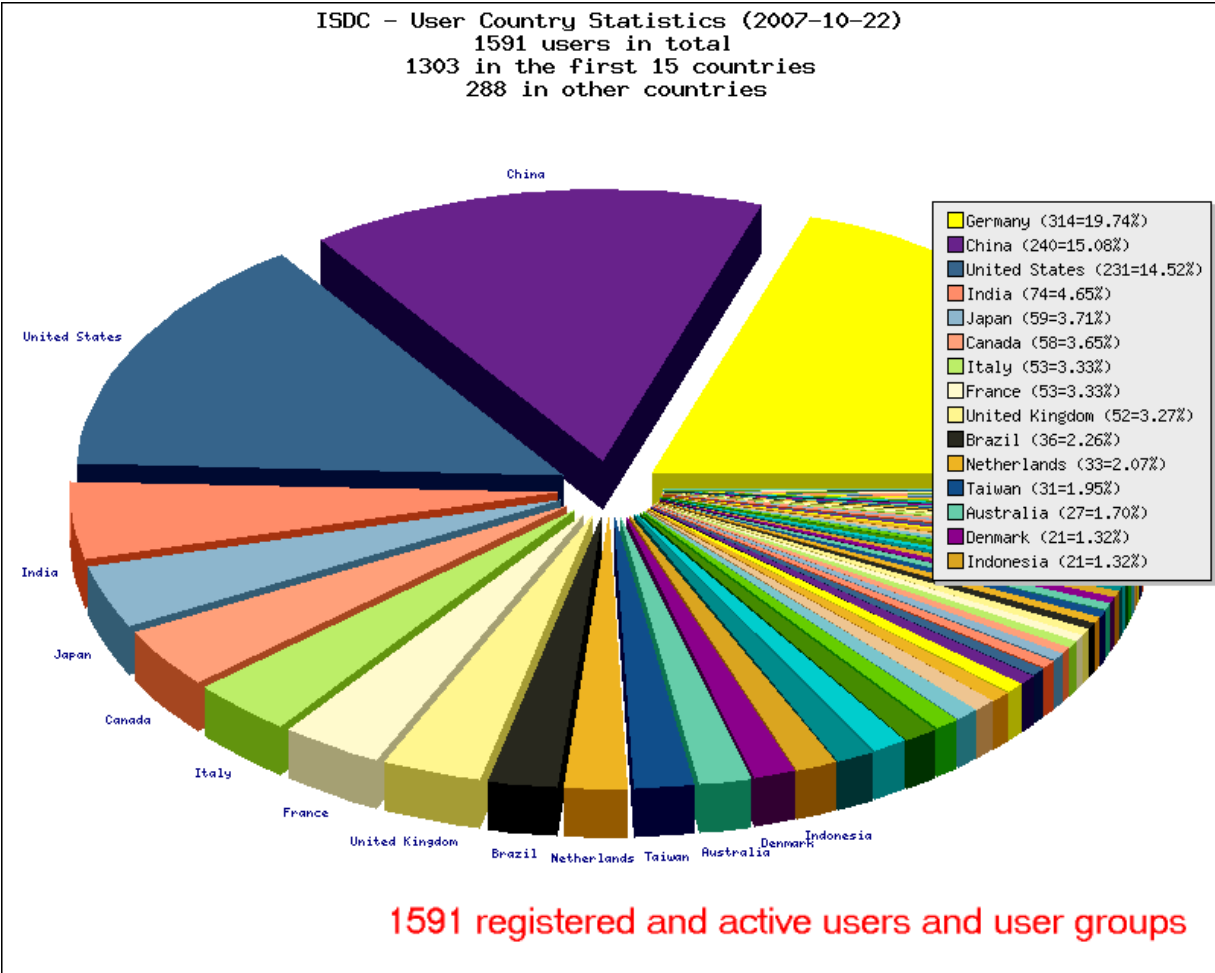
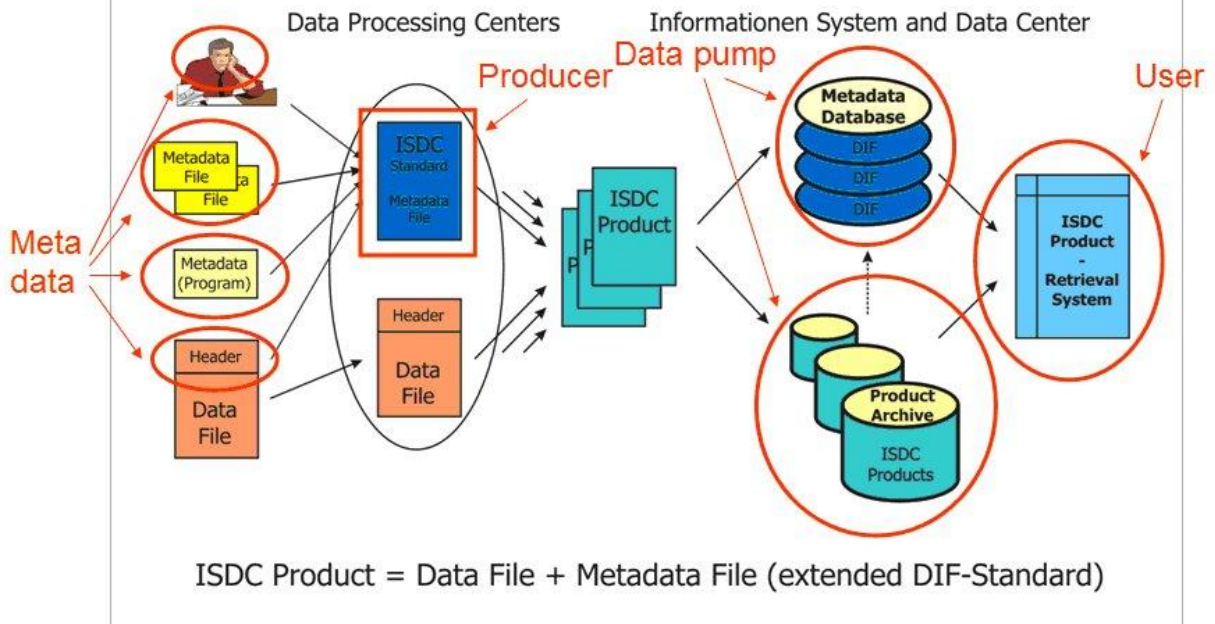


Figure 3: ISDC user – country statistics

ISDC Product Philosophy and Metadata Processing



ISDC Metadata Standard = Parent DIF (V. 9.0) + Extended Child DIF(s)*

<http://gcmd.nasa.gov/User/difguide/difman.html>

*in preparation

Figure 4: Extended ISDC product philosophy

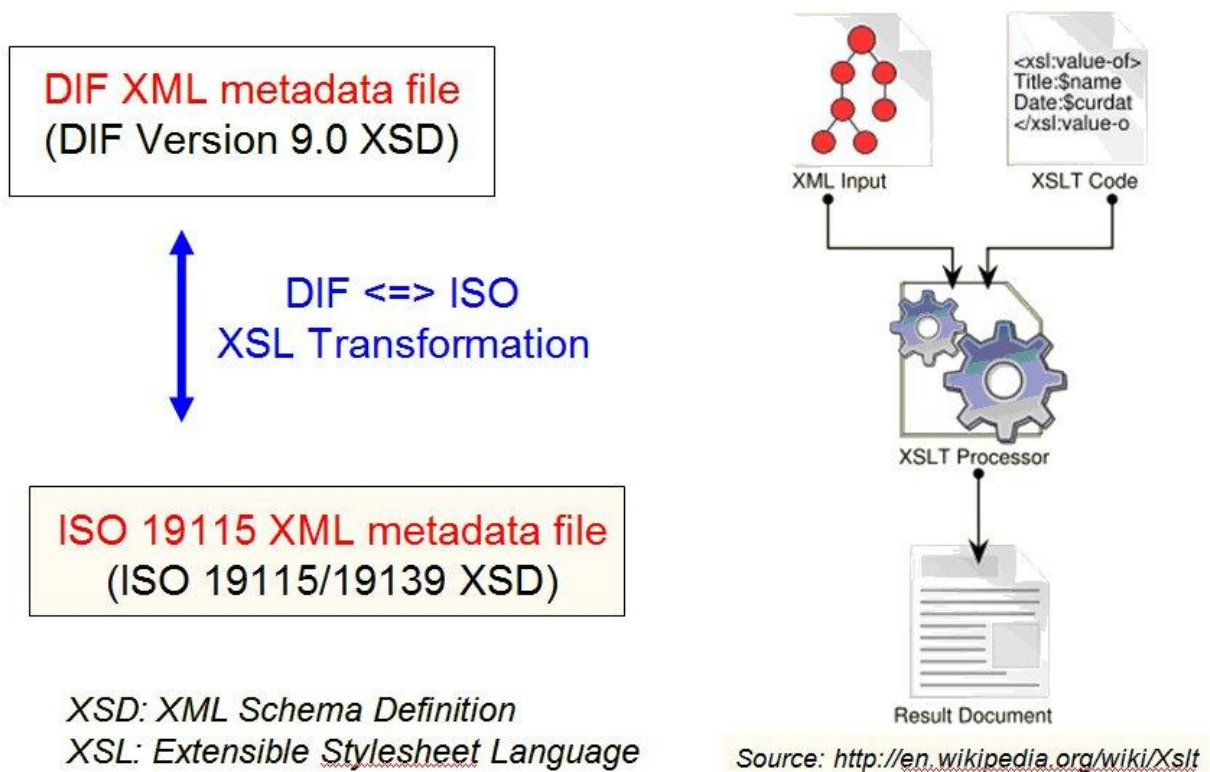


Figure 5: Mapping of standards

Integration of sustainable Web techniques from both worlds

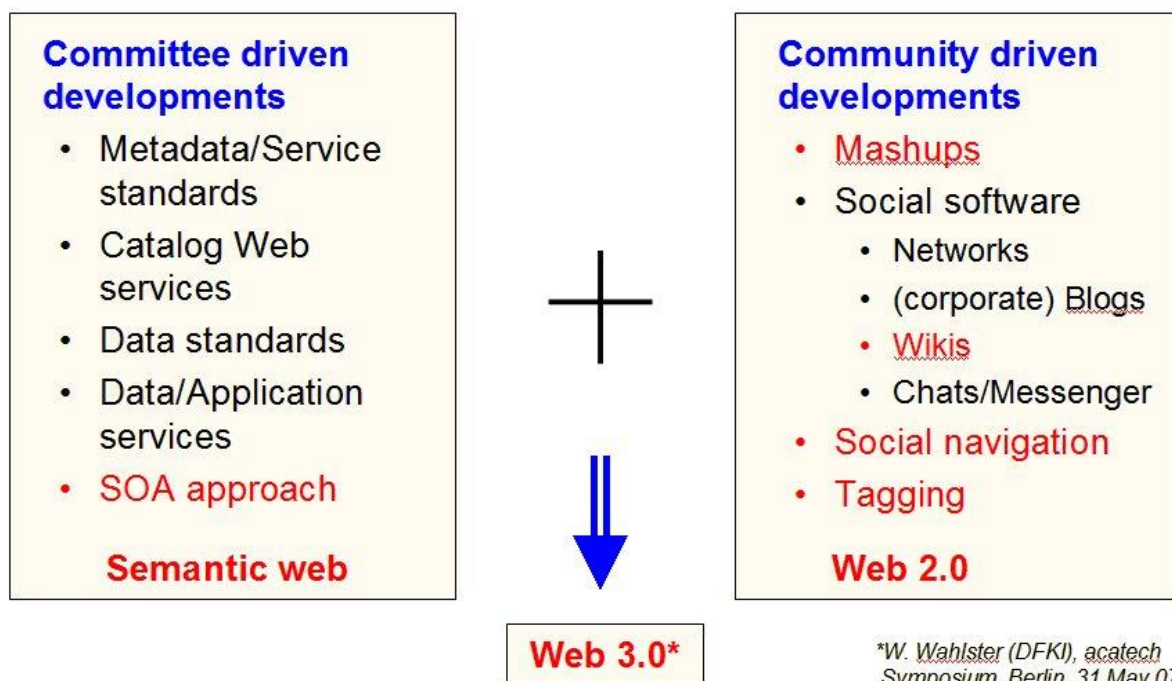


Figure 6: Connecting different worlds

References

Deegree Project: <http://www.deegree.org>

Global Change Master Directory: <http://gcmd.nasa.gov/>
XML & XSLT: www.w3.org/TR/xslt , <http://selfhtml.org/>

[1] Reigber Ch., Schwintzer P., Lühr H., Massmann F.-H., Galas R., Ritschel B.: CHAMP Mission Science Data System Operation and Generation of Scientific Products, GEOTECHNOLOGIEN Science Report, Observation of System Earth from Space, Status Seminar, Bavarian State Mapping Agency (BLVA), Munich, 12-13 June 2003, 129-131

[2] Flechtner F., Ackermann Ch., Meixner H., Meyer U., Neumayer K.-H., Ritschel B., Schmidt, A., Schmidt R., Zhu S., Reigber Ch.: Development of the GRACE Science Data System, GEOTECHNOLOGIEN Science Report, Observation of System Earth from Space, Status Seminar, Bavarian State Mapping Agency (BLVA), Munich, 12-13 June 2003, 48-50

[3] Ritschel B., Behrends K., Braune St., Freiberg S., Kopischke R., Palm H., Schmidt A.: CHAMP/GRACE-Information System and Data Center (ISDC) - The User Interfaces for Scientific Products of the CHAMP and GRACE Mission, GEOTECHNOLOGIEN Science Report, Observation of System Earth from Space, Status Seminar, Bavarian State Mapping Agency (BLVA), Munich, 12-13 June 2003, 132-133

[4] Ritschel, B., Bruhns, Ch., Burgess, Ph., Freiberg, S., Gericke, L., Kase, St., Kopischke, R., Loos, St., Lowisch, St., Palm, H.: The integration of CHAMP and GRACE products as well as associated scientific services in the new ISDC portal, GEOTECHNOLOGIEN Science Report, Observation of System Earth from Space, Status Seminar, Oberpfaffenhofen 2006

[5] V.Mende, B. Ritschel, H. Palm, L. Gericke, S. Freiberg.: ISDC Metadata Management, GEOTECHNOLOGIEN Science Report, Observation of System Earth from Space, Status Seminar, München 2007

[6] Ritschel, B., Bruhns, C., Kopischke R., Mende V., Palm H., Freiberg S., Gericke L. The ISDC concept for long-term sustainability of geoscience data and information, PV 2007 Conference, Symposiums-Proceeding, Oberpfaffenhofen 2007

[7] Braune, S., Czegka, W., Klump, J., Palm, H., Ritschel, B., Lochter, F. A. (2003): Anwendungen ISO-19115-konformer Metadaten in in Katalogsystemen aus dem Bereich umwelt- und geowissenschaftlicher Geofachdaten. - Zeitschrift für Geologische Wissenschaften, 31,1, 37-44

[8] Voges, U., Senkler, K. (2005): OpenGIS® Catalogue Services Specification 2.0 - ISO19115/ISO19119 Application Profile for CSW 2.0.; OpenGIS Consortium, Wayland, Massachusetts

[9] Burgess, Ph., Palm, H., Ritschel, B., Bruhns, Ch., Freiberg, S., Gericke, L., Kase, St., Kopischke, R., Loos, St., Lowisch, St.: Implementing modern data dissemination concepts in the ISDC Portal, GEOTECHNOLOGIEN Science Report, Observation of System Earth from Space, Status Seminar, Oberpfaffenhofen 2006