IGFS metadata for gravity and geoid. Structure, build-up and application module

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1. Introduction

Gravity field related products have been the focus of almost all geosciences in the sense that they provide realistic representation of the physical properties of system Earth. The rigorous documentation and archiving of gravity field related data, either irregularly distributed and on a grid, has become mandatory in order to ensure coherent and unambiguous utilization by users and archiving in related data management servers and services. Given the above, the International Gravity Field Service (IGFS) has taken steps in order to generate metadata for gravity field and geoid related data so that fragmentation of databases at national and international level as well as user needs can be addressed. To that respect, the general structure of the gravity and geoid metadata has been generated, describing all necessary fields that the metadata should have, while an online PHP-based web application has been developed and became available as an IGSF product to assist users to generate metadata for their gravity-related information. In this work, we describe the main characteristics of the metadata structure and give details on the developed web application. Finally, the dedicated IGFS application server, igfsapps.topo.auth.gr, is described and details on the incorporation of the gravity and geoid metadata application as an online IGFS service are provided.

2. Metadata structure

The IGFS standard for metadata is a metadata profile of ISO19915-1. As an extension of the ISO19115-1, the IGFS standard includes apart from the standard fields of information, additional ones for describing gravity and geoid datasets as there is currently no other international standard for supporting this kind of metadata. The IGFS standard includes five sections of information: a) Identification information, b) Standards and Conventions, c) Data and data quality information, d) Distribution information and e) Metadata reference information. Sections (a), (d) and (e) contain only information found in the ISO19115-1, where the only modifications involve the change of some input information from optional to required. Sections (b) and (c) are an extension to the ISO standard and contain information that is specific to gravity and geoid data.

Significant effort was made in order to maintain a balance between the number of mandatory and optional fields. As the number of mandatory fields increases, users tend to move away from such a standard or create metadata sets that end up to be incompatible with the standard requirements. On the other hand, too many optional fields lead end-users to provide only the minimum possible information. In order to assess that the new standard meets the requirements of the geodetic community, the selection of the required and optional metadata information was made independently of existing standards. In a next step, the newly compiled standard was checked against ISO19115-1. After the differences and inadequacies were examined, the new standard was made compatible with ISO19915-1 while the additional metadata elements were included in new classes that formed the final profile. It should be noted though that there is still work in progress to better accommodate some pieces of information to existing elements found in ISO19915-1 as well as enhance the structure of the extensions. Therefore, the end-users should be aware that the specifications are subject to change. Figure 1 presents some of the new metadata classes included in the IGFS metadata standard profile of ISO19115-1.

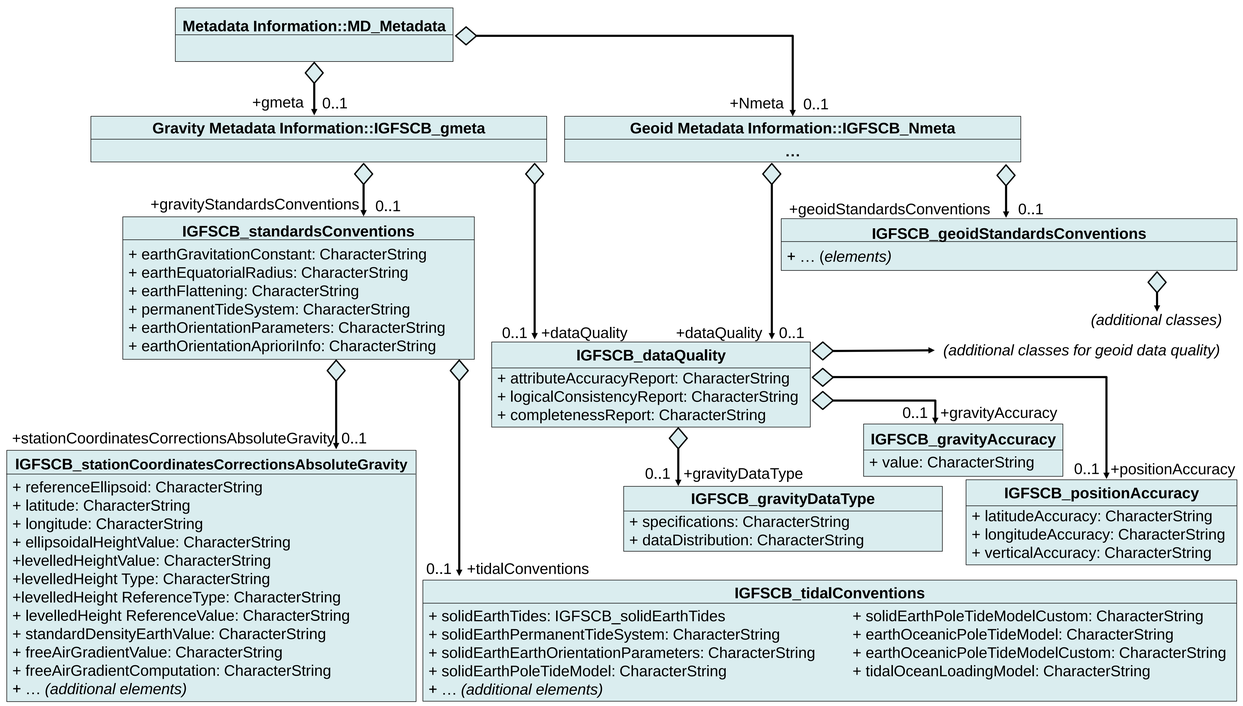
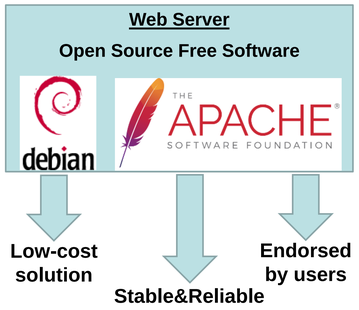


Figure 1: Selected classes included in the new IGFS metadata standard profile of ISO19115-1.

3. Web Application deployment

The online apps for the online creation of metadata are being developed by the IGFS Central Bureau (CB). Open-source and free to use technologies have been adopted for the deployment both of the web server and the development of the applications (see Figures 2 and 3). The web server is currently deployed as a virtual machine on the Aristotle University of Thessaloniki virtual machine host. This setting offers minimum downtime, automatic server backup and most importantly security as all virtual machines are constantly monitored for threats. It should be noted that this decision could be reconsidered in case the generated traffic and requirements increase although this is not expected in the near future. On the virtual machine, a Debian Linux server has been installed while the website is hosted on an Apache HTTP Server. The aforementioned software selection was based on four criteria: a) no or minimum cost, b) reliability, c) stability and d) community acceptance.



(all logos are trademarks of their respective owners)

Figure 2: Technologies used for the deployment of the web server.

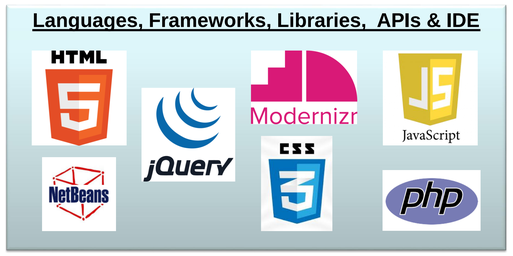


Figure 3: Technologies used for the development of the online applications. *(all logos are trademarks of their respective owners)*

Two online apps for the creation of metadata (g-μeta for metadata related to gravity datasets and N-μeta for metadata related to geoid models and heights) are currently under development. g-μeta Is currently on a beta-testing stage while N-μeta is on an alpha stage but not yet released for public testing. Both apps use HTML5 and CSS3 for their interface, JavaScript, jQuery, Modernizr and PHP for their functionality and NetBeans was used as the development environment. The most important criteria, apart from using free and open-source technologies, was compatibility. As the online apps aim to be used by different users using a variety of devices for accessing the IGFS CB online-apps website, it was necessary to ensure that all of them will share the same experience. Moreover, the developed applications were designed to be lightweight and user-friendly.

Access to the online apps is currently available only through the following URL: http://igfsapps.topo.auth.gr, and when the specifications are finalized and the apps have been thoroughly tested access will be provided through the main website of the IGFS (http://igfs.topo.auth.gr). Upon visiting the IGFS CB apps website (see Figure 4), the user is provided with three options. Currently only the g-μeta apps is available (for testing purposes) while the N-μeta app will be up for beta testing by the end of 2017. The μeta-Locator app will be discussed in another presentation. The size of the two μeta apps is less than 300KiB.

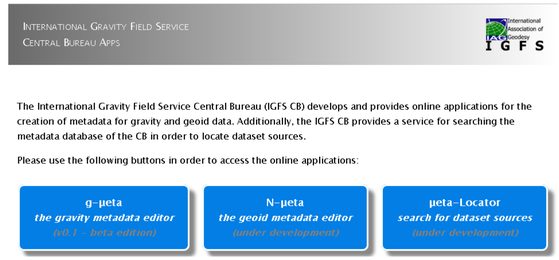


Figure 4: The IGFS CB apps website main page.

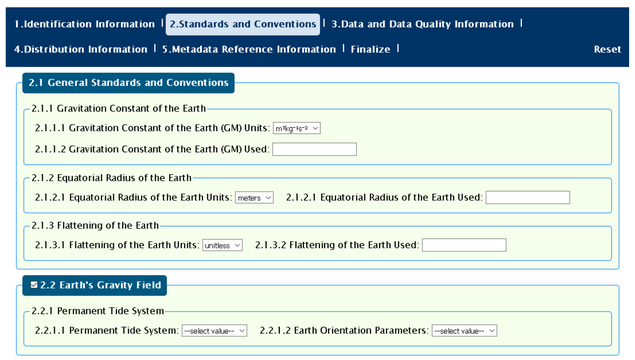


Figure 5: The IGFS CB g-μeta app (section 2 form).

Following the specifications, each section provides the optional and necessary information for creating the final metadata XML file (e.g., see Figure 5). For each quantity, units are provided on the interface although they are not recorded in the XML file. The user has also the ability to hide some subsections and exclude them from the XML file (available only for parts of sections 2 and 3). By hiding the subsections, the end-user focuses on the fields of information that are of main concern and for which input is possible. Upon filling in information in all five sections, the user moves on to the *Finalize* section where all information is being validated. If the validation succeeds the end-user may choose to prepare the final metadata file and then be provided with a link for downloading the produced XML file. Each XML file produced has a unique filename (and URL address for download) and therefore guarantees privacy of the end-users information.

4. Future work – Call for participation

Currently the main goal is to provide both applications (g-μeta and N-μeta) for testing by the end of 2017. IGFS urges all interested individuals and parties to test the available applications and submit their feedback to the IGFS CB or participate in the discussion by joining the IGFS Standards mailing list (http://igfs.topo.auth.gr/mailing-lists/). Future work includes also the preparation of schema files as well as ready to use code in order to support dissemination and adoption of the IGFS metadata standards profile of ISO19115-1.

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