IAGOS developments in the frame of IGAS for metadata standardization and database interoperability

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ABSTRACT

IAGOS (In-service Aircraft for a Global Observing System) [1] aims at the provision of long-term, frequent, regular, accurate, and spatially resolved in-situ observations of atmospheric chemical composition. IAGOS observation systems are deployed on a fleet of in-service aircraft of internationally operating airlines. The IAGOS database forms an essential element of the global network of atmospheric composition observations. In the framework of the newly starting IGAS project, major developments are planned in order to interoperate with international portals and other databases enabling easy use of the IAGOS observations by operational and other environmental services. These include metadata and formats standardization, added-value services, QA/QC procedures and traceability, and the real-time data transmission.

Keywords: aircraft data, in-situ observation, atmospheric composition, interoperability, relational database, metadata

INTRODUCTION

IAGOS (In-service Aircraft for a Global Observing System) [1] aims at the provision of long-term, frequent, regular, accurate, and spatially resolved in-situ observations of atmospheric chemical composition. IAGOS observation systems are deployed on a fleet of in-service aircraft of internationally operating airlines. It builds on almost 20 years of scientific and technological expertise gained in the research projects MOZAIK (Measurement of Ozone and Water Vapour on Airbus In-service Aircraft) and CARIBIC (Civil Aircraft for the Regular Investigation of the Atmosphere Based on an Instrument Container). The European consortium includes research centres, universities, national weather services and ECMWF (European Centre for Medium-Range Weather Forecasts), airline operators and aviation industry. In the framework of the newly
starting IGAS project [2] (IAGOS for GMES/Copernicus Atmospheric Service), major developments are planned in order to interoperate with international portals and other databases enabling easy use of the IAGOS observations by operational and other environmental services. These include metadata and formats standardisation, QA/QC procedures and traceability, and the real-time data transmission.

**IGAS GOALS**

The main goal of IGAS is to provide the different IAGOS data sets (Near Real Time and/or in delayed mode) to users in a standardized format including the necessary metadata and information on the data processing, data quality and uncertainties. Thereby the strong role of IAGOS data for the GMES/Copernicus atmosphere service will be further enhanced. With the developments in IGAS it will be possible not only to evaluate operational forecasts of the global atmospheric chemical composition, but also to apply IAGOS data in data assimilation, for the validation of satellite data products and studies by the scientific community. The sub-services that provide the different IAGOS data sets will be made interoperable among each other. The IAGOS database forms an essential element of the global network of atmospheric composition observations. In the framework of IGAS project, major developments are planned. We will redefine and standardize the IAGOS metadata for interoperable use within GMES/Copernicus. This metadata will comply with the ISO 19115, INSPIRE and CF conventions. IGAS will also contribute to the development of a community metadata profile in the framework of the GEO (Group on Earth Observations) Air Quality Community of Practice. IAGOS data formats shall be NetCDF and NASA AMES. We will also define, implement and demonstrate interoperability between the involved IAGOS data services including the former MOZAIC and former CARIBIC databases, Aircraft Research DLR database and the Jülich WCS web application JOIN (Jülich OWS Interface) which combines model outputs with in-situ data for intercomparison. We will implement the OGC (Open Geospatial Consortium) compliant GEO Air Quality Community WCS (Web Coverage Service) server software and an SOS (Sensor Observation Service) server for the IAGOS database. We will design an optimal data archiving strategy for IAGOS data sets (vertical profiles, time series, resolution, etc.) to be retrieved in NRT and/or delayed mode. To facilitate satellite and model validation, tools will be made available for co-location and comparison with IAGOS. We will enhance the JOIN application to properly display aircraft data as vertical profiles and along individual flight tracks and to allow for graphical comparison to model results that are accessible through interoperable web services, such as the daily products from the GMES/Copernicus atmospheric service. An intrinsic element of these developments will be the exploration of web-based techniques to manage data protection and privacy issues within INSPIRE compliant interoperable services.

**IGAS ARCHITECTURE**

Figure 1 shows the IGAS architecture. IAGOS data are automatically transmitted to reception server right after landing of the aircraft. MOZAIC and CARIBIC data are manually transmitted periodically and integrated in the database. IAGOS database contains observations, metadata and instruments data. IAGOS data are accessible by the IAGOS web interface. Users can retrieve data through requests based on temporal, geographic or thematic criteria. The DLR database will be interrogated to find the number of DLR records corresponding to the user request. Displaying and eventually getting the data is also made possible through the JOIN interface. JOIN will interrogate the IAGOS database using WCS protocol (for gridded or 2D data) and SOS protocol (for trajectory data or 1D data). JOIN can display IAGOS data and may allow downloading some data (climatology, etc). Also DLR user interface will interrogate IAGOS database to find number of IAGOS records corresponding to the user request. IAGOS metadata will be transmitted on a server in FZJ (Forschungszentrum Jülich) to be harvested by international metadata portals.
CONCLUSION

The IAGOS database relies on a user-friendly web interface for scientific users and policy makers providing added-value services and products such as graphical tools and interoperability with other databases or data portals.

The IGAS project will improve the standardization of IAGOS data and metadata formats, and interoperability protocols. Interoperability with the JOIN interface and the Aircraft Research DLR database will also provide new added-value services in addition to the current and/or under development IAGOS web services.

REFERENCES


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