International Permafrost Association

Action Group:

Quality Control and Assurance of the active layer thickness and permafrost temperature variables within the GTN-P database

Period

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Action Group Contacts:

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Objectives and scope of the Action Group

Background

The Global Terrestrial Network for Permafrost (GTN-P) is the primary international program concerned with monitoring permafrost parameters. GTN-P was developed in the 1990s by the International Permafrost Association (IPA) under the Global Climate Observing System (GCOS) and the Global Terrestrial Observing Network (GTOS), with the long term goal of obtaining a comprehensive view of the spatial structure, trends, and variability of changes in the active layer thickness and permafrost temperature.

The new Data Management System (DMS) of GTN-P, hosted at Arctic Portal in Iceland and designed in close relation with the Alfred Wegner Institute (AWI), has emerged within the framework of Page21 project (Changing Permafrost in the Arctic and its Global Effects in the 21st Century). The outcomes from this European project, in terms of data management, bring many new opportunities toward data submission, data mining, visualization and interoperability of ground temperature and active layer thickness time series at global scale.

Besides the prospect of building a standardized Data Model for Permafrost variables enabling exchange, comparison and dissemination of information from remote data centres and sources, the data quality control and assurance (QC/QA) should be a primary goal of the GTN-P database. The main purpose of quality control is to detect data deficiencies and to attempt to correct them in real time. Not only providing recommendations for future field measurements and data treatments, it also allows developing tools designed to provide additional data processing, data analysis capability and flagging within the database.

The action group shall produce a consensus document at the international level to identify Permafrost's variables data quality key parameters, providing standard methods and proto-

cols definitions. The product arising from the effort should consist of a publication as well as a set of structures to be implemented into the GTN-P database continuing to build, in the field of Geosciences, a referential model for data integration and interoperability.

Vision

The aim of the Permafrost QC/QA process is to establish a set of priorities and parameters for each of spatial, temporal and thematic components of Permafrost observations (encompassing accuracy, precision, consistency, completeness and usability) (H. Veregin, 1999). Beyond the Thermal State of Permafrost (TSP) and Circumpolar Active Layer Monitoring (CALM) data collections, permafrost data are far from being homogeneous, and strategies should be developed to minimize the bias, identifying uncertainties from existing data structure; allowing their use at broader scale in climate models.

Parameters

Throughout the 3 years of Page21 project, the GTN-P DMS development has already provided the conceptual environment to assess permafrost's variables QC/QA main constituents. Based on similar exercise conducted in the field of ecology and biodiversity (Chapman, A. D. 2005), the Action Group will establish the State-of-the-Art of data quality assessment within permafrost studies. This document should encompass all measures' metrics (i.e. data creation, data acquisition, data format, data curation, data delivery and data search), defining the character of each constituents while addressing research priorities. The World Meteorological Organization (WMO) offers an approach to ISO 19157 Data Quality and ISO 19158 Quality Assurance of data supply through its Commission on Basic Systems (CBS) who published technical guidance documents. These advanced standards should involve in particular real-time quality control, including correcting or flagging of more reports, parameters and levels.

Selection of participants and engagement

An online announcement will be launch on the GTN-P website (gtnp.org and gtnpdatabase.org) and its social networks. A GTN-P QC/QA page will be open offering accessible factsheet. The audience targeted will be engaged through existing communication network. An email will be circulated. The core group will coordinate the effort and meet in order to produce the document. The Arctic Portal team will implement the data quality control and validator within the database. The document will be distributed through the network of the GTN-P database which counts already 145 individual participants and 98 organizations.

Timeline

The project duration has been set for 2 years knowing the ambition and the difficulty of the task. The Action Group will build a strong basis to prefigure a work, within Permafrost Research, that should be extended in time with further funding and cooperation, evolving in parallel with the development of technologies and the integration of global scientific networks.

Announcement

The first announcement will be made beginning of January 2015 toward all network partners. The GTN-P website will host the project web page and an email will be available for any kind of inputs. The main themes will be exposed within a permafrost variables QC/QA communication factsheet. The scope should be enlarged with a multidisciplinary prospect. A technical QC/QA section will be developed within the Data Management sections of the

gtnp.org website. The core group members will be asked to publicize the efforts in their network.

State-of-the-Art

Bringing together all available materials that have already been produced and moving from data acquisition to data dissemination, the action group will lead the study of permafrost temperature and active layer thickness variables QC/QA. From field scientists to modellers every steps of the data processing will be assessed while characterizing the needs of all different actors.

In April 2015 the QC/QA State-of-the-Art document is circulated toward all relevant GTN-P participants in order to gather feedbacks leading to evaluate and prioritize the needs of the community in regard to QC/QA.

Prioritizing

Prior to the GTN-P meeting and encompassing the feedbacks from the community, the Action Group will define the key QC/QA challenges to be discussed with the partners in China.

Core group Meetings

The Action Group will try to meet during or around major events in order to publicize the effort and gather additional input from the community.

A meeting will take place during the GTN-P General Assembly hold in fall 2015 in China. The Action Group will present to all GTN-P partners the key questions and parameters that have arisen from the Permafrost variables QC/QA State-of-the-Art. The GTN-P Data Management System QC/QA functions and libraries will be as well presented. The content of the academic paper as well as the journal for the publication will be decided then.

A core group meeting will be organized in January 2016 to elaborate the writing of the manuscripts.

Manuscript

The Action Group will write 2 manuscripts. One academic will be published as draft for the 11th International Conference on Permafrost - ICOP 2016 22 June - 26 June 2016 Potsdam, Germany. The second, a reference manual for field measurement good practices, submission and post data treatment should be edited during fall 2016.

Database implementation

The GTN-P database already insures the data quality through a set of parameters such as data submission standardization process, lists of control vocabularies, computation of metadata completeness, etc. The implementation of tools, indexes and parameters for data quality will be made all along the action group duration.

Deliverables

Several outputs are prepared by the Action Group. The first one should be a short Permafrost monitoring QC/QA factsheet introducing the main themes and challenges of the discipline. An extended document for field measurement good practices, submission and post data treatment is written and formatted to be distributed for all Permafrost monitoring stations. Additionally, an academic paper relating the full QC/QA process and providing all material in annexes follows and completes several other publications about the GTN-P DMS

The all QC/QA process enables the design of dataset products toward global networks and modelers complying with the CF convention (for Climate and Forecast). Weekly, Monthly and annual datasets products in NetCDF will then outcomes from the GTN-P DMS with embedded data quality flags.

Support of Interest groups

This activity is not proposed by an IPA Interest Group. However, the scope of the project, encompassing Permafrost data quality and data reliability, can be profitable to many. A close cooperation with the IPA and the Permafrost Young Researchers Network (PYRN) will be maintained all along the project.

Other Action Group Members

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International dimension

The GTN-P is an international network involving more than 20 countries and their respective National Correspondents. Many organizations or international projects are indirectly or directly involved through cooperation, support or development with GTN-P (Arctic Portal in Iceland, the Alfred Wegner Institute in Germany, the National Snow and Data Centre in the USA, the ESA DUE Permafrost Project based in Austria among others. The distinguished Vladimir Romanowski from Alaska and Hanne Christianssen from Svalbard assure us of their support.

References

Chapman, A. D. 2005. Principles of Data Quality version 1.0. Report for the Global Biodiversity Information Facility, Copenhagen.

Veregin, H., 1999 Geographic Information Systems – Principles and Technical Issues Vol.1, Data Quality Parameters John Wiley & Sons, Chapter 12 pp. 177-189.

WMO CBS (Commission on Basic Systems) technical guidance documents relating to quality, quality control and quality assurance:

The Guide on the Global Data-processing System (WMO-No. 305), 1993

Manual on the GOS (WMO-No 544 Volume 1 Global Aspects Part V Quality Control) , 2003

Guidelines on quality management procedures and practices for Public Weather Services (WMO/TD No. 1256), 2005.

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The WMO Technical Regulations (WMO–No. 49). Volume I – General Meteorological Standards and Recommended Practices. Section A -- World Weather Watch, 1988