**Project Report for the GEWEX GHP Meeting**

**Global Runoff Data Centre (GRDC)**

**Reporting Period: September 2013 – November 2014**

**Starting date: 1988**

**End date:**

**URL:** [**http://grdc.bafg.de**](http://grdc.bafg.de)

**Chair(s) and term dates: Ulrich Looser**

***1) GRDC activities over the last year***

* Overview:

The Global Runoff Data Centre (GRDC) was established in 1988 at the Federal Institute for Hydrology (BfG) under the auspices of the World Meteorological Organization (WMO). It is a contribution of the Federal Republic of Germany to the World Climate Programme of the WMO. WMO mandates and directly supports GRDC through its Resolution 21 (Cg XII, 1995: Request to the member states to provide GRDC with river discharge data) and Resolution 25 (Cg XIII, 1999: Free and unrestricted exchange of hydrological data).

An international steering committee is guiding and overseeing the activities of the GRDC. The steering committee consists of representatives from the Federal Institute of Hydrology, WMO, UNESCO, UNEP, ICSU, IAHS and partner data centres GPCC, IGRAC, GEMS/Water and HYDROLARE.

GRDC funding is provided by the German Government through the Federal Institute of Hydrology (BfG) on a continuous basis.

* Objectives:

The main objective of the GRDC is the world-wide acquisition, storage and dissemination of historical river discharge data in support of the predominantly water and climate related programmes and projects of the United Nations (UN), their specialised agencies and the scientific research community.

Additionally the GRDC has the following objectives:

* Operation and further development of the GRDC database, improvement of integration with external databases, contribution to the development as well as application and propagation of international standards for metadata, discharge data exchange and data structures
* Preparation and maintenance of applied global data products and discharge-related geo-information, partly in collaboration with specialised external institutions
* Collaboration with and consulting of international organisations, other world data centres and foreign institutions in the fields of hydrology, water resources as well as data management and data acquisition. This includes active participation in a number of national and international working groups, steering committees and panels.
* Status:

During the reporting period the GRDC managed to acquire discharge data from 13 countries around the world. For several countries updates are now received at regular intervals. Numerous contacts were made and more deliveries of discharge data are pending, especially in the European region.

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Active involvement of the GRDC in the OGC Hydrology Domain Working Group is continuing, especially on conceptual models. The GRDC has representing WMO interests in this working group until June 2014 when the head of the GRDC stepped down as one of the co-chairs. Further developments are still closely monitored.

The Global Terrestrial Network for River Discharge (GTN-R) is still lacking support from several countries. However, almost 20 countries have agreed to make their GTN-R data freely available without restrictions. The GRDC is preparing the technology to make these data available through the GEOSS and other portals.

In June 2014 the GRDC database holds world-wide discharge data of 9,009 stations in 160 countries featuring around 370,000 station-years of monthly and daily values with an average time-series length of 41 years.

Additionally the GRDC maintains the following specialised databases:

* Arctic Runoff Database (ARDB) containing data from over 2400 stations specifically for the arctic research community associated with the WCRP ACSYS and CLiC Programmes.
* Global Terrestrial Network for River Discharge (GTN-R) database for near real-time data, a contribution towards the [Implementation Plan for the Global Observing System for Climate](http://grdc.bafg.de/servlet/is/2470/) and to [GTN-H](http://grdc.bafg.de/servlet/is/1900/).
* European Water Archive (EWA) in support of the European Flow Regimes from International Experimental and Network Data (EURO-FRIEND-Water) research community
* GRDC Reference Dataset referencing 718 evenly spread GRDC stations to cover the globe in a 2.5° grid. The basin area is at least 10,000 km² in size with a time-series of at least 20 years.
* Climate Sensitive Stations Dataset of currently 1,175 GRDC stations from 27 countries identified by the countries as stations representing climate sensitive river basins having minimal disturbance.

* Key results:
* Consolidated data requests to many European countries with first results visible
* River discharge data updates for about 3,000 stations from 13 countries
* Provision of GRDC station catalogue and KMZ files on Website to visualize all stations using Google Earth together with basic station metadata
* Negotiating the unrestricted access the time series data for almost 300 stations belonging to the GTN-R network
* Providing information and web-services from the Global Freshwater Fluxes into the World Oceans re-calculated in 2014, based on results from the global hydrological model *WaterGAP* (Doell et al., 2003)for 0.5° grid cell resolution. The annual fluxes are available for a 50 year period (1960 – 2009)
* Recalculation of Long Term Mean Monthly Discharges for more than 3,800 stations available on the Website. Provided information include mean, minimum, maximum monthly discharge, its standard deviation and time series of mean, minimum, maximum annual discharge
* Workshops and meetings held
* 16th Session of the WMO Europe Regional Association, 11-16 September 2013, Helsinki, Finland
* 10th Session of the WMO WHYCOS International Advisory Group (WIAG-10), 10-11 October 2013, Geneva, Switzerland
* 16th Session of the Terrestrial Observation Panel for Climate (TOPC), 10-11 March 2014, Geneva, Switzerland
* Arctic-HYCOS Planning and Implementation Meeting, 26–27 March 2014, Geneva, Switzerland
* Annual OGC Hydrology Domain Working Group Workshop, August 2014, New York, United States
* WMO RA VI Hydrology Forum, 24–26 September 2014, Warsaw, Poland
* UNESCO FRIEND Data Group Meeting, 07-10 October 2014, Montpellier, France
* 22nd Meeting of International Hydrological Programme (IHP) Regional Steering Committee (RSC) for Southeast Asia and Pacific 14–15 November 2014 Yogyakarta, Indonesia
* WMO Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) Task Team on WIGOS Metadata (TT-WMD), 01 – 04 December 2014, Geneva, Switzerland
* Issues for the GHP and the GEWEX SSG:

Plea to GEWEX members who as part of their duties collect river discharge data from National Hydrological Services to remind the NHS’s of their moral obligations to provide discharge data to the GRDC. Contact details should be forwarded, so that the GRDC can negotiate the transfer of river discharge data.

***2) GRDC activities for next year***

* Future activites:
* Continued data acquisition strategy and initiatives on a regional basis to update and expand the excising historical database, at the same time try to institutionalise the provision of data and automate data downloads from National Hydrological Services that provide their discharge data via online services.
* Preparation of the GRDC IT infrastructure to ingest and redistribute time-series data using web services
* Continue to support the development, standardisation and implementation of standards for improved hydrological data exchange
* Support actively international programmes and initiatives for improved exchange and sharing of hydro-meteorological data
* Support the research community with relevant river discharge datasets and spatial products
* Planned workshops or meetings:
* 17th Session of the Terrestrial Observation Panel for Climate (TOPC), 16-18 March 2015, Zurich, Switzerland
* Arctic-HYCOS Planning Meeting, 24–25 March 2014, Reykjavik, Iceland
* 12th Meeting of the GRDC Steering Committee, 18-19 June 2015, Koblenz, Germany
* 7th GTN-H Coordinating Panel Meeting, 16-17 June 2015, Koblenz, Germany
* New directions:

The exchange of near real-time river discharge data on a global scale remains an overarching aim and many actions of the GRDC are directed to achieve this vision. The development of the GTN-R as a baseline global river discharge network is further pursued. Representation of the WMO in the standard setting processes for hydrological data exchange within the framework of the OGC Hydrology Domain Working Group will be continued.

***3) GRDC Contributions to the GEWEX Science Questions***

The GRDC is contributing to the GSQ2, 3 & 4. The GRDC is recognised as one of the hydro-meteorological projects in GEWEX. As such the GRDC seeks to provide inputs to GHP Continental Scale Experiments ([CSE](http://grdc.bafg.de/servlet/is/932/)) and modelling efforts by providing improved data sets.

The objective of the GRDC is to provide quality assured discharge data to the research community. All historical data received are being put through plausibility checks. In case of failure they are referred back to the providers to ensure quality assurance procedures before the data is entered in to the database.

Energy and water cycle process studies are dependent on good quality datasets and the GRDC is aiming to provide the required datasets for river discharge.

The models used for the predictability studies of key water and energy cycle variables need to be validated by independent high quality observation data sets – like those of the GRDC.

The GRDC is completely dependent on the cooperation of National Hydrological Services for the provision of discharge data. The most convincing argument to encourage cooperation is the expressed need for good quality regional data to improve the global climate models to be able to address climate change adaptation and mitigation strategies.

***4) Activities contributing to the WCRP Grand Challenges as identified by the JSC***

The GRDC is a global data centre for river discharge data. It is mandated by WMO resolutions to collect data on a global scale, harmonise the data and provide the data to predominantly water and climate related programmes and projects of the United Nations (UN), their specialised agencies and the scientific research community.

The provision of river discharge data from NHS’s to the GRDC is not institutionalised and is based on WMO Resolutions on the free and unrestricted exchange of Hydro-meteorological data.

Currently the GRDC is holding quality controlled historical mean daily and/or monthly discharge data for more than 9,000 stations from 160 countries. The data are available free of charge to the scientific community.

Efforts are made to obtain near real-time river discharge data from a global baseline river gauging network for improved studies on global climate variability and change and the verification of hydro-climatological models.

***5) Cooperation with other GHP and WCRP projects (CLIVAR, CliC, SPARC), outside bodies (e.g., IGBP) and links to applications***

* CLiC - Maintaining the Arctic Runoff Database (ARDB) as a subset of the GRDC database in support of CliC
* UNESCO IHP FRIEND-Water – Maintaining river discharge database for the European FRIEND-Water and Southern African FRIEND-Water Programmes. Negotiations to incorporate river discharge databases from further FRIEND-Water Programmes (Himalaya-Hindukush, Asia-Pacific).
* Global Climate Observing System (GCOS) – Maintaining and expanding the Global Terrestrial Network for River Discharge (GTN-R) as a baseline network in support of GCOS, UNFCCC, GTN-Hydrology and Group on Earth Observations (GEO).
* WMO Commission for Hydrology (CHy) – Maintaining and expanding the river discharge data for WMO defined "Climate Sensitive Stations”.

***6) List of key publications***

* Report 44 (Aug 2014): Global Freshwater Fluxes into the World Oceans: Technical Report prepared for the GRDC */* K. Wilkinson, M. von Zabern, J. Scherzer (UDATA, Germany). -  (9 pp). – DOI: 10.5675/GRDC\_Report\_44
* Report 39r2 (Dec 2013): Hydrologic Information – Metadata: Semantic structure for the description of hydrologic data (GRDC Hydrologic Metadata) / I. Dornblut. (26 pp, annex 30 pp). - DOI: 10.5675/GRDC\_Report\_39r2
* Report 43r1 (Nov 2013): HY\_Features: a geographic information model for the hydrology domain. Concepts of the HY\_Features common hydrologic feature model / I. Dornblut, Global Runoff Data Centre; R. A. Atkinson, CSIRO Australia*.* (33 pp, annex 34 pp). - DOI: 10.5675/GRDC\_Report\_43r1