WAT-45 ORAL PRESENTATION · WATER TRACK · SURFACE WATER HYDROLOGY & BASIN MANAGEMENT

Development of a Harmonized Long-Term Global River Discharge Database for Basin Water Resources Management

A. Senavirathne[1*], M. Leh[1], K. Matheswaran[1], P. T. Prabhath[1], N. M. Velpuri[1] and A. Seid[2]

[1]*International Water Management Institute, Colombo, Sri Lanka*
[2]*International Water Management Institute, Addis Ababa, Ethiopia*
**Corresponding author: a.senavirathna@cgiar.org*
DOI: https://doi.org/10.31705/ICEWSE.2026.65

Abstract

Reliable long-term river discharge observations are fundamental for understanding surface-water variability and supporting effective river-basin management, yet global streamflow records remain fragmented across national and international repositories. This study developed a global daily river discharge database covering the period 1800–2026. Data was harmonized using PostgreSQL for systematic data integration, preprocessing, and quality control. Station metadata and daily discharge observations were compiled from multiple hydrological databases through application programming interfaces, direct downloads, and request-based access. Spatial preprocessing removed stations with missing, invalid, or geographically erroneous coordinates. Stations sharing identical coordinates were identified as potential duplicates and evaluated using station names, record start and end dates, temporal overlap, common observation dates, and discharge-series similarity. The preprocessing workflow generated 20,209 pairwise comparisons, including 908 pairs with accessible discharge observations from both sources. Duplicate, continuation, and overlapping records were reconciled by retaining the most complete record or merging complementary observations after removing repeated dates. Overall, 18,393 source records were consolidated during harmonization. The final database contains 65,804 unique physical stations, including 50,806 stations (77.2%) with daily discharge observations and 14,998 metadata only stations (22.8%). The harmonized database provides a consistent foundation for global and basin scale assessments of streamflow, water availability, hydrological variability, flood and drought conditions, and long-term changes monitoring, supporting evidence-based water resource planning and sustainable river basin management.

Keywords: *data harmonization; global river discharge; long-term hydrology; PostgreSQL; river-basin management; streamflow database*