Hydrometeorological data acquisition, management and analysis for the Athens water supply system

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Elements of the Athens water resource system
General scheme of the Decision Support System

Automatic hydrological and meteorological stations
- Evinos
- Mornos
- Yliki
- Marathon

Telemetric system data

Other data
- Reservoir operation data
- Aqueducts characteristics
- Water supply data
- Irrigation data
- Economical parameters
- Electric power generated
- Water policy parameters
- Conventional hydrological data
- Conventional meteorological data

Data processing (program Hydrognomon)

Stochastic simulation and forecast (program Castalia)

Geographical information system (program Arcgis)

Water resources management (program Hydronomeas)
Main purposes of the telemetric system

- Feeding of the Decision Support System with reliable data
- Quantitative inspection of the water resources of the catchments that contribute to the water supply of Athens
- Improvement of the estimation of the parameters involved in the reservoirs' water budget
- Exploration of the hydrological and climatic characteristics of the study area after compilation of reliable time series of hydrometeorological variables
- Supply of hydrometeorological and water availability data in real time on the Internet for public awareness
Existing infrastructure
Experience from the 11-year operation of the telemetric station at NTUA Campus

*Current conditions *Last 24-hour statistics *Pictures *Last 24-hour charts *Historical data
*What’s new *General information *Links *FAQ *Contact info-Project team
Positioning of the stations

General criteria

- The sites should be hydrologically appropriate and fulfilling the WMO specifications
- The sites must be near to facilities (dams or water pumping stations) in order to ensure the safety of the station and the availability of electricity and telephony
- The sites of meteorological stations must be close to the maximum reservoir elevation in order to be as representative as possible for the variables that take part in the reservoir’s water budget
- The reservoir stage stations must be installed at the deepest point in the reservoir (but above the dead storage)
- The flow measuring stations must be as close as possible to the dams (above maximum reservoir elevation) in order to measure the maximum portion of inflow to the reservoir

Procedure

- Bibliographical review (using previous reports for candidate sites and using WMO specifications)
- Visits to the candidate sites (ensuring the participation of experts and local personnel, making record of specific site characteristics and taking photos and videos)
- Comparison of different characteristics (hydrological suitability, security, availability of electricity and telephony, ease of installation)
Data management and processing

General scheme of telemetric data acquisition

System functions

Automatic storage of telemetric data

Organised viewing and management of various information
- station-instrument characteristics
- time series
- multimedia

Data processing module
- range/time consistency check facility
- fixing of time step
- infilling of missing values
- time series aggregation
- double mass analysis
- construction of stage-discharge curves
- calculating derivative time series (evaporation, discharge)
- statistical analysis

EYINOS REGION

METEOROLOGICAL (5 minutes time step)
Rainfall, Temperature, Humidity, Radiation, Evaporation

RESERVOIR STAGE (hourly time step)
Stage

MARATHON, YLIKI, MORNOS REGIONS

METEOROLOGICAL (10 minutes time step)
Rainfall, Temperature, Humidity, Wind, Radiation, Sunshine duration

RESERVOIR STAGE (hourly time step)
Stage, Atmospheric pressure

RIVER STAGE (10 minutes time step)
Stage

ASCII FILES
Transmission from stations loggers to DAC via telephone network every 24 hours

DATA ADMINISTRATION CENTRE (DAC)

HARD DISC
Subprogram LogToDB
Transmission from ASCII files to appropriate raw time series

DATA BASE
RAW TIME SERIES
PROCESSED TIME SERIES
Corrected-filled
Aggregated (daily, monthly, yearly)
Derivative (evaporation, reservoir current surface and volume)
Data management and processing

Time series manipulation

**Copy from ASCII to DB**

- **Telemetric raw data**

**Range check**

- **Raw data irregular time step**

**Fixing of time step**

- **10 minute processed data**

**Aggregation**

- **Hourly aggregated data**

- **Monthly aggregated data**

- **Yearly aggregated data**

**Infilling of missing values from other stations**

- **Daily filled data**

**Coalition of several sensors**

- **Daily coalesced data**

**Aggregation**

- **Monthly filled data**

**Aggregation**

**Meteorological stations**

- More than 100 time series per station
- About one million records per station per year

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Hydrometeorological data acquisition management and analysis for the Athens water supply system
Internet application (actually in Greek)
http://www.itia.ntua.gr/nikos/arx_int/CDCREATE/metrhtiko.htm

METRHTIKO DIKTYO EUDAIP

ΕΝΤΥΠΑ

Τέταρτος: Επιλογή θέσεων υδρομετεορολογικών σταθμών
Τέταρτος: Τεχνικά χαρακτηριστικά υδρομετεορολογικών σταθμών και στήλευσης δεδομένων σε συστήματος
Τέταρτος: Μετρητικό σύστημα.
Related current project: “ODYSSEYS”

Project title: Integrated Management of Hydrosystems in Conjunction with an Advanced Information System (“ODYSSEYS”)

Project aim: Development of a commercial software package

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