R Package

Meteo Browser South Tyrol: A Shiny App to download the meteorological time series from the Open Data Catalogue of the Province of Bolzano/ Bozen - Italy

Giulio Genova[‡], Mattia Rossi[§], Georg Niedrist[‡], Stefano Della Chiesa[‡]

‡ Eurac Research, Institute for Alpine Environment, Bolzano/Bozen, Italy
§ Eurac Research, Institute for Earth Observation, Bolzano/Bozen, Italy

Abstract

Meteo Browser South Tyrol is a user-friendly web-based application that helps to visualize and download the hydro-meteorological time series freely available in South Tyrol, Italy. It is designed for a wide range of users, from common citizens to students as well as researchers, private companies and the public administration. Meteo Browser South Tyrol is a Shiny App inside an R package and can be used on a local machine or accessed on-line. Drop down menus allow the user to select hydro-meteorological station and measurements. A simple map shows where the monitoring stations are, the latest measurements available, and lets the user subset the selected stations geographically by drawing a polygon.

Keywords

Open Data; Shiny; Hydrology; Meteo; Leaflet; South Tyrol

Introduction

Promoting open data framework with a comprehensive data infrastructure increases publicly available knowledge and provides new unexplored benefits (Janssen et al. 2012). Moreover, combining meteorological and hydrological open data with other datasets can have a positive impact in environmental application (Zuiderwijk et al. 2014).

The [Open Data catalogue of South Tyrol](#) is a bilingual (Italian and German) public database with a large variety of local data and aims to facilitate data search and data re-usability. The Meteo section of the Open Data catalogue contains several meteorological and hydrological variables coming from 120 real-time monitoring stations. Precisely, measurements of air temperature, air humidity, precipitation, wind speed, wind direction, solar radiation, hours of sunlight, river discharge, water level, and ground water level. The dataset available refers to the last three years.

Meteo Browser South Tyrol is a web application based on the statistical programming language R (Team 2018) and the package Shiny (Chang et al. 2018). Shiny provides the framework for building responsive web based applications using javascript. Meteo Browser South Tyrol comes in the form of an R package and its purpose is to access and retrieve meteorological and hydrological time series from the South Tyrolean Meteo Open Data [API](#) in an easy and comprehensive way. This can promote data dissemination and the development of services in several fields such as higher education, hydrology and agriculture (Carolan et al. 2015).

Finally, the developed web application provides a fast and comprehensible solution to access, visualize and download openly available databases exposed to a JSON-based API. This can be further developed and possibly expanded to other networks based on similar APIs and Open Data standardization.

Installation

Install the package *MeteoBrowser* available on [github](#). The *install_github* function from the *devtools* package (Wickham et al. 2018) makes it straightforward. To run the application use the *run_app* function available in the *MeteoBrowser*. Further instructions are available on [github](#).

Usage

The tool creates multiple queries that filter and resample the available data (Fig. 1). Users can interact with leaflet (Cheng et al. 2018) graphical representation of all stations, calculate distances and draw polygons to select the target stations. They can also filter by station, date range, altitude and type of measurement. The latest available measurements (near real-time) can be seen by clicking on the markers in the map. Data time series can

be exported as comma separated values .csv or JSON (JavaScript Object Notation) and the format is compliant to tidy data frames (Wickham 2014), both long and wide tables can be downloaded. The app is available in English, German and Italian. The "readme" tab shows further information about the data, contacts, and the legend of the download table.
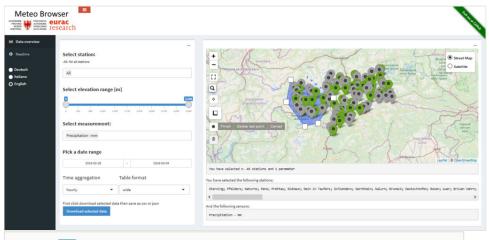

Figure 1. doi

Main dashboard of Meteo Browser South Tyrol. Elements of the page (from left to right): tab and language selector, Station-Measurement selector and download button, map and polygon selection.

Developer Notes

In the aggregation of dates and times the following criteria are used. The hourly time aggregation rounds values up to the nearest integer value ("ceiling" approach). Daily, weekly, monthly, and yearly time aggregations round values down to the nearest integer value ("floor" approach).

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Web location (URIs) and repository

A stable online version is available here: http://meteobrowser.eurac.edu/

The repository is at the following link: https://github.com/GiulioGenova/MeteoBrowser

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