

Catchment Characteristics

Abstract

Catchment characteristics such as geometry, morphometry, land cover, and soil are important bases for the description of catchments and estimation of hydrological conditions using hydrological models. A selection of hydrologically relevant catchment characteristics can be displayed as a grid map and also downloaded in aggregate form for more than 4500 catchments.

Authors: Jan Schwanbeck¹, Alain Bühlmann¹

¹Hydrological Atlas of Switzerland, Hallerstrasse 12, CH-3012 Bern

1 Introduction

Knowledge of the hydrological conditions of an area are of great importance for decisions on flood protection or water management. Ideally, this requires hydrological parameters from long-term discharge data series. As the availability of such data series is temporally and spatially limited, hydrological models are used to close any gaps. These models usually rely on catchment characteristics.

The characteristics considered here quantitatively describe geometry, morphometry, and land cover of catchments. They are suitable for the description of a catchment as well as for comparative analysis of different catchments. The selection of characteristics corresponds to plate 1.2 of the printed issue [1]. A new addition comprises information on aspect and further categories of land cover.

2 Data and Methods

The data sets listed in Table 1 are used to calculate catchment characteristics. The oldest data source is the soil suitability map [2], created in 1980 and slightly revised in 2000. This data is still in use as there is no uniform soil map for the whole of Switzerland. For the water storage capacity calculated from the soil suitability map, the limitation applies that only a relative comparison between catchments is meaningful [1].

The geometric characteristics of area and perimeter are directly taken from the digital catchment area polygons [5], [6].

Morphometric characteristics describe the shape of the terrain surface. These can either be taken directly from a digital terrain model or based on the results of analyses of the terrain model. All available morphometrical characteristics in the Hydrological Atlas are compiled in Table 2. Mean, minimum, and maximum altitude are taken directly from the EU-DEM (see Table 1). For terrain slope and aspect, new data sets are calculated and then statistically analysed. The EU-DEM is

used as it also covers areas outside national borders. This ensures that the parameters of all catchments are based on uniform data.

Table 2. Morphometric characteristics

Symbol	Unit	Description
mH	m a.s.l.	Mean altitude
H _{max}	m a.s.l.	Maximum altitude
H _{min}	m a.s.l.	Minimum altitude
mI	°	Average slope
I ₃	%	Slope < 3°
I ₁₅	%	Slope > 15°
mE	°	Average aspect
E _N	%	Aspect north (315° ≤ E < 45°)
E _E	%	Aspect east (45° ≤ E < 135°)
E _S	%	Aspect south (135° ≤ E < 225°)
E _W	%	Aspect west (225° ≤ E < 315°)

For land cover characteristics, the EU data set “Corine Land Cover CLC” is used (s. Tab. 1), which depicts the land cover of Europe in a 100 m x 100 m grid and a vector data set. It contains a total of 44 land cover classes. If a land cover type occupies an area less than 25 ha, it is added to a neighbouring area, according to a generalisation scheme [7]. In the Hydrological Atlas, the 44 classes of the initial data set are reclassified into the 12 classes listed in Table 3.

3 Use

In the maps on catchment characteristics it is possible to visualise and download the characteristics mentioned above for all catchments in the data and analysis platform. The surface area of each catchment and average altitude is made available in all maps.

Table 1. Geodata and spatial resolution used in the calculation of catchment characteristics

Description	Version	Year	Data type	Resolution	Data source
EU-DEM	1.1	2015	Grid	25 m	[3]
Corine Land Cover CLC	18.5.1	2012	Grid	100 m	[4]
Soil suitability map	1.0	1980 (2000)	Vector	1:200 000	[2]

Table 3. Land cover characteristics and the classes of the initial CLC data set contained therein (cf. Table 1)

Symbol	Description	CLC-classes
A _{glc}	Glaciers	335
A _{wtr}	Water	511, 512, 521–523
A _{wtl}	Wetlands	322, 411, 412, 421–423
A _{roc}	Rock	332
A _{gsi}	Loose rock	131–133, 331, 333, 334
A _{frr}	Forest	311–313
A _{frc}	Coniferous forest	312
A _{frd}	Deciduous forest	311
A _{frm}	Mixed forest	313
A _{bsh}	Bush vegetation	221–223, 244, 323, 324
A _{grs}	Grassy and herbaceous vegetation	141, 231, 321
A _{agr}	Agriculture	211–213, 241–243
A _{urb}	Urban area	111–124, 142

References

- [1] Breinlinger, R., Gamma, P. and Weingartner, R. (1992). Kenngrößen kleiner Einzugsgebiete. In: *Hydrologischer Atlas der Schweiz*. Ed. by "Bundesamt für Umwelt BAFU". Vol. 1. Tafel 1.2. <http://hydrologischeratlas.ch/produkte/druckausgabe/grundlagen/tafel-1-2>. Bern.
- [2] BLW (2000). *Bodeneignungskarte der Schweiz*. <https://www.blw.admin.ch/blw/de/home/politik/datenmanagement/geografisches-informationssystem-gis/download-geodaten.html>. Bern: Bundesamt für Landwirtschaft BLW.
- [3] European Environment Agency (2015). *EU-DEM Upgrade v1.1*. <https://land.copernicus.eu/user-corner/technical-library/eu-dem-v1-1-user-guide>.
- [4] European Environment Agency. *Corine Land Cover version 18.5*. Vol. 2016. <https://land.copernicus.eu/pan-european/corine-land-cover>.
- [5] Bühlmann, A., Schwanbeck, J. and Hauser, F. (2018). *River Catchments*. https://hydromaps.ch/texts/00_Baselayers/waters_overlay/en_baselayers.pdf#view=page&page=1. Hydrological Atlas of Switzerland.
- [6] Schwanbeck, J. et al. (2018). *Hydrometric Networks – Catchments and Data Series*. https://hydromaps.ch/texts/A_Grundlagen/a05_abfluss_Messstationen/a05_en.pdf#view=page&page=1. Hydrological Atlas of Switzerland.
- [7] European Environment Agency (2007). *CLC2006 technical guidelines*. English. <http://dx.publications.europa.eu/10.2800/12134>. Luxembourg: Publications Office. ISBN: 978-92-9167-968-3.