University of Padova

Vauz Basin

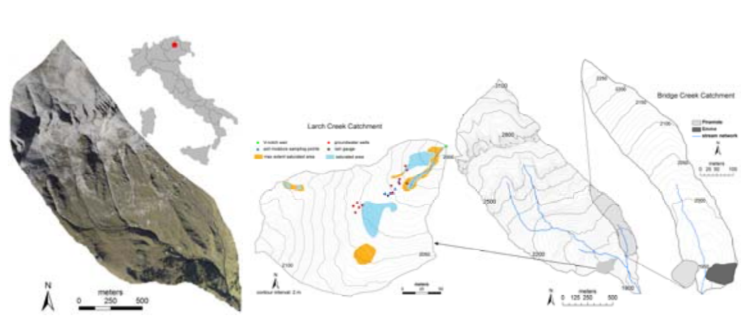
Dolomites, Italy

Department of Land and Agro-Forest Environments

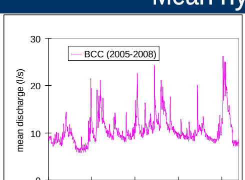
Basin characteristics

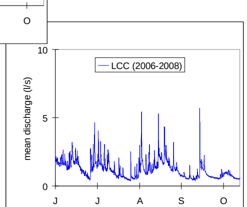
River Basin / River Basin (according EU-WFD)	Vauz Creek Basin
Operation (from... to...)	From 2003 to present
Gauge coordinates / Gauge datum:	46° 29' 19.14'' N; 11° 50' 43.48'' E
Catchment area:	1.9 km². Two monitored subcatchments: 0.14 and 0.032 km²
Elevation range:	1847-3152 m asl
Basin type: (alpine, mountainous, lowland)	Alpine
Climatic parameters: (mean precipitation, temperature and others)	Mean annual precipitation: 1220 mm (49% as snow); average monthly temperature: -5.7 / 14.1°C
Land use:	Alpine grassland, scattered shrubs, conifers (*Picea abies*, *Larix decidua*)
Soils:	Cambisoil with by clay or silty-clay layers underlying a deep organic matter portion
Geology:	Upper Triassic Dolomitic formations + Quaterary till deposits
Hydrogeology: (Type of aquifers, hydraulic conductivity)	Ksat: $1.1*10^{-4}$ to $2.0*10^{-7}$ m/s; mean: $1.1*10^{-6}$ m/s.
Characteristic water discharges: (Q_{min}, Q_{max}, Q_{mean})	LCC: 0.01-16.5 l/s; BCC: 4.0-90.6 l/s

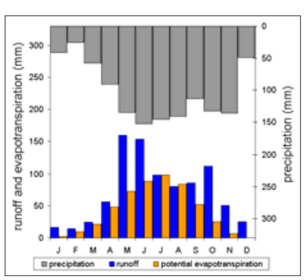
Map of the research basin



Mean hydrograph / Climatic conditions







Special basin characteristics (hydrogeology, lakes, reservoirs etc.)

Main hydrological processes in reference to geological units

(Gardi L., 2003: *Hydrogeology of the Cordevole catchment*. Free University of Amsterdam, Faculty of Earth and Life Sciences, modified)

Hydrogeological processes	Dolomite	Volcanic tuffs	Alluvium	Morain deposits
Interception	0	X	0	0
Transpiration	0	X	0	0
Surface storage	0	X	0	0
Ground water storage	X	0	XX	0
Ground water flow	X	0	XX	0
Surface runoff	0	XX	0	XX
Evaporation	0	X	0	0
Infiltration	X	X	XX	0
Interflow	0	XX	0	X

Instrumentation and data

Measured hydrological parameters	Measuring period	Temporal resolution	Number of stations
streamflow	May-October 2005-2009 winter 2008-2009	5 min. (15 min. in 2009)	2
precipitation	May-October 2005-2009	impulse (0.2 mm)	2
soil moisture at 0-6, 0-12 and 0-20 cm depth	summer months 2005-2009	manually, twice a day	three hillslopes:26+26+64
soil moisture at 0-30 cm depth	May-October 2005-2009	1 hour (15 min. in 2009)	4
groundwater level	May-October 2005-2009 winter 2008-2009	5 min. 15 min. in 2009)	50
environmental isotopes ^{2}H, ^{18}O	event based	event dependent	event dependent

Applied models

1. snowmelt (Cazorzi & Dalla Fontana, 1996)
2. shallow landslides (Borga et al., 1998, 2002a,2002b)
3. kinematic subsurface wave model (Norbiato & Borga 2008)
4. Teuling's soil moisture model (Penna et al., 2009)
5. ARFFS continuous hydrological model (Norbiato et al., 2009)

Main scientific results

1. Quick hydrological response of streamflow due to the fast soil saturation of the riparian zone.
2. Different dynamics of groundwater in the near- and far-stream zone → hysteretic behaviour between streamflow and basin-averaged water table level and between groundwater in the riparian and hillslope zone.
3. Threshold effect in the soil moisture-streamflow relathionship: initial moisture condition determine the extent of the riparian zone close to saturation. Similar non linear behaviour between antecedent moisture condition, runoff coefficient and water table: surface and subsurface runoff generation occur above a soil moisture threshold of 45-48%.
4. Strong linear correlation between streamflow and precipitation amount above a 20 mm rain threshold; when this value is exceeded also subsurface flow from the hillslopes and the entire watershed contributes to flow.
5. Good temporal stability of spatial patterns of soil moisture over three sampled hillslopes, mainly due to soil properties; strong correlation among moisture patterns at different depths.
6. Detections of CASMM (Catchment Average Soil Moisture) sites within the sampled hillslopes.
7. Marked effect of dew on the 0–6 cm soil depth layers: the surface layers are usually wetter and show lower space–time variability than deeper soil layers, particularly during dry-down.
8. Negative relationship between the mean soil moisture and the standard deviation. The spatial variability patterns are well represented by linear negative functions between the mean and the coefficient of variation of soil moisture.
9. Pre-event water contribution to total discharge accounts between 29 and 78%.

Key references for the basin

1. CAZORZI, F., DALLA FONTANA, G., 1996. Snowmelt modelling by combining air temperature and a distributed radiation index. *Journal of Hydrology. 181, 169–187.*
2. BORGA, M., DALLA FONTANA G., DA ROS D. and L. MARCHI, 1998: Shallow landslide hazard assessment using a physically based model and digital elevation data. *Journal of Environmental Geology*, *35(2-3), 81-88, 1998.*
3. BORGA, M., G. DALLA FONTANA, C. GREGORETTI, and L. MARCHI: Assessment of shallow landsliding by using a physically based model of hillslope stability. *Hydrological Processes, 16, 2833-2851, 2002a.*
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8. NORBIATO, D., M. BORGA, R. MERZ, G. BLÖSCHL and A. CARTON, 2009: Controls on event runoff coefficients in the eastern Italian Alps. *J. Hydrology*, *375, 312-325*

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