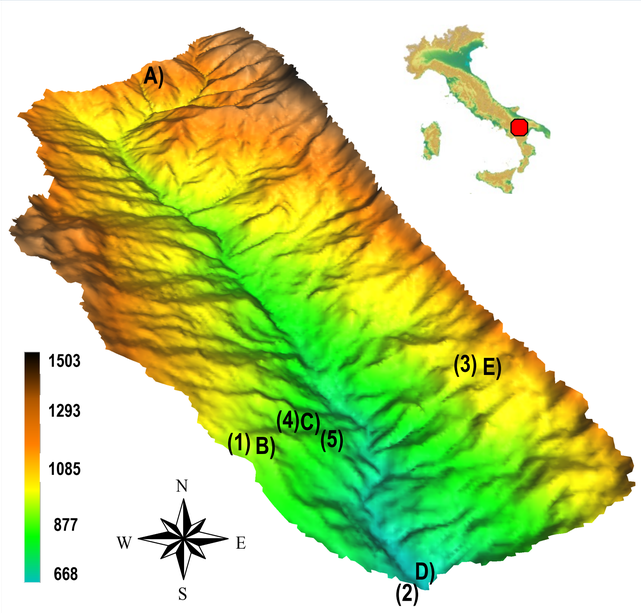
Fiumarella of Corleto

Corleto Perticara (PZ), Italy

Basin characteristics

River Basin / River Basin (according EU-WFD)	Fiumarella of Corleto
Operation (from… to…)	from 2002 to present
Gauge coordinates / Gauge datum:	40°24’ 11.86’ ’ N – 16°03’ 13.93’ ’ E
Catchment area:	32.5 km^2, with a nested subcatchment of 0.65 km^2
Elevation range:	630 – 1380 m asl
Basin type: (alpine, mountainous, lowland)	mountainous
Climatic parameters: (mean precipitation, temperature and others)	600 mm; 9.9°C (2002 – 2011)
Land use and soils:	One slope on the left is covered mostly by forests, the slope on the right is covered by agricultural land. For more details see the soil-landscape map below.
Hydrogeology: (soil porosity, field capacity, hydraulic conductivity)	soil porosity ranges from 0.5 to 0.59; field capacity 0.35 to 0.487; hydraulic conductivity Ks = 5.05 to 12 mmh^{-1}
Characteristic water discharges: (Q_{min}, Q_{max}, Q_{mean})	0 m^3/sec; 38.5 m^3/sec; 0.94 m^3/sec

Map of the basin and Monitoring System

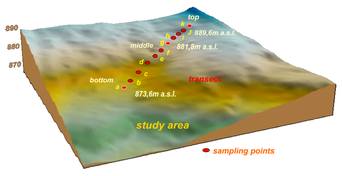


Hydrological monitoring system

(1) Meteo-hydrological station

(2) Hydrometer and rain-gauge

(3) Rain-gauge

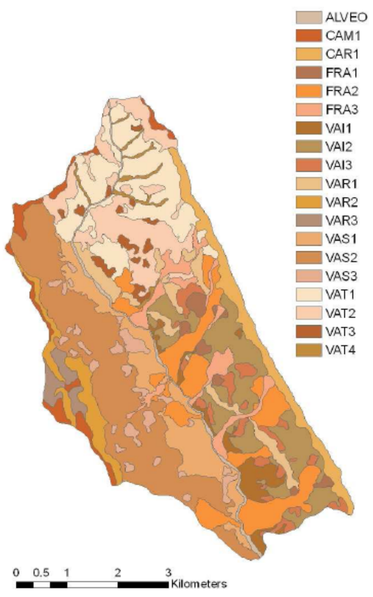


(4) Soil moisture monitoring

(5) Gauging station

A), B), C), D), E) spot and transect TDR sites

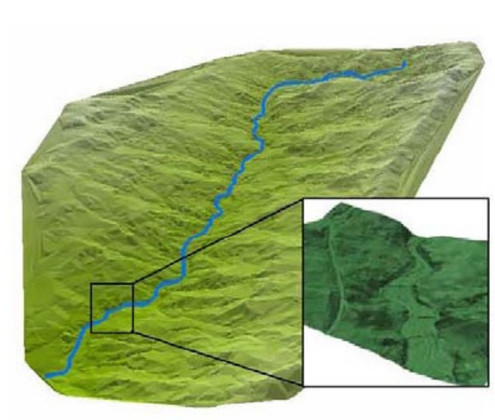
Land system map and physical-hydraulic characteristics

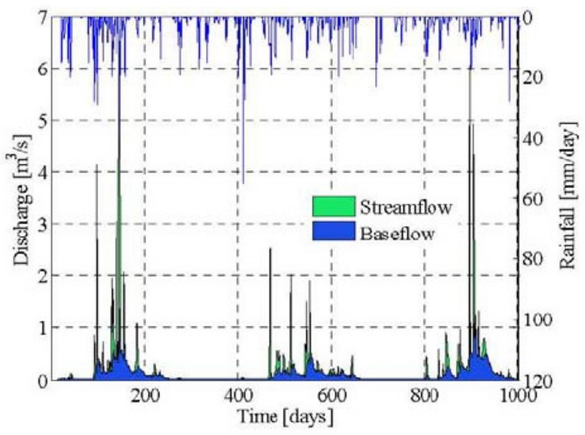


UNIT	% CLAY	% SAND	% SILT	DEPTH (cm)	POROSITY INDEX	ORGANIC MATTER	θ_c (field capacity)	θ_r	θ_s	K_s (mm/h)	LAND USE
ALVEO	0	0	0	70	4.5	0	0.35	0.15	0.45	12	bare soil
CAM1	29.17	34.97	35.85	72	8.4	2.66	0.372	0.198	0.494	11.45	forest
CAR1	27.8	30.81	41.4	90	6	1.86	0.352	0.18	0.494	10.35	grass
FRA1	41.65	15.07	43.28	53	10	1.76	0.43	0.248	0.528	5.35	agricultural areas
FRA2	41.65	15.07	43.28	53	10	1.76	0.43	0.248	0.528	5.35	agricultural areas
FRA3	41.65	15.07	43.28	53	10	1.76	0.43	0.248	0.528	5.35	agricultural areas
VAI1	41.65	15.07	43.28	53	10	1.76	0.43	0.248	0.528	5.35	agricultural areas
VAI2	31.53	21.59	46.88	80	8.4	1.93	0.386	0.2	0.508	7.5	agricultural areas
VAI3	42.22	18.49	39.28	80	10	2.73	0.454	0.264	0.526	5.86	agricultural areas
VAR1	38.37	17.12	44.51	60	7.6	2.65	0.441	0.244	0.522	5.96	shrubs
VAR2	37.65	33.79	28.55	20	8.4	4.68	0.465	0.269	0.509	9.76	forest
VAR3	38.01	25.46	36.53	60	8.4	2.73	0.425	0.243	0.515	7.63	forest
VAS1	35.46	23.19	41.35	70	8.4	2.9	0.426	0.233	0.513	7.41	forest
VAS2	42.67	17.16	40.16	60	10	2.71	0.458	0.266	0.528	5.6	forest and heterogeneous vegetation
VAS3	47.68	16.17	36.15	50	10.8	3.02	0.487	0.296	0.534	5.05	forest and heterogeneous vegetation
VAT1	medium-fine	medium-fine	medium-fine	35	6.5	medium-fine	0.406	0.2	0.5	7.5	forest
VAT2	medium-fine	medium-fine	medium-fine	35	6.5	medium-fine	0.406	0.2	0.5	7.5	shrubs
VAT3	medium-fine	medium-fine	medium-fine	35	6.5	medium-fine	0.406	0.2	0.5	7.5	shrubs
VAT4	medium-fine	medium-fine	medium-fine	35	6.5	medium-fine	0.406	0.2	0.5	7.5	forest

Physical and hydraulic characteristics of the land system units

Rainfall, superficial runoff and base flow components





3-D elaboration morphology and basin response with the definition of the superficial runoff and base flow components obtained using a matematical filter (see *Manfreda et al.,* 2003)

Instrumentation and data

Measured hydrological parameters	Measuring period	Temporal resolution	Number of stations
Streamflow	from september 2002 to present (basin outlet) from december 2006 to present (sub-basin outlet)	15 min. (basin outlet) 2 min. (sub-basin outlet)	2
Precipitation	from september 2002 to present	10 min.	3
Air temperature	from september 2002 to present	hourly	1
Air humidity, pressure, solar radiation	from november 2004 to present	hourly	1
Wind (velocity and direction)	from november 2004 to present	10 min.	1
Temperature of the snow layers	from december 2007 to present	hourly	1
Depth snowpack	from december 2007 to present	hourly	1
Soil moisture at 30-60 cm depth (continuous)	from february 2006 to present	hourly	1 with 22 probes
Soil moisture at 0-30 cm depth (spot measurements)	3 march – 18 may 2010	manually twice a week	48 points

Applied models

1. AD2
2. AD3
3. DREAM
4. DREAM 1.1
5. MISDc

Main scientific results

RUNOFF GENERATION MECHANISMS [3,8]

At the small scale (0.65 km^2), the basin response shows a rapid change as the antecedent soil moisture content reaches a value close to the field capacity of the soil. Changing from the small scale (surface of 0.65 km^2) up to the medium scale (surface of 32 km^2) the threshold mechanism in runoff production is less detectable because masked by the increased spatial heterogeneity of the vegetation cover and soil texture that makes difficult to parameterize the behavior of the whole basin with only a field capacity value.

REMOTE SENSING OF SOIL MOISTURE [1]

We investigated the use of the National Oceanic and Atmospheric Administration – Advanced Microwave Sounding Unit-A (NOAA-AMSU-A) radiometer for the remote characterization of soil water content. To this aim, a field measurement campaign, lasted about thre months (3 March 2010–18 May 2010), was carried out using a portable time-domain reflectometer (TDR) to get soil water content measures over five different locations within an experimental basin. The reliability of AMSU-based indices has been explored using a field monitoring campaign and a long term hydrological simulation. Results show how well AMSU-based indices may describes the SM seasonal fluctuations, especially after the application of a low pass filter.

SPATIAL AND TEMPORAL VARIABILITY OF SOIL MOISTURE [2, 4, 5]

The statistical structure of soil moisture patterns has been examined using soil moisture measurements over a hillslope transect of the experimental basin “Fiumarella of Corleto”, located in Southern of Italy. The results shows that the spatial variability of the soil moisture increases with the mean soil moisture and reaches a maximum at 0.35 then it starts to decrease again. This result is due the intrinsic characteristic of the process that is bounded between two possible states: the saturation and the dryness. These results are also consistent with other experimental campaigns.

Key references for the basin

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2. **Fiorentino, M., Manfreda, S., Margiotta, M.R., Onorati, B.:** *Risultati delle indagini sperimentali condotte sul bacino Fiumarella di Corleto,* **Tecniche per la Difesa dall'Inquinamento, Editoriale Bios, pp. 167-178, 2010.**
3. **Onorati, B., Margiotta, M.R., Carriero, D., Manfreda, S., Fiorentino, M.:** *Experimental Evidence on Runoff Generation Mechanisms*, **Variability in space and time of extreme rainfalls, floods and droughts Proceedings of the AMHY-FRIEND International Workshop on Hydrological Extremes, held at University of Calabria, Cosenza (Italy), June 6-8, 2009.**
4. **Manfreda, S., Onorati, B., Iacobellis, V., Margiotta, M.R.**, *Indagine sperimentale sulla variabilità spazio-temporale dell'umidità del suolo*, **29° Convegno di Idraulica e Costruzioni Idrauliche, 2008.**
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6. **Carriero, D., Manfreda, S., Fiorentino, M.**: *Snowmelt processes within the experimental basin of "Fiumarella of Corleto"*, **International Workshop on Hydrological Extremes AMHY-FRIEND group: "Observing and modelling exceptional floods and rainfalls" edit by E. Ferrari and P. Versace, pp. 201-212, 2006.**
7. **Carriero, D., Romano, N., Fiorentino, M.** *A simplified approach for characterizing soil hydrologic behavior at basin scale*. **Rivista di Ingegneria Agraria. vol. 2, 2006.**
8. **Fiorentino M., D. Carriero, V. Iacobellis, S. Manfreda, I. Portoghese,** *MEDCLUB - starting line and first activities*, **In: Predictions in Ungauged Basins: Promises and Progress edited by Murugesu Sivapalan, Thorsten Wagener, Stefan Uhlenbrook, Erwin Zehe, Venkat Lakshmi, Xu Liang, Yasuto Tachikawa & Praveen Kumar, ISBN 1-901502-48-1, IAHS Publ. 303, 2006.**

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