Rio Cordon

Veneto region

Belluno province

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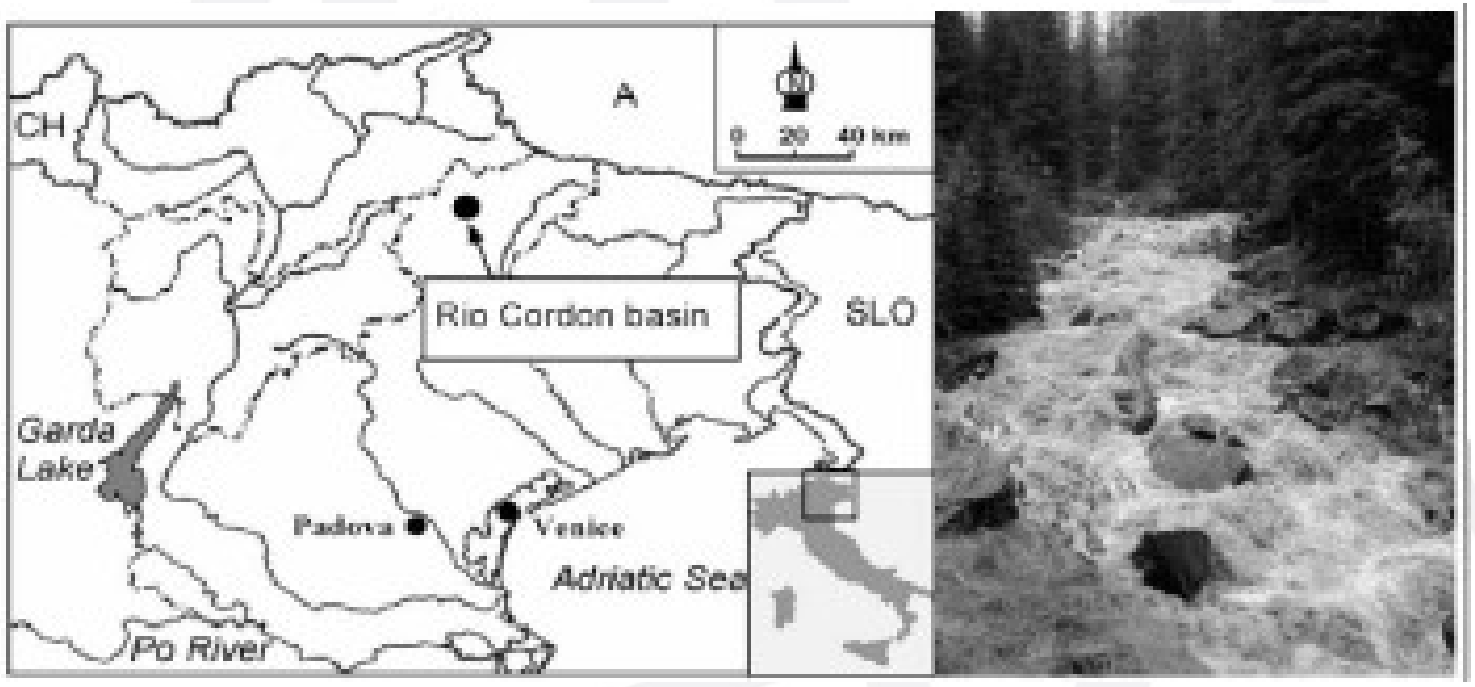
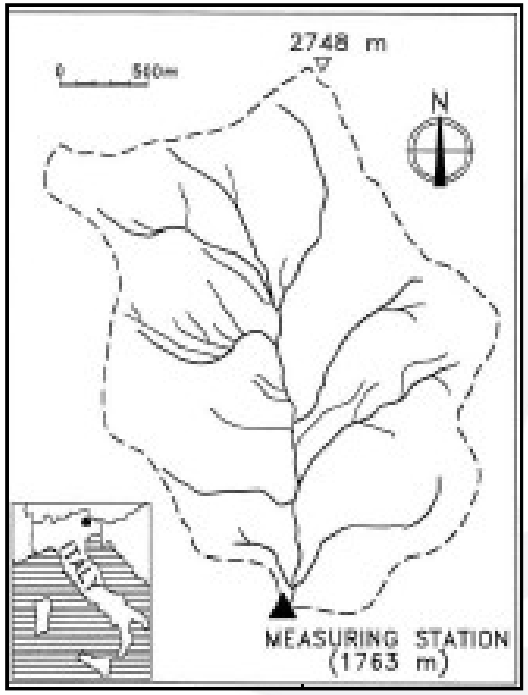
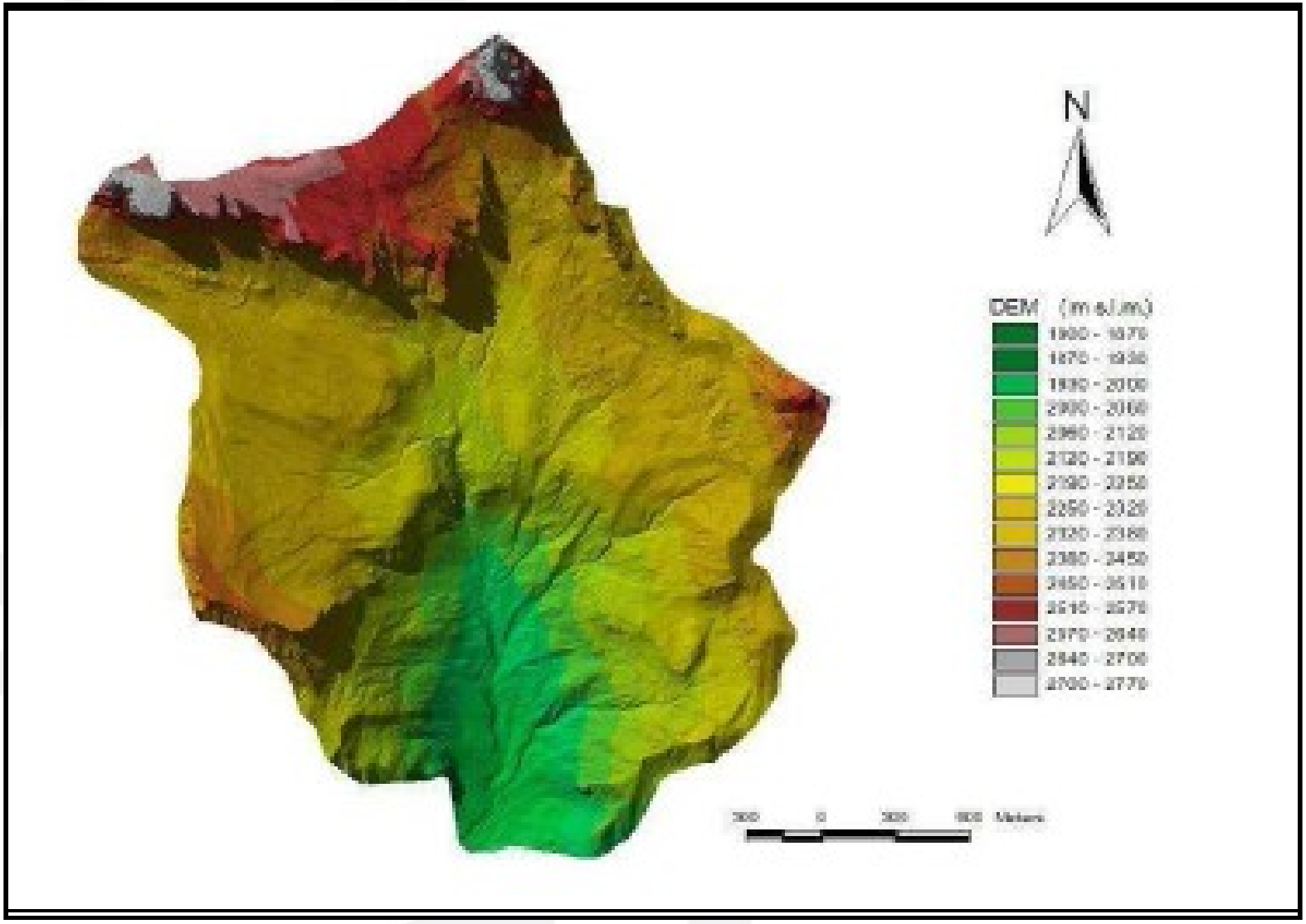
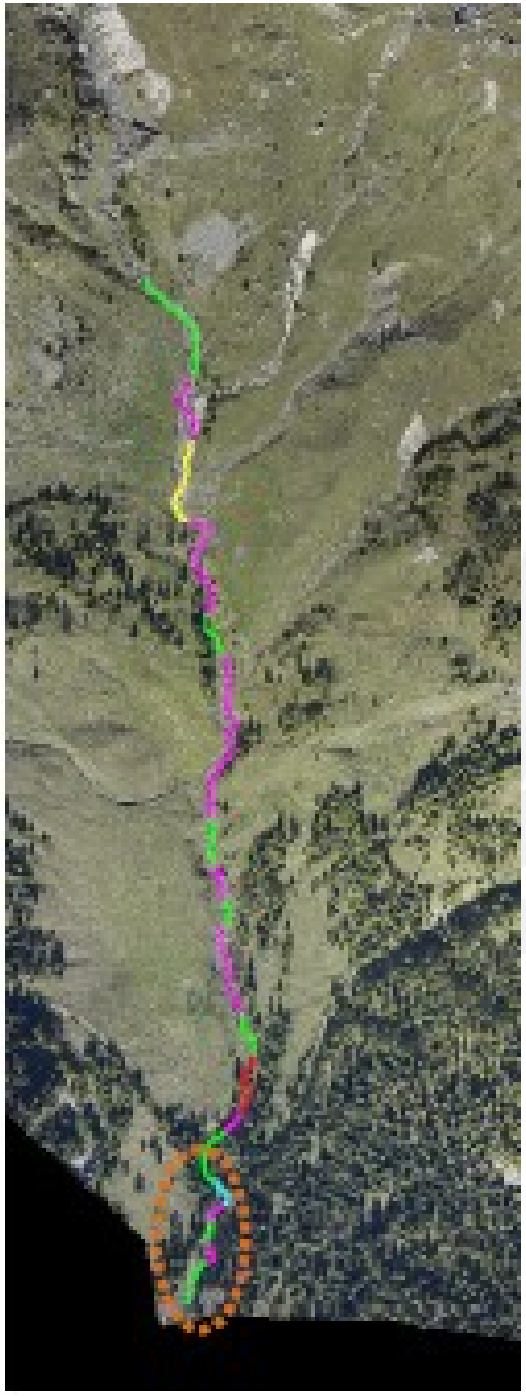
The small alpine catchment is located inside the dolomitic region (Veneto Region), in the north-east portion of the Italian Alps.
The Rio Cordon basin (5.0 km2) is provided, at the close section, of a monitoring station realized by ARPAV for the liquid and solid discharges evaluation.




2748 m
0 500m
N
MEASURING STATION
(1763 m)


N
DEM (m a.s.l.m.)
1900 - 1970
1970 - 1930
1930 - 2010
2010 - 2060
2060 - 2120
2120 - 2190
2190 - 2260
2260 - 2320
2320 - 2380
2380 - 2450
2450 - 2510
2510 - 2570
2570 - 2640
2640 - 2700
2700 - 2770
Meters

Rio Cordon	
Catchment area (km^2)	5.0
Minimum elevation (m a.s.l.)	1763
Maximum elevation (m a.s.l.)	2748
Average elevation (m a.s.l.)	2198
Mean hillslope gradient(%)	52
Mean width of the main channe l (m)	5.7
Mean gradient of channel upstream the station (%)	13.6
Mean annual rainfall (mm)	1100
Length of the main stream (km)	2.84
Maximum flow discharge (m^3/s)	10.4
Mean flow discharge (m^3/s)	0.26
Minimum water discharge measured (m^3/s)	0.05



Channel morphologies

depositional

glide cascade

mixed (SC-StP)

step pools

stepped cascade

PP3 UNIPD Bedload monitoring (surrogate techniques)

Along the main stream, at 1763 m a.s.l. (close section), on 1986 ARPAV installed a gauge station for discharge and sediment transport measuring.

The facility for measuring sediment transport operates by *separating coarse bedload transport from fine sediment and water*

The experimental station installed instruments allow the record continuously of:

- *bedload transport;*
- *suspended sediment transport;*
- *water discharge;*
- *physical-chemical water quality characteristics;*
- *other parameters for the hydraulic flow characterization.*

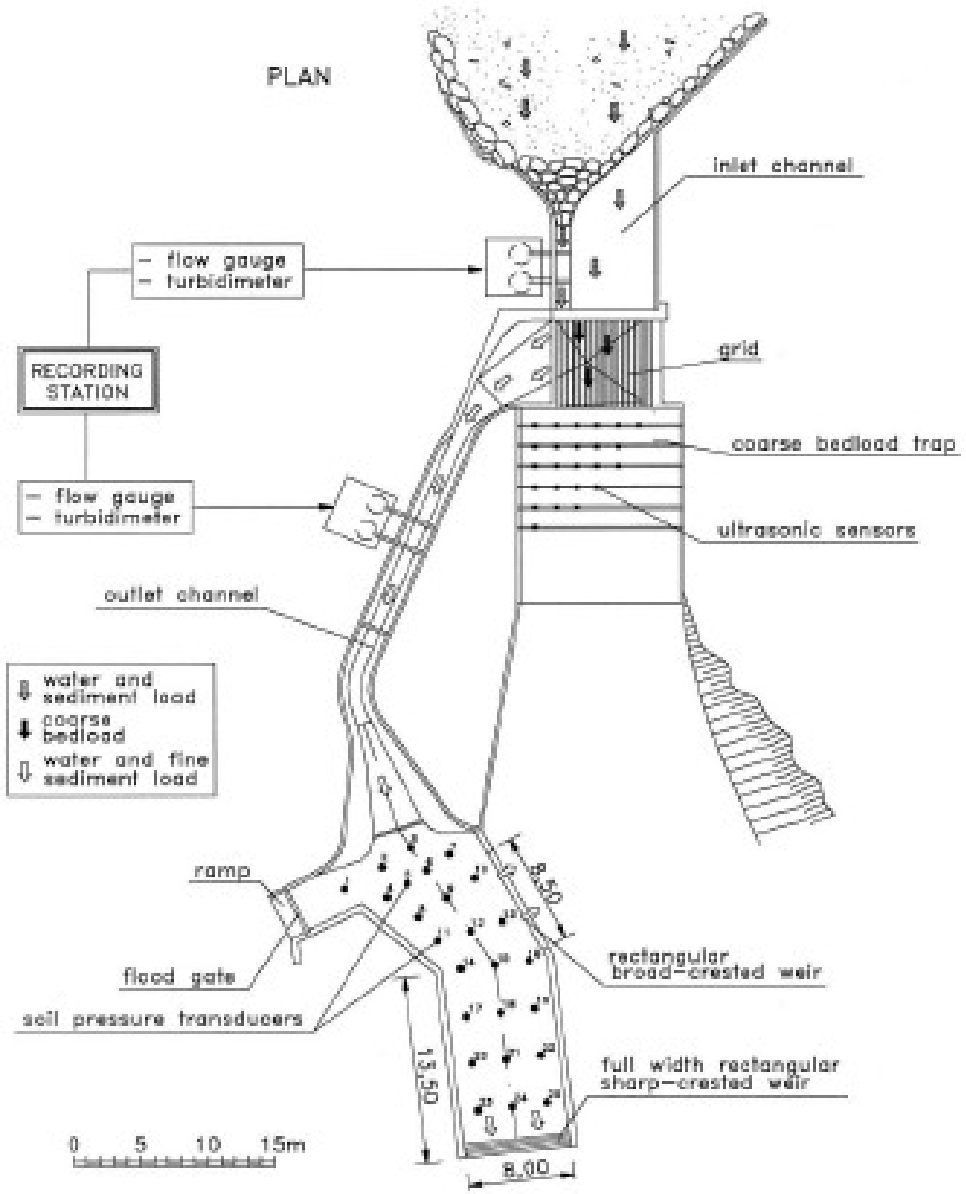


Figure 5. Rio Cordon catchment, close section at 1760 m a.s.l.: plan view of the ARPAV gauge station for discharge and sediment transport measuring (from: Lenzi et al., 1999)

The measuring device of the Cordon creek consists of :

· *1 inlet channel (Fig. 6e);*

· *1 grid allowing coarse sediment to be separated from the water and fine sediments (Fig. 6c and 6d);*

· *1 diversion pool for water and fine material flowing through the grid (Fig. 6b);*

· *1 outlet channel to convoy water and fine material (Fig. 6a and 6f);*

· *an enlargement for coarse material deposition limited by two walls, supporting a structure with ultrasonic sensors, being able to measure, in real time, the deposited coarse material (Fig. 6c and 6d);*

· *2 small buildings where the sensors, the recording instruments and the system for data acquisition are housed (Fig. 6a);*

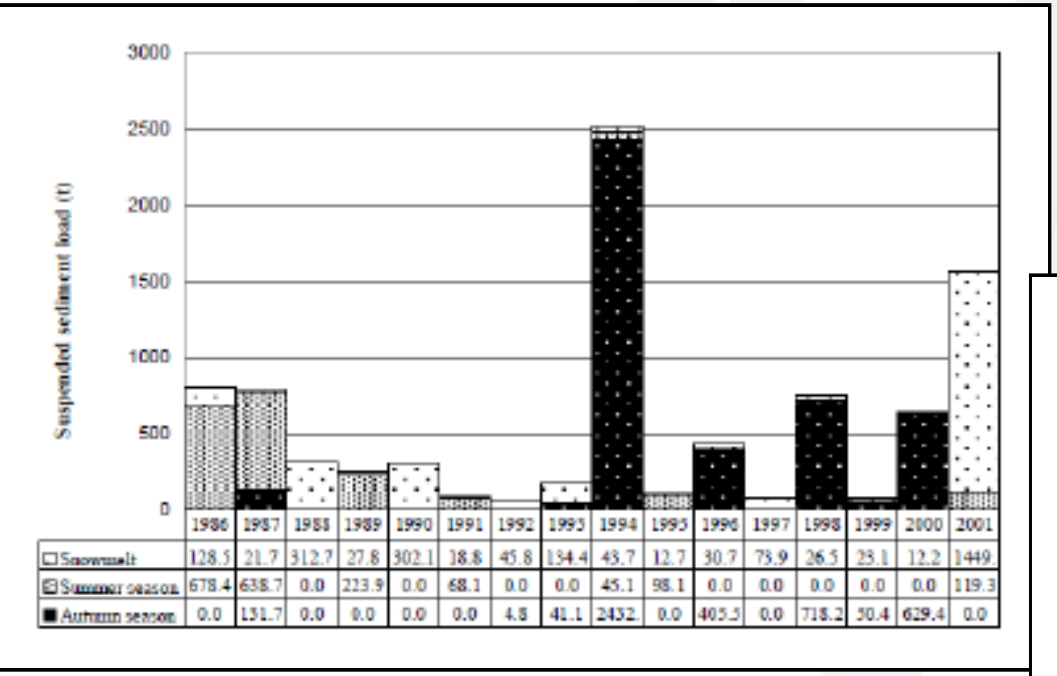
· *sensors for the recording of suspended sediment, water discharge and water quality characteristics.*

· *2 pluviographs located at the measuring station (basin close section) and at the basin watershed.*

Figure 6. Photos of the Rio Cordon ARPAV experimental measuring station (from: Mao et al., 2010)

Figure 7. ARPAV monitoring station: frontal view of the depositional place and of the separating grid for the coarse bedload (from: Il Bacino Attrezzato del Rio Cordon, Regione Veneto, 1992), and outlet channel for the finer sediment deposition

The data recorded by the monitoring station allowed a lot of analyses on sediment transport processes. For example, annual budgets of the suspended and bedload solid transports for the period 1986–2001, divided into snowmelt, summer and autumn seasons.



Year	Suspended sediment load (t)	Bedload (t)	Total sediment load (t)	Suspended/total sediment load (%)	Annual contribution of suspended load to the total 16 years sediment load (%)
1986	806.9	0.0	806.9	100	9
1987	792.1	85.6	877.7	90	9
1988	312.7	0.0	312.7	100	3
1989	251.8	145.6	397.3	63	3
1990	302.1	0.0	302.1	100	3
1991	86.9	67.2	154.1	56	1
1992	50.6	15.5	66.1	77	1
1993	175.4	17.2	192.7	91	2
1994	2521.5	1543.4	4064.8	62	28
1995	110.8	10.3	121.1	91	1
1996	436.2	94.7	530.9	82	5
1997	73.9	0.0	73.9	100	1
1998	744.7	516.8	1261.4	59	8
1999	73.4	32.7	106.1	69	1
2000	641.6	92.2	733.7	87	7
2001	1568.5	174.0	1742.5	90	18
Total	8949.1	2795.1	11744.2	76	100