San Salvador catchment
Upper Aragón valley, Spain

Basin characteristics
River Basin / River Basin (according EU-WFD)
Estarrón river basin / Aragón river basin

Since 1998, still in operation

Operation (from… to…)

Gauge coordinates / Gauge datum:
42°37'51" N/0°38'33" W m a.s.l.

Catchment area:
0.92 km²

Elevation range:
878-1325 m a.s.l.

Basin type:
Mountainous

( alpine, mountainous, lowland)

Climatic parameters:
(mean precipitation, temperature and others)
929,7 mm (1999-2006)

Land use:
98% forest, 1% shrubs, 0% grass, 1% bare soil

Soils:
Regosols, Cambisols, Kastanozems and Phaeozems

Geology:
Eocene flysch

Hydrogeology:
Limestones

(Type of aquifers, hydraulic conductivity)

Regosols, Cambisols, Kastanozems and Phaeozems

Characteristic water discharges:
0.0 l/s, 6.45 l/s, 1200 l/s

Instrumentation and data

Measured hydrological parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measuring period</th>
<th>Temporal resolution</th>
<th>Number of stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream flow</td>
<td>1999 – cont.</td>
<td>5 min</td>
<td>1</td>
</tr>
<tr>
<td>Precipitation</td>
<td>1999 – cont.</td>
<td>5 min</td>
<td>1</td>
</tr>
<tr>
<td>Air temp., Air hum, wind speed, radiation</td>
<td>1999 – cont.</td>
<td>Impuls/ 0.2 mm</td>
<td>2</td>
</tr>
<tr>
<td>Groundwater level</td>
<td>2005, 2007 – cont</td>
<td>20 min</td>
<td>2</td>
</tr>
<tr>
<td>Soil temp.</td>
<td>2007 – Cont</td>
<td>20 min</td>
<td>2</td>
</tr>
<tr>
<td>Throughfall</td>
<td>2006 – 2007 – 2008</td>
<td>At event scale 2/3 month</td>
<td>3</td>
</tr>
<tr>
<td>Streamflow</td>
<td>April 2006 – 2007 – March 2008</td>
<td>At event scale 2/3 month</td>
<td>3</td>
</tr>
<tr>
<td>Soil water moisture</td>
<td>2008 – Cont</td>
<td>20 min</td>
<td>3</td>
</tr>
</tbody>
</table>

Main scientific results

1. Rainfall and runoff show a strong non-linearity during the hydrological year; streamflow response is determined by catchment moisture conditions, in particular by water-table dynamics.

2. The water table level seems to have a large influence on the discharge: the discharge of the San Salvador catchment only increases in the event of rainfall when the soil is previously saturated, that is, when the water table is close to the soil surface at the start of the rainfall event. It is interesting to note that the water table level undergoes intense fluctuations, with sharp falls once rainfall has ceased.

3. The rainfall events at the beginning of the hydrological year (autumn) produce no or only a very limited hydrological response in the catchment, even though they are relatively intense. This should be attributed to the exhaustion of the water reserves by the previous dry period and the high water consumption by vegetation.

4. The only high flow period in San Salvador arises in spring and coincides with the long rainy period with continuous rainfall from the season.

5. There is no discharge increase in the San Salvador catchment at the end of the hydrological year.

6. The discharge responses to rainfall events are very variable, in the range 0 to 1300 Ls⁻¹ km⁻², and are not related to the volume or intensity of rainfall.

7. Most sediment exported from the San Salvador catchment is in the form of solutes (75% of the total), and the rest is suspended sediment. There is no bedload.

8. Throughfall (the precipitation that falls directly to the ground) is important in the basin of San Salvador due to the dense cover of forest. Throughfall depends on the type of tree and on the season. In summer it represents 71.7 % of the rainfall under beech, whereas in winter it increases up to 83 % under the same type of tree ; 81.85 % under oak and 82.19 % under pine. Such differences are related to the percentage of coverage of each one of the species in every season of the year. Thus, in summer the coverage in the beech plot is 95 %, in the oak plot is around 73 % and in the pine plot is slightly lower; 54 %. In winter the coverage in the deciduous tree plot is only 49 % and in the oak plot is 40 %. Pine cover remains relatively stable the whole year and therefore throughfall does not show seasonal differences. Although oak coverage decreases in winter, throughfall under oak remains more or less stable during the whole year.

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Key references for the basin

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Special basin characteristics (hydrogeology, lakes, reservoirs etc.)
The entire catchment is covered by a dense forest of Pinus sylvestris, Fagus sylvatica (in the shady concavities) and Quercus gr. faginea (areas with a sunny aspect). Soils are relatively deep (generally in excess of 50 cm), more in the shady than in the sunny aspect, where some evidence of old agricultural activities appears, particularly in the lower part.

Few contrasts can be found between the north- and the south-facing slopes of the catchment.