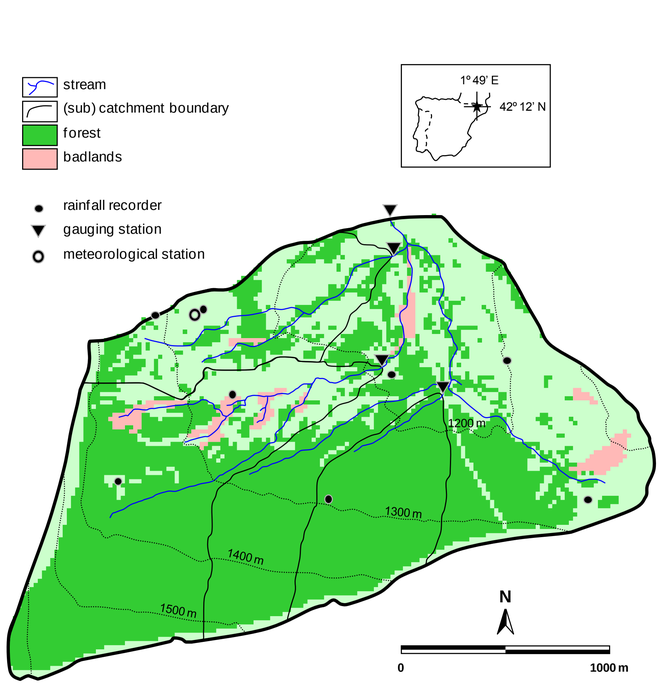
Vallcebre research basins

Vallcebre (Eastern Pyrenees), Spain

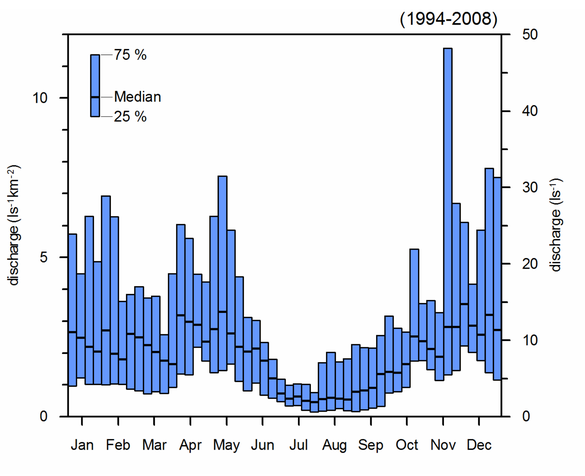
Basin characteristics

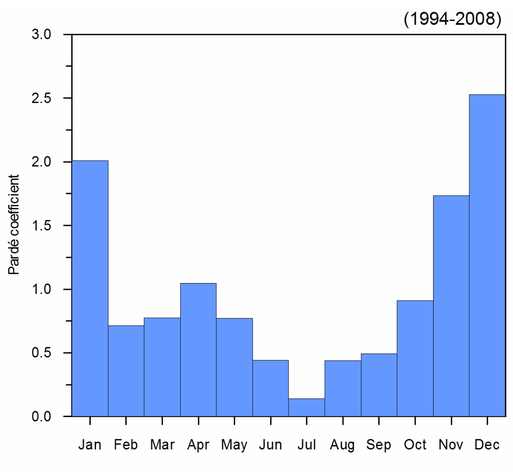
River Basin / River Basin (according EU-WFD)	Saldes river basin / Llobregat river basin
Operation	Since 1991, still in operation
Gauge coordinates / Gauge datum:	402948;4672832 UTM (31n) / 1104 m a.s.l.
Catchment area:	0.56-4.17 km^2
Elevation range:	1104-1643 m a.s.l. (mean = 1299 m a.s.l.)
Basin type:	Mountainous
Climatic parameters:	Sub Mediterranean climate . 862 (1983-2006), 90 rainy days per year, snowfall less than 5% / 9.1ºC
Land use:	60 % Scots Pine, 21% meadows, 9% sparse vegetation, 7% bedrock outcrop, 3% bad-lands
Soils:	Silt loam, silty clay loam / soil thickness: 0 to 3m
Geology:	Limestones, mudstones
Hydrogeology: (Type of aquifers, hydraulic conductivity)	Shallow aquifers, ± connected / perched with respect to regional aquifer
Characteristic water discharges: (Q_{min}, Q_{max}, Q_{mean})	0 $ls^{-1}km^{-2}$, 1093 $ls^{-1}km^{-2}$, 7 $ls^{-1}km^{-2}$ (daily values, 1994-2008)

Map of the research basin



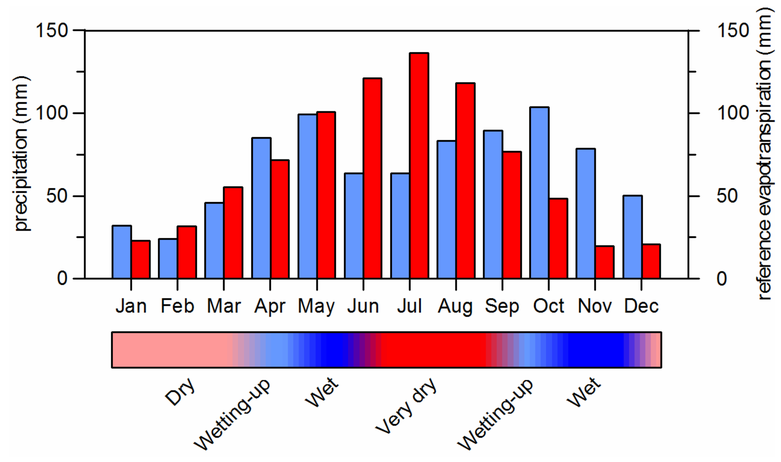
Mean hydrograph / Pardé flow regime





Special basin characteristics

Mean monthly rainfall (blue) and reference evapotranspiration (red). The dynamics of rainfall and evaporative demand during the year cause the succession of dry and wet periods separated by wetting-up phases.



Instrumentation and data

Measured hydrological Parameters	Measuring period	Temporal resolution	Number of stations
Precipitation	1982-1989 1989-cont.	Daily 0.2 mm	1 2-10
Meteorological variables	1989-cont.	5min	1-2
Stream flow	1991-cont.	2min/20min	3-4
Suspended sediment concentration	1995-cont	Automatic samplers 2min	3
Soil water content (0-80cm, TDR)	1994-cont	weekly	6-9 profiles
Soil water tension	1996-1999	10 min	2 profiles
Groundwater level	1994-2003 1995-2006 2006-cont	Weekly 20 min 10min	1 3 20
Rainfall interception	1993-2003 P. Sylvestris 2004-cont Q. Pubescens	5min	1 (9 troughs) 1 (6 troughs)
Trees transpiration (sap flow)	1994-2000 P. Sylvestris 2003-2005 P. Sylvestris 2003-2005 Q. Pubescens	15 min	1 (7 trees) 1 (12 trees) 1 (12 trees)

Applied models

1. Shetran, 2. Topmodel, 3. Topkapi , 4. Sacramento, 5. Kineros

Main scientific results

1. Rainfall interception in forests represents up to 24% of annual precipitation, and is especially efficient during both long rainy periods under atmospheric wet conditions and shorter rainfall events of moderate intensity under atmospheric dry conditions.
2. Soil moisture shows a temporal pattern characterised by significant and frequent changes and by the occurrence of marked deficit periods in summer and, eventually less pronounced, in winter.
3. The overall response to water deficits of Scots pine and Pubescent oak is similar, but Scots pine is more sensitive to soil drought, reducing markedly its transpiration during dry summer periods.
4. The rainfall-runoff relationship at the basin scale is strongly non-linear along the year. Above a given threshold, the water table position can influence the rainfall-runoff relationship. Finally three types of characteristic hydrological behaviour with different dominant runoff generation processes happen during the year.
5. Suspended sediment concentrations are very low in waters coming from vegetated areas but very high in basins with badlands areas. The seasonal pattern of erosion processes in badlands areas is characterised by physical weathering during winter, severe regolith breakdown during spring, intense erosion in summer, and efficient transport in autumn.
6. Tests performed with several types of hydrological models demonstrate their capacity to simulate accurately basin response during wet periods, but also stress the need of an increased model complexity to simulate properly runoff events during summer and wetting up periods and to improve the overall basin water balance.

Key references for the basin

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3. Gallart, F., Balasch, C., Regüés, D., Soler, M. and Castelltort, X. (2005a). Catchment dynamics in a Mediterranean mountain environment: the Vallcebre research basins (South Eastern Pyrenees) II: temporal and spatial dynamics of erosion and stream sediment transport. In: C. Garcia and R.J. Batalla (eds.): *Catchment Dynamics and River Processes: Mediterranean and Other Climate Regions*. Elsevier, pp. 17-29.
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Contact

Francesc Gallart, Pilar Llorens, Jérôme Latron
Surface Hydrology and Erosion Group, Institute of Environmental Assessment and Water Research (IDÆA), CSIC. Solé i Sabaris s/n 08028 Barcelona, Spain
E-mail: francesc.gallart@idaea.csic.es , pilar.llorens@idaea.csic.es , jerome.latron@idaea.csic.es
Web Page: http://www.idaea.csic.es/ **(Geosciences Department/ Surface Hydrology and Erosion Group)**