

THE PENHAS DOURADAS OBSERVATORY SERRA DA ESTRELA, PORTUGAL

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Abstract

This is a short description of the Portuguese Observatory of “Penhas Douradas”, celebrating its centenary this year 2003, its location, climate and history. The observing programmes in this site are referred in relation with its importance in the national network, for climate assessment, for weather watch and also for atmospheric composition monitoring in Mainland Portugal.

Location



Picture of the Penhas Douradas Observatory

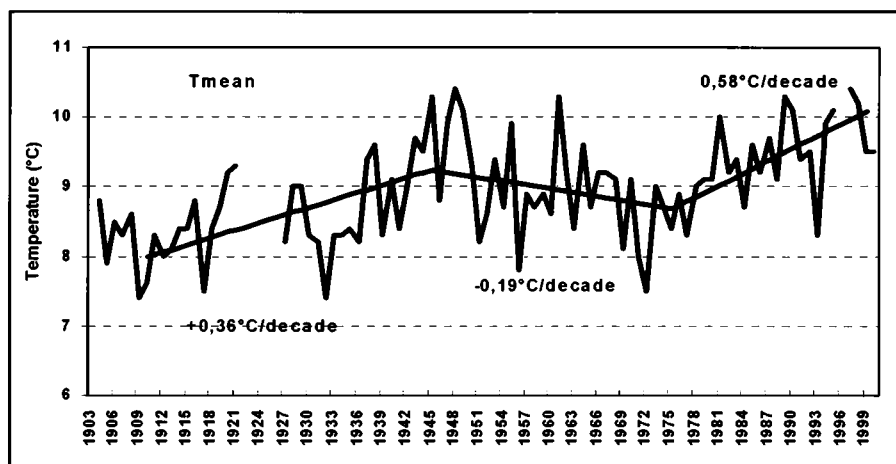
“Serra da Estrela” is the largest and highest chain of mountains in Portugal Mainland, its highest peak having 1990 m above mean sea level and its location is in the central-northern part of the territory, with an approximate orientation of SW-NE. The Penhas Douradas Observatory is placed near the central part of the mountain, at an altitude of 1380 m, close to the source of Mondego River; the nearest village is Manteigas, located down in the valley at about 15 km away from the Observatory. The meteorological station operating at the Observatory is WMO number 08568 and its geographic coordinates are: Latitude = 40° 25' North; Longitude = 07° 33' West.

History

The construction of the building of the current Observatory started at the beginning of the XXth century and the more recent works to repair the Observatory took place during the early 1980's. The first observations at this station, which used to be called “Serra da Estrela”, were made after its conclusion in November 1903; The Observatory adopted the name of “Penhas Douradas Observatory” later on, in 1925. The regular meteorological observations in this mountain started before the existence of the Observatory. Observations of pressure, temperature, precipitation and surface ozone, were made since 1882 in a near place (Poio Negro), at about the same altitude (1450 m) and between 1898 and 1903 the station moved to another different location (Carvalheira) at 1216 m of altitude. When the observations begun at the Observatory, they were made at the top of the building, with the radiation screen and other instruments installed, some 12 m above the ground and the wind observations started at that same date (1903) with an anemograph. The radiation screen and its instruments were moved to the ground level in 1938, to allow observations at about 1,5 m.

Climate

The climate in this region is a typical mountain temperate climate, with maritime influences; the following figures are some of the absolute extreme and average values from the climatological normals relating to the periods 1903-30, 1931-60 and 1961-90:



Annual average temperature (1903-2000) data series with trends

	Temperature (°C)			Precipitation (mm)		Sunshine (hours)
	Average	Abs.Max.	Abs.Min.	Average	Daily Max.	Average
1901-30	8,3	30,7	-09,4	2364,8	331,0	-
1931-60	8,9	32,8	-13,3	1916,3	234,5	2643,0
1961-90	9,0	32,2	-12,9	1716,4	134,3	2435,4

	Wind speed (km/h)	Number of days with			
	Average	Fog	Snow	T.Min.<0°C	Rain Amount>10mm
1901-30	26,7	147,2	35,4	72,3	57,7
1931-60	23,8	145,0	34,0	66,0	54,0
1961-90	19,6	146,7	51,1	68,2	112,9

Since November until March, the Observatory becomes isolated very often because of accumulated snow in the mountains, including the roads.

Observing Programmes

Most of the time, the main observing hours, since the beginning of the observations in this mountain, are 09, 12, 15, 18 and 21 UTC, with slight changes along the years in the frequency of daily observations. The current meteorological observing programme consists in some instrumental observations (sunshine duration, evaporation and snow depth) and visual observations (clouds amount, ceiling and type, visibility, present/past weather and state of ground) at 09, 12, 15 and 18 UTC, which are integrated, via a PC-terminal with the hourly observations made by an automatic weather station (AWS), which measures atmospheric pressure, air temperature and relative humidity, wind direction and speed, rain amount and duration, surface and soil temperature and global radiation. The AWS generates 10 minutes records, which are archived in the local PC and also transmitted every hour to the IM headquarters in Lisbon.

The sunshine duration observing programme started in 1939 using Campbell-Stokes recorder and the global radiation programme started in 1955, using a solarygraph.

Surface ozone measurements using standard methods began in late 1989, but the record has several interruptions due to frequent failures occurred on the system. Hourly data are available at the WMO World Data Centre for Greenhouse Gases (<http://gaw.kishou.go.jp/wdcgg.html>).

Total ozone, SO₂ and UVB measurements were done with a Brewer spectrophotometer between 1994 and 1999. The program was closed due to the decreasing of available personnel to operate the instrument properly. Total ozone and SO₂ daily data are available at the WMO World Ozone and Ultraviolet Radiation Data Centre (http://www.msc-smc.ec.gc.ca/woudc/index_e.html).

UV irradiance data is available at the European Database for UV Climatology and Evaluation (<http://www.muk.uni-hannover.de/~martin/database.html>).

Atmospheric radioactivity measurements are carried out, since 1989, by the Portuguese Institute of Environment (IA) using Gamma probes.

Equipments Installed

For the meteorological/climatological programmes there is a classical station (CLS) and an automatic weather station (AWS). Following the installation of an AWS in 1996 close to the site of the CLS, hourly instrumental observations begun by means of this AWS, but two daily observations are still made with the CLS instruments at 09 and 18 UTC to allow for the comparisons of results from the AWS and the CLS measurements.

For surface ozone measurements an UV absorption photometric analyser (DASIBI) was installed at the 2nd floor of the main building. The air intake is located at 5 m high from the ground and 1 m from the North wall.

A radioactivity probe, based on 2 GM detectors, one for low levels and other for high levels, was installed by the DGA (current IA) in 1989 close to the CLS.

A high volume sampler system for radioactive monitoring of atmospheric aerosols is located on the 1st floor. The system is part of the RADNET network for nuclear emergency warning as well as of the REVIRA Spanish network.

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