

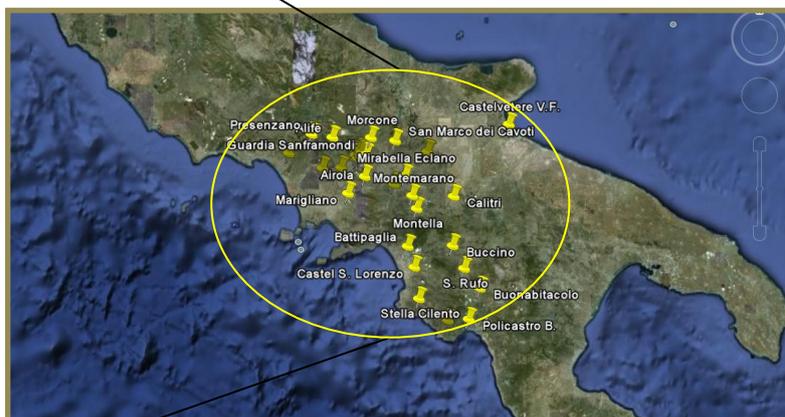


SOILCONS-WEB PROJECT

Technical report on Climate data monitoring in the Telesina Valley (first approximation)

Campania Region (Agro-meteorological Service) monitors several climatic parameters measuring them by means of a ground network of gauges. For our applied research in the test area of the Telesina Valley, a first selection of some gauges in a geographical domain including the valley was made. Here the complete list is reported:

Airola
Alife
Castel morrone
Castelvenere 1
Castelvenere 2
Castelvenere 3
Greci
Guardia san framondi
Mirabella eclano
Morcone
Presenzano
S_Marco dei cavoti
Sessa aurunca
Solopaca 1
Solopaca 2
Solopaca 4
Solopaca 5
Telese
Vitulazio 1



At second stage the set of climatic parameters particularly needed for modeling applications is selected:

	Parameter					
	<i>Wind (hour)</i>	<i>Rain</i>	<i>Atmospheric pressure (day)</i>	<i>Solar radiation</i>	<i>Air temp.</i>	<i>Air moist.</i>
Type of parameter	direction	cumulative (hour)	max	cumulative (hour)	average (hour)	average (hour)
	speed	cumulative (day)	average	cumulative (day)	max (day)	max (day)
			min		average (day)	average (day)
					min (day)	min (day)

The spatial analysis of such climatic data is done by means of the use of spatial inference models (such as Inverse Weighted Distance or Moving Average) satisfactory as approaches for the aims of the project.

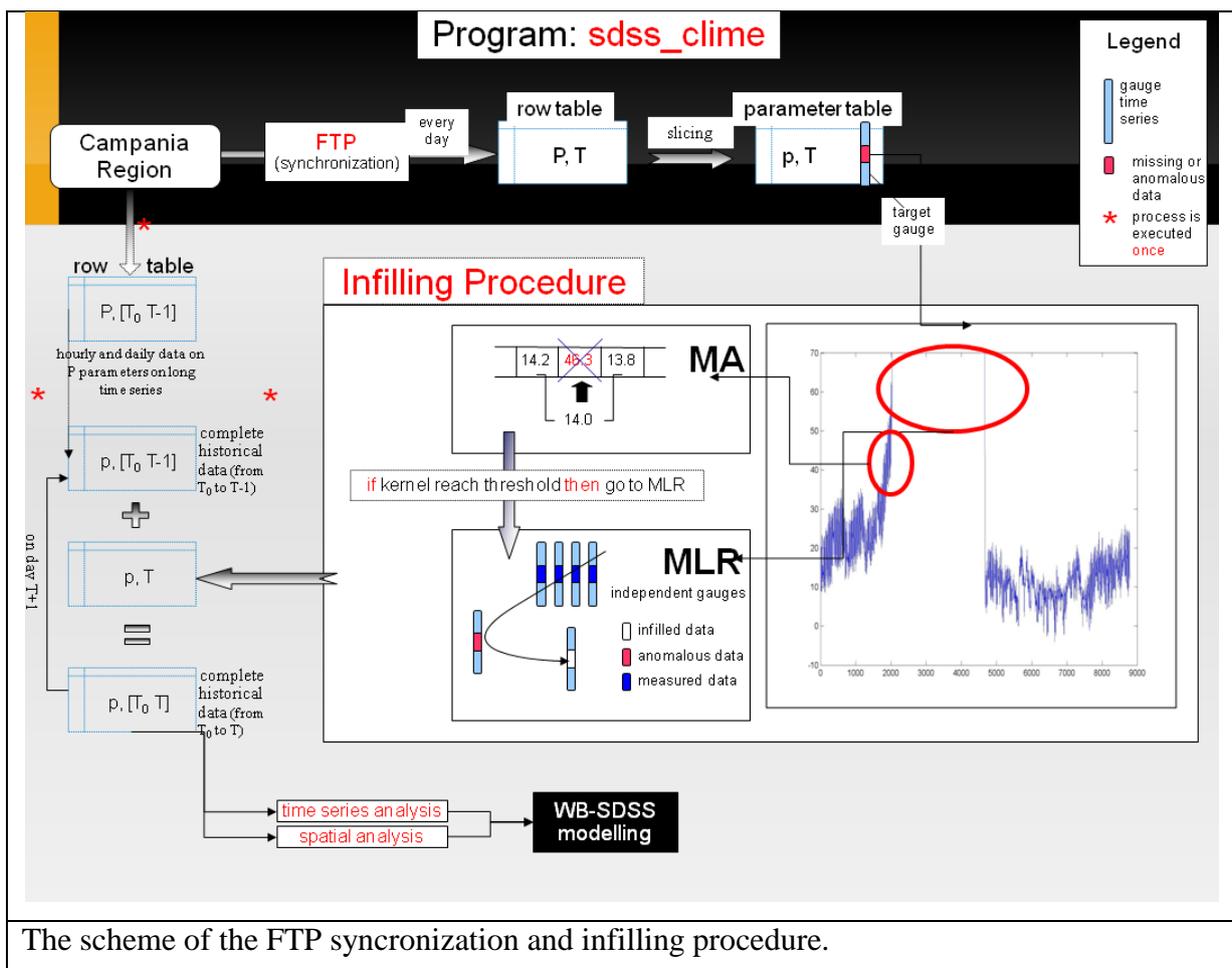
The monitoring of climate is undertaken thanks to an FTP synchronization of ground sensor recordings between the Agrometeorological Department server and our UNINA server.

There are 19 gauges and 16 climatic parameters. The Agrometeorological service of Campania Region has yearly backup archives of these data spanning between 1998 to nowadays.

A program it was written specifically for our project needs (climate monitoring) in order to organize and to analyze all climatic data. It starts from the first backup in 2010 and year by year goes behind in time. The following operations are executed by the program:

1. *For any backup file*, the raw table with all gauges and parameters for the whole year is sliced to build as many tables as how many climatic parameters are there. Here it is paid strong attention to both correctly join data measured at the same frequency (hour or day) and merge data at exact points in time domain. As a result a table for any parameter (parameter table) is built in which (hourly or daily) measurements for gauges are ordered in time.
2. *For any parameter* (i.e. parameter table), a procedure of data check is fulfilled. It moves gauge-by-gauge, recognizes any missing or anomalous datum (i.e. out of the possible physical range for that gauge), and infills it using a predicted value (see the scheme below). An articulated strategy is used to principally gain a low computing time. Therefore, for any gauge:

- All data to be “patched up” (infilled) are collected and a Moving Average (MA) interpolation is carried out. MA uses growing kernels in size starting from the lowest possible (i.e. 3). As soon as at least two good measurements are found in kernel, the average is calculated and infilled. A kernel size threshold is kept to allow a predicted value having also a sound statistical sense (i.e. it follows the probability distribution of the occurrence in the current point in time).
- Eventually, all remaining data to be patched up are collected and predicted using a stepwise Multi Linear Regression (MLR) of current gauge (target) with other gauges (independents). If performance is below a certain threshold or if any other statistical condition restrains the program from doing a good performing MLR, data elements are grouped for contiguity in time and a MLR is separately performed for any group. If again it is impossible to address MLR for all/any group, the MLR procedure is executed for any single remaining datum.



At the end the program is able to:

- build a complete and a long time series parameter table for any climatic parameter;
- recognize voids in time span, that is missing data for all gauges of a parameter table (which is obviously not predicted by the program, and should maybe undergo to a manual infilling procedure)
- add any raw table with new time intervals. This is particularly useful to add data gathered from monitoring (see activity 20, the daily monitoring of hourly and daily data). An automatism has to be built