Short description of PERO

for testing in working group 2 in COST 718

General:

PERO calculates the infection start of grapevine disease Peronospora and its further development as numbers of visible and invisible oilspots. Leaf wetness is needed and can be calculated by the physical model DROPBEN. The time step is 1 hour, the output are daily results for PERO and hourly for DROPBEN. PERO has been developed by Dr. D.Hoppmann, Geisenheim, DWD.

Input files:

file formats: see PERO.doc

meteorological files:	**RF**_*year.station*	hourly rel. humidity (2m)	[%]
	RR_*year.station*	hourly precipitation amount	[mm]
	TL_*year.station*	hourly air temperature (2m)	[°C]
	BE_*year.station*	calculated hourly leaf wetness	[-]
further input file:			
	PERO.STA	starting file (input & output path, date of primary infection (or blank), coordinates, ...)	

Output files:

INF_*year.station*	output of infection events: date of primary infection, date of sporulation, multiplication, no. and date of cycles, oilspot nos.
ENT_*year.station*	output of daily development: dates of calculated periods, oilspot numbers (new, latent, visible, sum)

Most important instructions:

The correct filling of starting or boundary values in the PERO.STA file is most important for obtaining reasonable results.
Even single meteorological data missing should be interpolated first to have a successful model run. Meteorological forecast data easily can be added.
The model is based upon the results of Hill (1989) and the theses of M.Bläser (1978) and K.Gehmann (1987).

It is presupposed that inoculum has survived winter on the ground of the vineyard. The start of the model cannot be set earlier than Julian day 50. This starting day may be left blank - then the model finds the day of primary infection, or the day assessed in the vineyard can be taken.
A nonlinear temperature function calculates the end of an infection process, and oilspots are then switched to visible ones. Secondary infections need at least 4 hours of leaf wetness. Germinating spores underly a survival routine, if temperature is below 11.5°C and leaf wetness duration is below 6 hours.

The number of oilspots are meant as per hectare. For German conditions the number of 1000 visible oilspots indicates a warning threshold, while the reaching of 5000 visible oilspots represents about 1% infested leaves per hectare. This infestation threshold represents the start of spraying (with curative agents).
The end of a model run is automatically found, on 1st of September at the latest.

For details look into PERO.doc.

(For calculation of leaf wetness see DROPBEN description next page.)

Supporting program for PERO:

Short description of **DROPBEN**:
The model DROPBEN calculates the vine foilage wetness for the level of 2m from the energy balance (rain-wetted leaves, dew on leaves, evaporating droplets). The output is hourly as indices taking values from 0 to 3.

Input files for DROPBEN:

file formats: see PERO.doc

meteorological files:		**RF**_*year.stationb*	hourly rel. humidity (2m)	[%]
		RG_*year.stationb*	hourly global radiation	[W/m^2]
		RR_*year.stationb*	hourly precipitation amount	[mm]
		TL_*year.stationb*	hourly air temperature (2m)	[°C]
		VV_*year.stationb*	hourly windspeed (10m)	[m/s]
		LG_*year.stationb*	hourly longwave radiation	[W/m^2]
	or:	**NG**_*year.stationb*	hourly cloudiness	[octas]

further input files:

DROPBEN.STA	starting file (input & output path, stations, mode of radiation data use)
DROPBEN.PAR	parameter file: droplet physical data (should not be changed)

Output file of DROPBEN:

BE_*year.station*	output file for leaf wetness: hourly indices as 0 = dry, 1 = dew, 2 = wet during rain, 3 = evaporating drops

Most important instructions:

The model DROPBEN has to be run before PERO, because the wetness file BE_year.station is needed as input for PERO.
Radiation data are essential for this physical calculation of leaf wetness. So global radiation is essential, and for incoming longwave radiation you can choose between a longwave radiation or a cloudiness (octas) file.

The use of measured leaf wetness is only possible for PERO, if the data are meaningful converted into the indices of BE_*year.station*.

For details look into PERO.doc.

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References:

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