

# Alpine Test Site Guetsch: Meteorological measurements and wind turbine performance analysis

COST 727 Measuring and forecasting atmospheric icing on structures

Météo Suisse, Payerne / *METEOTEST* Bern / <http://www.meteotest.ch/cost727/index.html>

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## Project Plan

Upgrade of the test site Guetsch with comprehensive meteorological equipment specific for icing problematic - Monitoring of the station.

Definition and configuration of the experiment for sensor comparison, installations, tests and operation: experimental phase in winter 2005/2006, official measurements in winters 2006/2007 and 2007/2008.

Setup of experiment with wind generator ENERCON E40 in summer, to monitor performance and behaviour under icing condition. first test winter 2005/2006, final tests following 2 winters.

International cooperation and comparison of the results within the COST-727 Action, in coordination with parallel measurements efforts in other countries. Meetings with other experts, exchanges of information and further developments specifically based on the Guetsch experimental site. Meetings of specialists on the test site Guetsch (Andermatt): organization of one to several MC and/or WG meetings.

Analysis of sensor performance - recommendations for reference measurements and standardization.

Developments of modelling algorithms based on normal meteorological measurements (without ice detectors).

Comparisons with other test sites in their respective typical environment (subarctic in Finland, others...).

## Meteorological Test Station Guetsch MeteoSwiss - Configuration

### Standard measurements (10 minutes integration time):

Wind speed and direction (3D)  
Pressure  
Temperature (T + Tdew) & RH%  
Short wave down-welling irradiance  
Short wave reflected irradiance  
Long wave down-welling irradiance  
Luminosity  
Sunshine duration  
Rain detection  
Rain amount  
Snow-height, -temperature, -surface temperature  
Radioactivity  
Control video camera (rotating, zoom, remote control, etc.)

### Special measurements (10 minutes integration time):

Cloud base (ceilometer)  
Precipitation characteristics (droplets size distribution, disdrometer)  
Present weather (2x)  
Rain amount (weighting principle)  
Ice detection (Vibrometer prototype)  
Ice detector (2xRosemount)  
Ice detector LID-3500  
Ice detector HoloOptics T23  
Humidity (Vaisala, HMP243)  
ISO12494 ice detector with motor  
ISO12494 ice detector without motor  
(?) rotating multicylinder method (J. Atmospheric and Oceanic Technology, 9(3), 258-263)  
Other instruments for COST-727

### Wind Turbine Guetsch ENERCON E40 EWU instrumentation:

- Wind on hub height (52 m)
- Turbulence Intensity (all directions)
- short term fluctuation of wind direction
- vertical speed
- power output of turbine
- rotor data (rpm, unbalance, load at root of blade)

additional measurements:

- ambient temperature and humidity
- icing on blade or nacelle by ice detector
- webcam for monitoring of icing on blades
- monitoring of inbuilt deicing system (hot air)
- observation of ice throw by wind turbine