

# METLIFT - A NEW DEVICE FOR ACCURATE MEASUREMENTS OF METEOROLOGICAL PARAMETERS IN A SNOW RICH ENVIRONMENT



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## Problems for accurate measurements in mountainous terrain

- deep snow pack
- remote locations
- no external power supply
- very low temperatures

### Consequences

- sensor height above surface is unknown for increasing and decreasing snow pack and does not follow WMO recommendations
- surface stations may be snow covered
- station may stop logging due to power failure because of low temperatures (below -40 degree C).

### Current solution

- several sensors are mounted on a mast at different heights
- logger mounted at the ground under the snow pack to protect it against too low temperatures

### Disadvantages

- exact position of the sensor above snow surface is never known
- dig out the logger for downloading station data (only during fine weather episodes possible in winter time)
- no real-time data delivery



Figure 1: Illustration of measurements problems in snow rich and remote mountainous regions. a) Temperature sensor almost snow covered; b) Wind anemometer of weather station only about 50cm above snow surface; c) students are digging out the station; d) data download from the snow covered loggers.

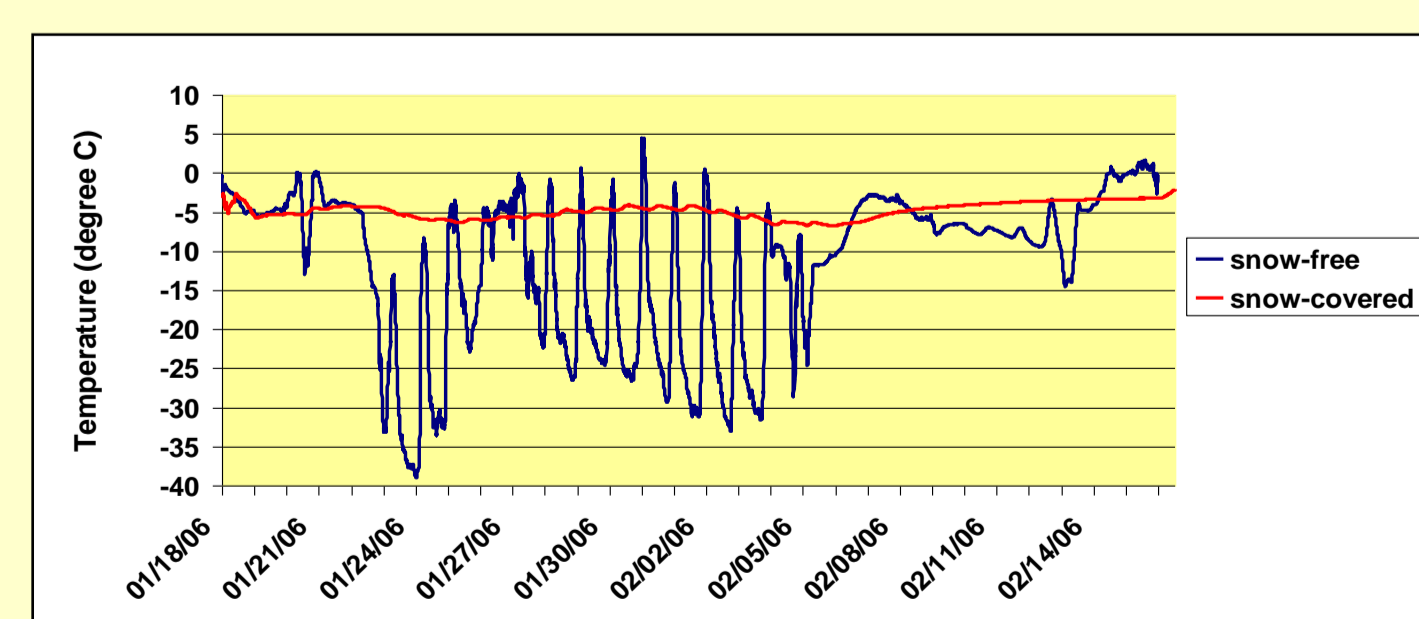


Figure 2: Two temperature records at Grünloch, Lower Austria for a winter time period in 2006: blue: sensor above snow surface; red: sensor snow-covered.

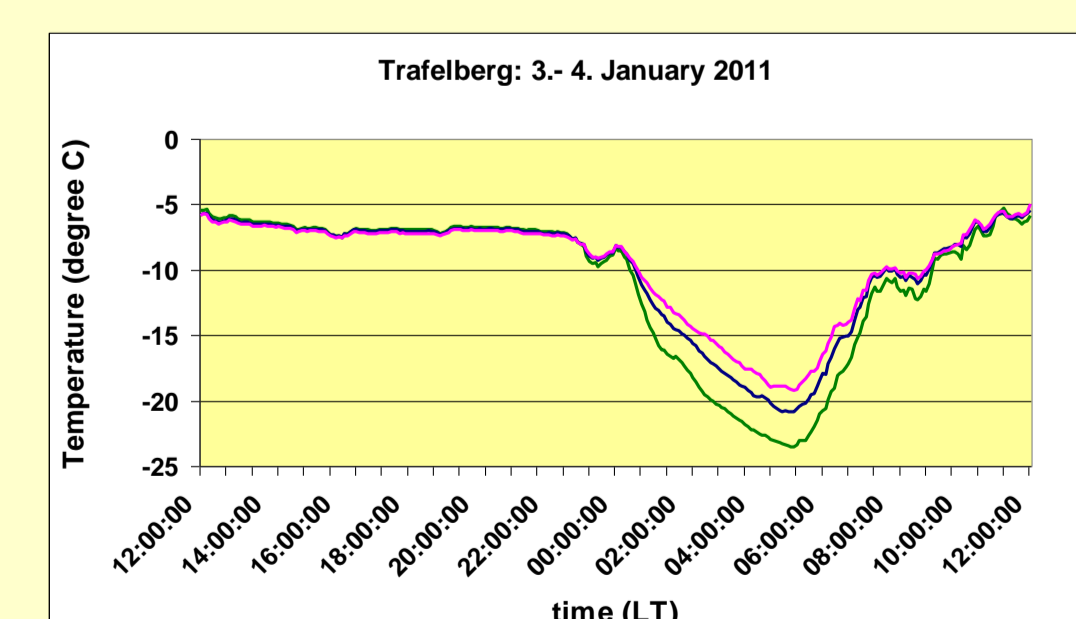


Figure 3: Three temperature records for a clearing winter night: green: 20cm; blue: 120cm and pink: 220cm above snow surface.

## The solution

In close cooperation with the technical high school in Waidhofen/Ybbs, Lower Austria, a new device was developed to guarantee the sensor height above Surface within the WMO limits in harsh and remote environments. An ultrasonic snow height sensor measures the distance to the snow surface. If it exceeds certain limits due to snow accumulation or snow melt the lift adapts its height accordingly.

### From the idea ...

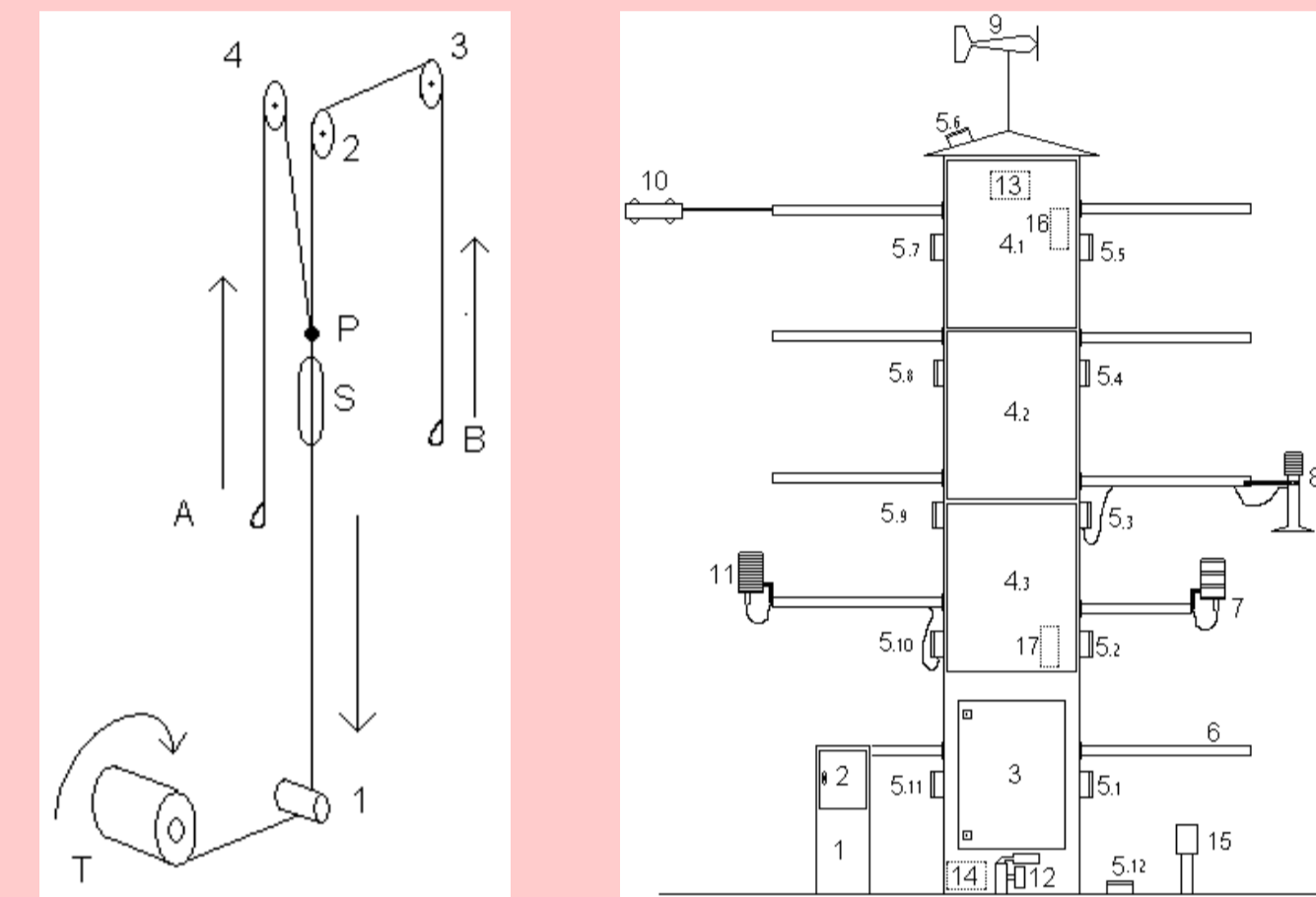


Figure 3: Construction plans of METLIFT. Automatic adaptation of lift position via snow height sensor measurements. Left: lifting mechanism, realised via a winch and a hoist. Right: Detailed front view of METLIFT.

### ... to reality

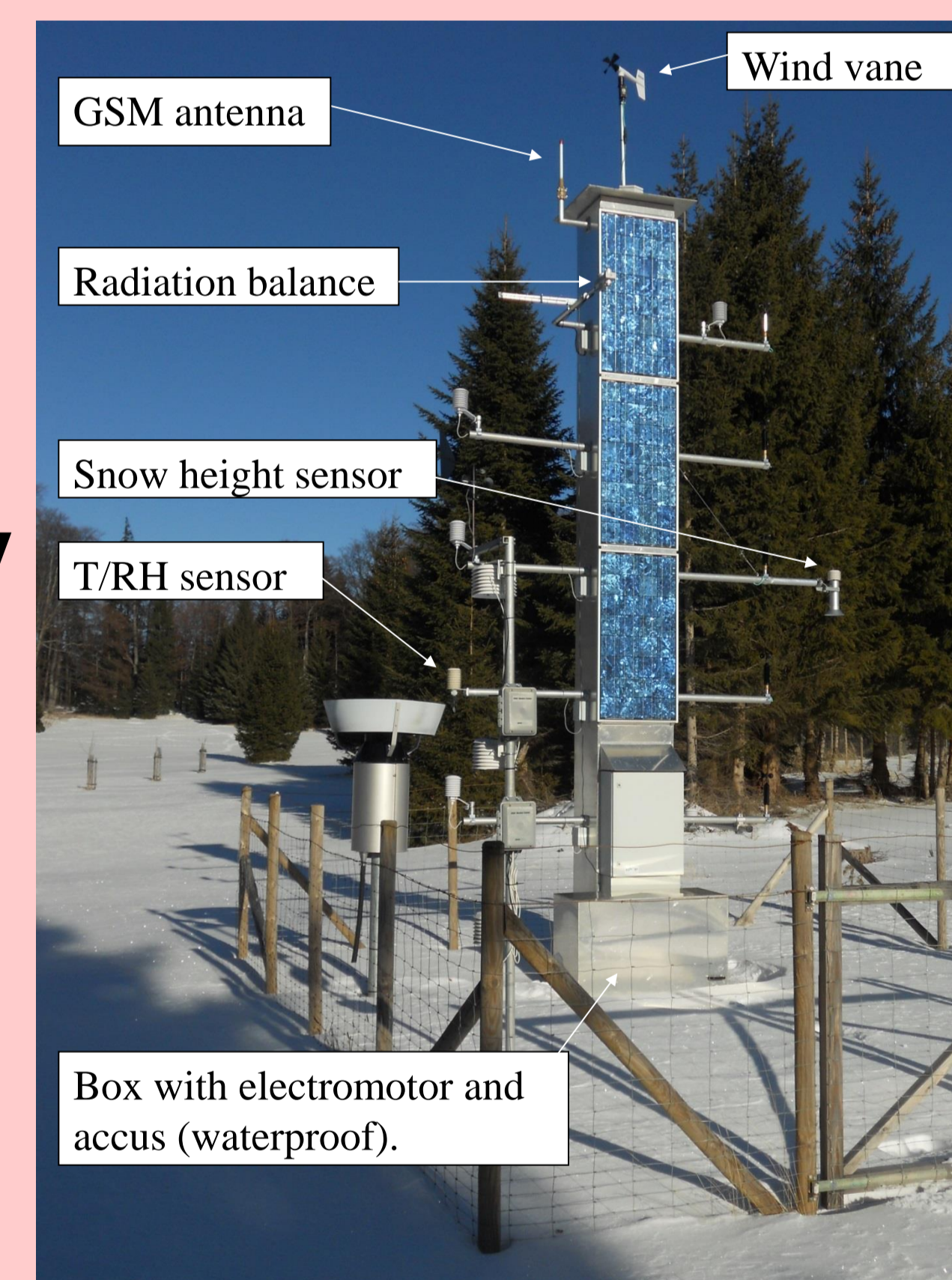


Figure 4: Prototype of METLIFT at Trafelberg, Lower Austria.

Extensive system checks have been performed before METLIFT has been brought into the field.

### Data transmission check

data flow from the logger via radio signal and GSM signal to a server and real-time availability has been tested.

### Energy consumption check

extensive checks have been performed to optimize the energy consumption of the whole system.

### Icing check

icing conditions have been simulated by sprinkling the tower during very cold winter days. The lifting device can deal very well with such harsh conditions.

## Some technical details

### Power supply

- three lead gel accumulators (12V, 85Ah, Fig. 5)
- recharged by three solar panels (105Wp each)
- accu and electromotor will be snow-covered



Figure 5: Accu, lifting control box, electromotor and winch. All components are fixed at the ground.

### Lifting mechanism

- lifting control box developed by HTL Waidhofen/Ybbs
- 12V Electromotor (Fig. 5)
- transmission rate 2856:1
- winch and hoist



Figure 6: Electronic control box with data logger and radio transmission unit, will be lifted.

### Data logging and transmission

- all electronic units (Fig. 6) are checked for temperatures down to -50 degree C
- lightning protection provided
- radio transmission to nearby mountain station or GSM transmission
- manual switchers provided to operate the lift in the case of an electronic failure



Figure 7: METLIFT at its maximum lifting height of 4m.

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