The PermaSense Mountain Lab
Technology and infrastructure for an open permafrost data repository

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PermaSense System
- Wireless systems, low-latency data transmission
- Customized sensors and ruggedized equipment

Sensor Nodes and Sensor Integration
- Optimized for ultra-low duty cycles
- Static, low-rate sensing (120 sec)
- Disconnected operation: 1 GB storage
- 4 years of independent operation (~150 μA avg. power)
- Ruggedized for alpine extremes
- < 0.1 MB/node/day
- Generic interface for analog and digital sensors

Wireless Sensor Network (WSN)
- WSN Technology allows to acquire mountain phenomena
- Self organizing multi-hop network
- Optimized for ultra-low duty cycles
- 8+ years experience, ~1'276'035'519 data points, 1.5 TB

Internet Access
- WLAN (802.11a) long-haul communication using directional links
- Leased fiber/DSL from Zermatt Bergbahnen AG to mountaintop
- Commercial components (Mikrotik)
- Weatherproofed, protected

Advantages
- Enables spatially distributed field measurements
- Data all year-round at near real-time
- No long cables, less problems with lightning
- Low maintenance

Challenges
- Harsh environment
- Low power consumption
- Time synchronization

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Server Backend: Global Sensor Network (GSN)
- Dual architecture translates data from machine representation to SI values, adds metadata
- Organized in “virtual sensors”, i.e. data types/semantics
- Hierarchies and concatenation of virtual sensors enable on-line processing

Data Access Portal
- Public open data access in real time
- Tutorial available online

http://data.permasense.ch