

# iButton Assist + idNotebook for Android

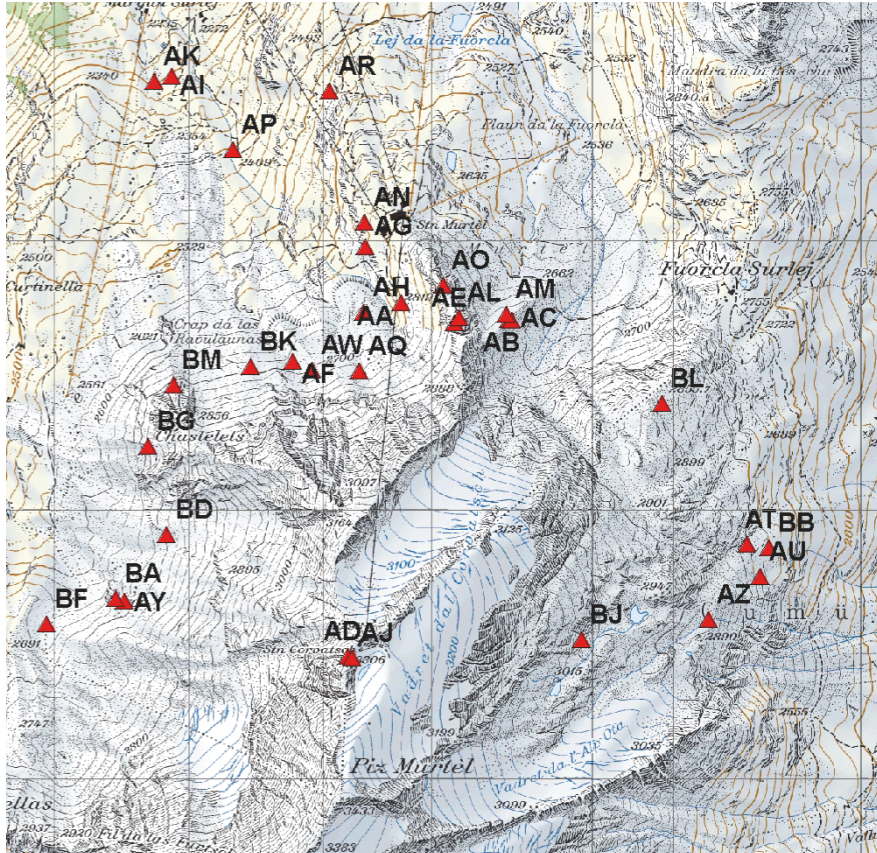
## Mass Deployment of Miniature Temperature Loggers

Matthias Keller

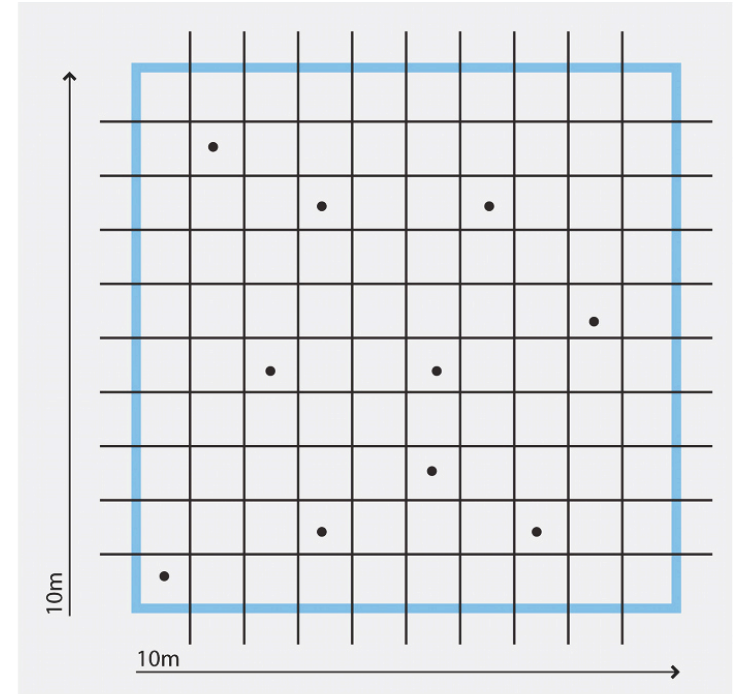


# Example: Measuring GST in the Alps

~30 patches of 10 m x 10 m size



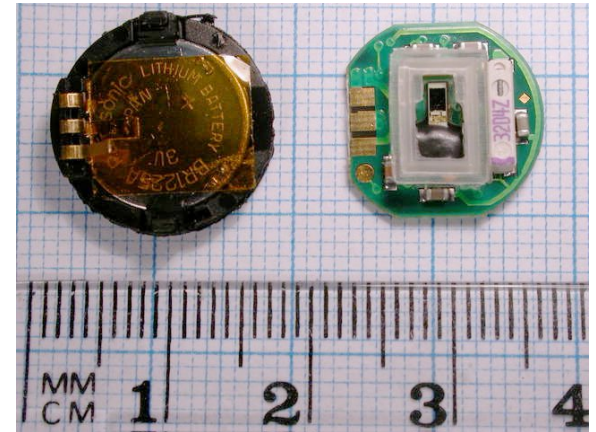
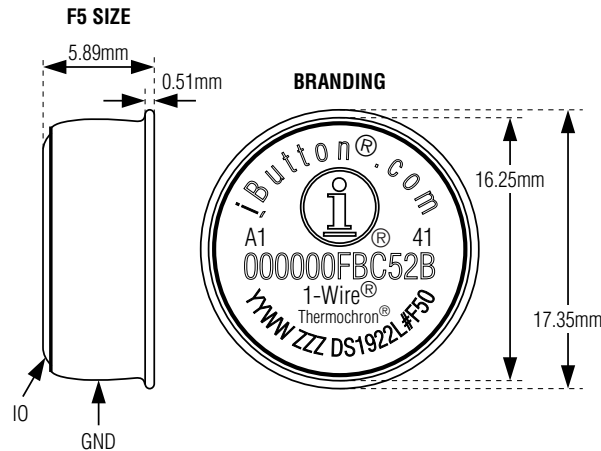
10 temperature loggers per patch



→ Deployment of ~300 loggers

Stefanie Gubler, Joel Fiddes, Matthias Keller and Stephan Gruber: *Scale-dependent Measurement and Analysis of Ground Surface Temperature Variability in Alpine Terrain*, *The Cryosphere*, Vol 5, Issue 2, 2011

# iButton Temperature Loggers



Model	Range	Max. resolution	Accuracy	Max. samples	Price (25-99 loggers)
DS1921G	-30°C..+70°C	0.5°C	±1.0°C	2048	~22 US\$ each
DS1921H	+15°C..+46°C	0.125°C	±1.0°C	2048	~22 US\$ each
DS1921Z	-5°C..+26°C	0.125°C	±1.0°C	2048	~22 US\$ each
DS1922L	-10°C..+65°C	0.0625°C	±0.5°C	8192	~45 US\$ each
DS1922T	+20°C..+75°C	0.0625°C	±0.5°C	8192	~65 US\$ each

# User-defined Mission Parameters

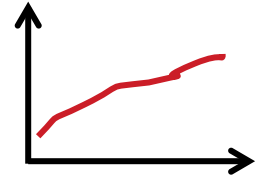
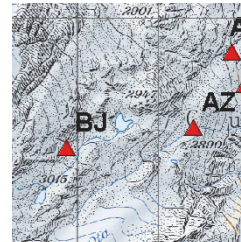
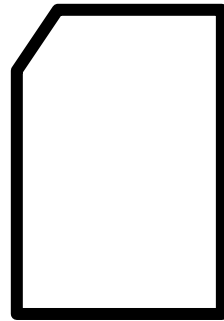
- ▶ Sampling rate (seconds to months)
- ▶ Delayed start of measurements
- ▶ Overwrite or stop when memory is full?
- ▶ High or low temperature resolution? [DS1922 only]



```
kellmatt — kellmatt@pc-10022: ~/eee-pc/builds/...
Please enter value: 0
Enter the sample rate in seconds.
3600
Enter start delay in minutes.
0
Enable rollover? (T/F)
F
Should the iButton clock be sync'ed with the OS clock? (T/F)
T
Do you want the temperture channel enabled? (T/F)
T
Do you want to set a high temperature alarm? (T/F)
F
Do you want to set a low temperature alarm? (T/F)
F
Do you want to start mission upon a temperature alarm? (T/F)
F
Do you want the temperatures recorded in high resolution? (T/F)
T
Do you want the data channel enabled? (T/F)
F
```

*Screenshot of vendor tool kit  
~10 questions per logger*

# Bookkeeping Challenges



iButton serial #  
e.g., *040000001BF32F21*

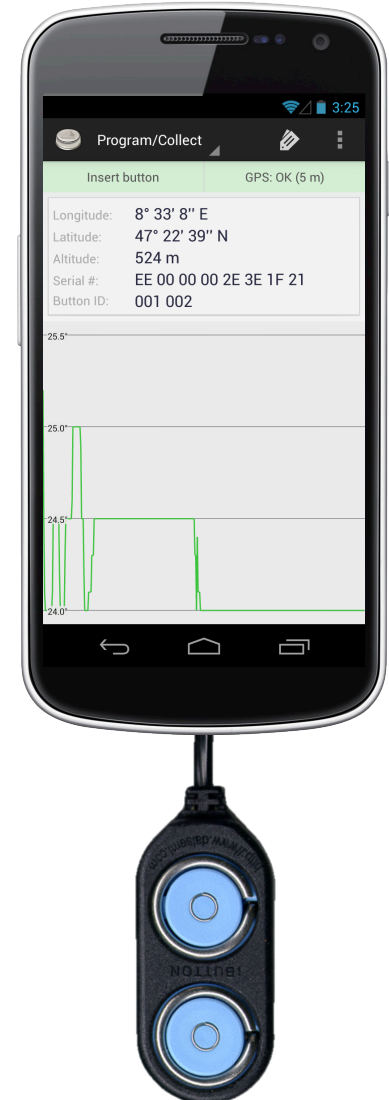
Mission  
parameters

Logger  
location

Measurements

# iButton Assist for Android

- ▶ Touch user interface with hearable and haptic feedback
- ▶ Uses GPS, camera and network capabilities provided by the smartphone
- ▶ Automatic annotation of time and location information
- ▶ All data is stored in a structured database
- ▶ Online data synchronization
- ▶ Data export to CSV files



# Deployment Workflow

The image displays four sequential screenshots of a mobile application interface for a deployment workflow.

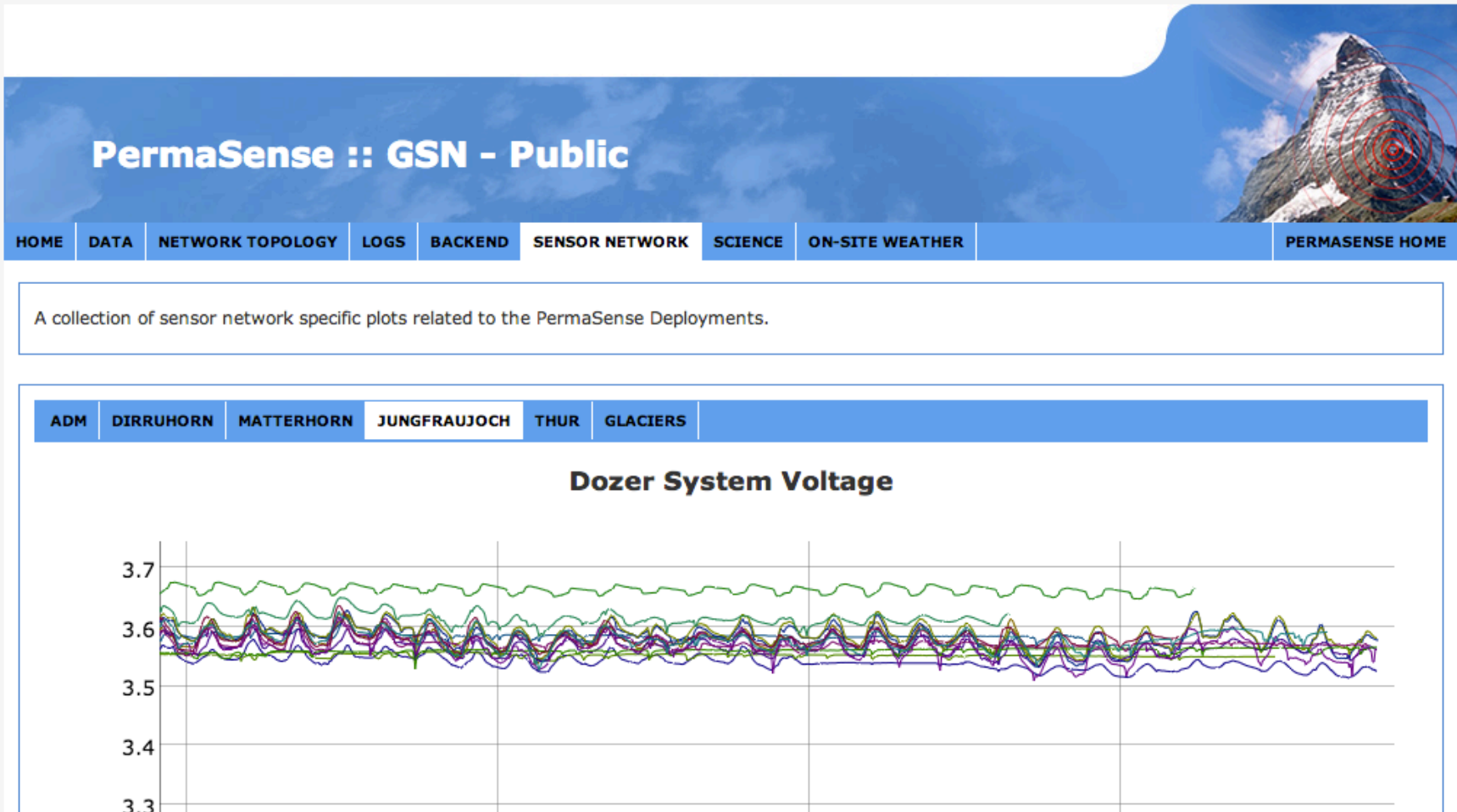
- Deployments (3:30):** Shows a list of deployments. The first entry is "Nano-Tera Annual..." with a status of "Active" and a checkmark. Below the list is a "No description" label.
- Deployment Settings (3:26):** Shows configuration options for a deployment.
  - DEPLOYMENT SETTINGS:** Includes fields for "Name" and "Location/Description".
  - MISSION SETTINGS:** Includes "Sample rate" (Smallest supported sample rate: 1 minute (DS1921) and 1 second (DS1922)), "Enable mission start time" (checkbox), "Start time", "Enable rollover" (checkbox), and "High temperature resolution" (checkbox, Only relevant when programming).
- Program/Collect (3:24):** Shows the screen for programming the device.
  - Buttons: "Insert button" and "GPS: OK (10 m)".
  - Fields: Longitude: 8° 33' 8" E, Latitude: 47° 22' 39" N, Altitude: 544 m, Serial #: F7 00 00 00 20 0E 92 41, Button ID: 001 001.
  - Buttons: A trash icon and a camera icon.
  - Text: "No pictures" is displayed in the center.
- Measurements (3:25):** Shows a list of collected measurements.
  - 001 001: 8192 samples, 47° 22' 39" N 8° 33' 8" E, Fri, 24.05.13 15:24
  - 001 002: 2048 samples, 47° 22' 39" N 8° 33' 8" E, Fri, 24.05.13 15:24Below the list is a line graph showing temperature data over time, with values ranging from approximately 23.5 to 26.0.

# iButton Assist Demo





# Online Synchronisation with GSN



<http://data.permasense.ch>

# idNotebook – Field Work Logbook

- ▶ Mapping of device-specific IDs to locations on a map
- ▶ Recording of additional meta data
  - Pictures
  - Voice memos

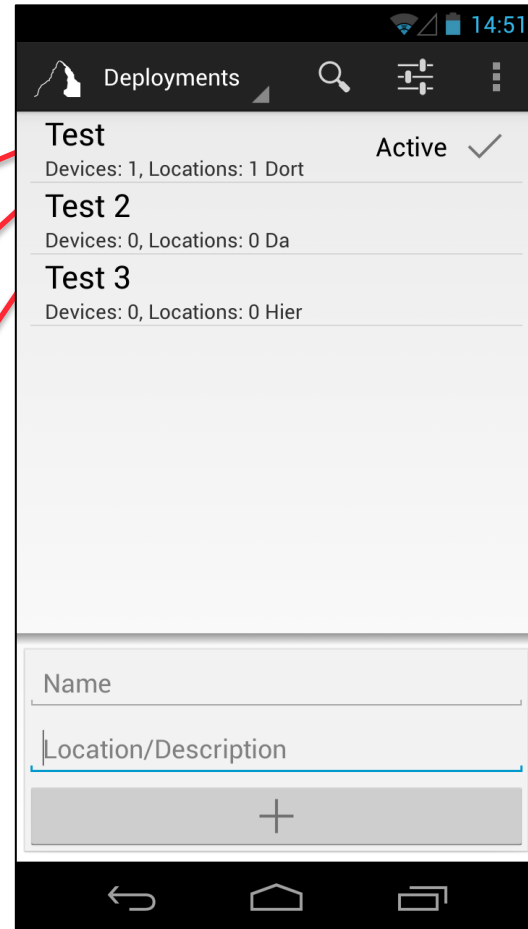


# Mapping Sensors to Locations

1<sup>st</sup> level: Deployments

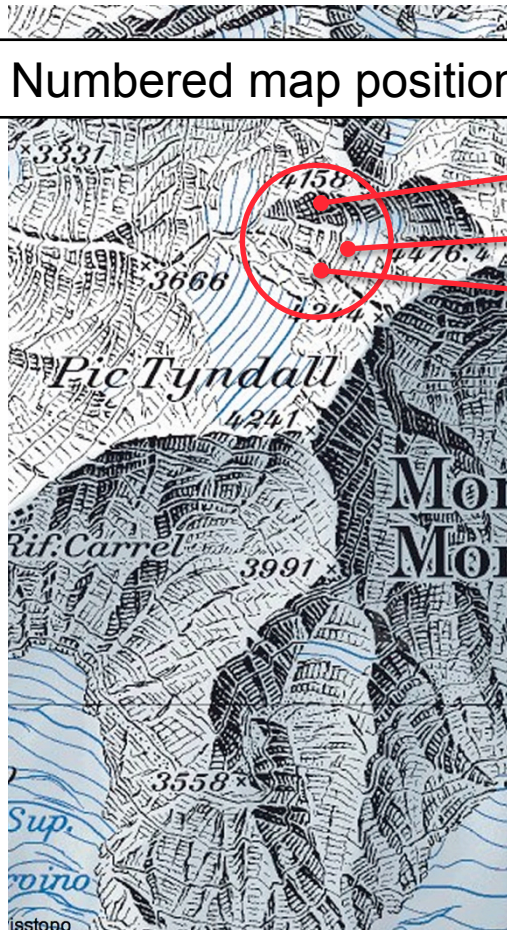


Map by <http://map.geo.admin.ch/>



# Device to Position Mapping

2<sup>nd</sup> level: Numbered map positions



Map by <http://map.geo.admin.ch/>

Device ID	Map Position
100 110	40
684 135 / 248 067 ±21,6m	18.12.12 14:57
100 111	40
684 135 / 248 067 ±21,6m	18.12.12 14:57
100 112	40
684 135 / 248 067 ±21,6m	18.12.12 14:57
...	...
100 113	40
684 135 / 248 067 ±21,6m	18.12.12 14:57
100 114	40
684 135 / 248 067 ±21,6m	18.12.12 14:57
100 115	40
684 135 / 248 067 ±21,6m	18.12.12 14:57
100 116	40
684 135 / 248 067 ±21,6m	18.12.12 14:57

GPS: OK (21,6 m)

Coordinates: 684 135 / 248 067

100117 40

Current time +

Device IDs

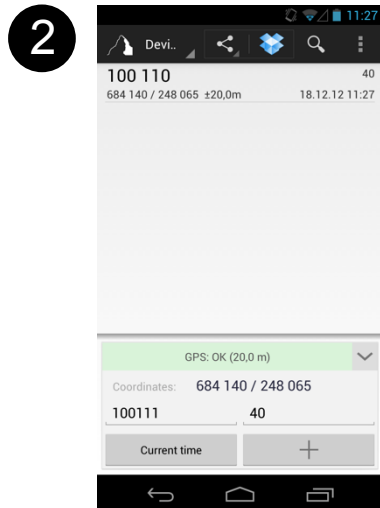
Map positions

# iButton Assist + idNotebook



## Sensor setup

First use of new button:  
Assignment of **unique device ID**

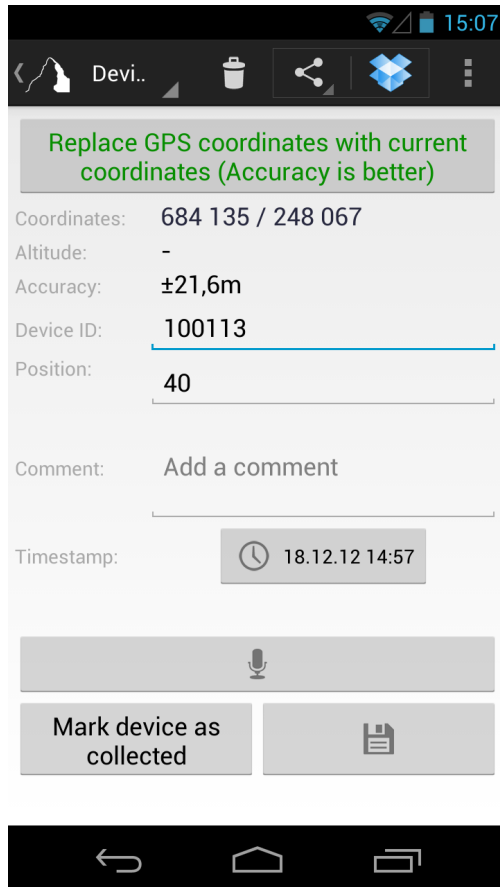


## Deployment and registration in logbook

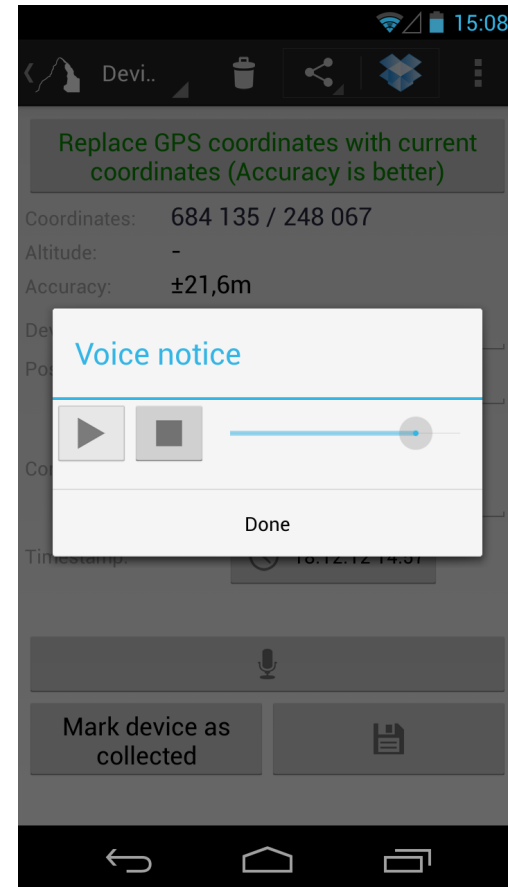
Map Pos.	Device ID	Time (from-until)	GPS Pos.
40	100 101	11/11/2011 12:01 – 20/12/2011 14:01	...
40	100 110	20/12/2011 14:05 – 15/03/2012 16:34	...
40	100 121	15/03/2012 16:34 – ongoing	...

# Acquisition of Meta Information

- ▶ Save GPS data, comments, ...



- ▶ Voice memos



# Conclusions

- ▶ *iButton Assist* supports the whole deployment lifecycle of iButton temperature loggers
- ▶ *idNotebook* helps to manage deployments by providing a multimedia logbook
- ▶ Easy installation from Google Play app store, updates are automatically distributed to the users

<http://play.google.com/store/apps/details?id=ch.ethz.iassist>

<http://play.google.com/store/apps/details?id=ch.ethz.idnotebook>

<http://www.tik.ee.ethz.ch/~kellmatt> [slides]

<http://www.permasense.ch>

