Swiss Experiment

Interdisciplinary Environmental Research

APUNCH: Advanced Process UNderstanding and prediction of hydrological extremes and Complex Hazards

David Finger, Bettina Schäppi, Maurizio Savina, Paolo Burlando

ETHZ, Chair of Hydrology and Water Resources Management (HWRM)

About APUNCH

Recent flood events have pointed out several deficiencies of the planning and prediction methods used for flood risk mitigation. The goal of APUNCH is to gain a comprehensive and process chain based insight into the response of alpine watersheds hit by storm rainfall events. This objective is being investigated by a combination of targeted laboratory work with comprehensive and concurrent multiprocess field monitoring. Within the APUNCH project HWRM is focusing on the following topics:

(i) Distributed precipitation input
(ii) Weather forecasts based on GPS technology
(iii) Dyke Breaches
(iv) Sediment transport
(v) Landslides

Fig.1: sensor scope station

Fig.2: X-Band radar

Sensors: 1 X-band radar; 13 sensor scope stations; 6 reference stations

Sensors used in collaboration with SwissEx

13 Sensor scope stations (Fig.1) and 6 reference stations:

- Precipitation (Accuracy: ±4%)
- Air temperature (Accuracy: ±0.3°C)
- Soil temp. (Accuracy: ±1°C)
- Wind speed (Accuracy: ±5%)
- Wind direction (Accuracy: ±7°)
- Soil moisture (Accuracy: ±3%)
- Rel. humidity (Accuracy: ±1.8%)

X-Band radar (Fig.2) :

- 3.2cm wavelength at 9.4GHz
- Maximum range: 60km
- Resolution: from 100 to 500m in space and 1 min in time

All data is directly transmitted over the mobile network to a data storage unit at ETHZ

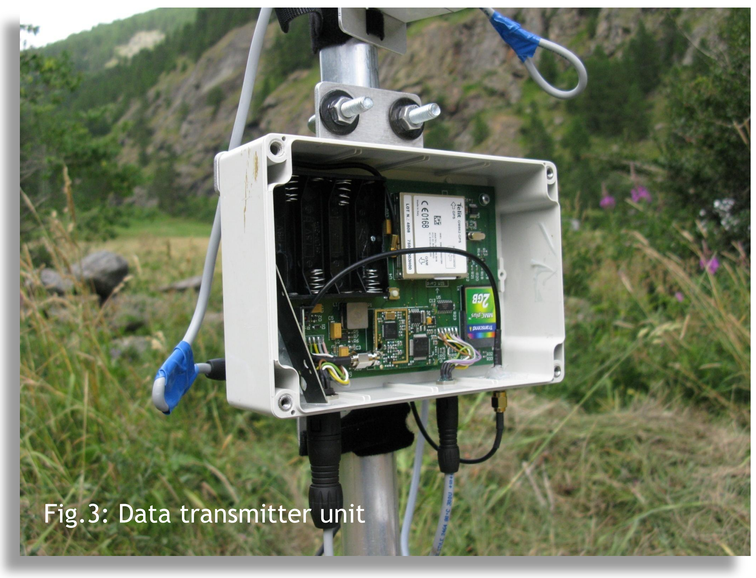
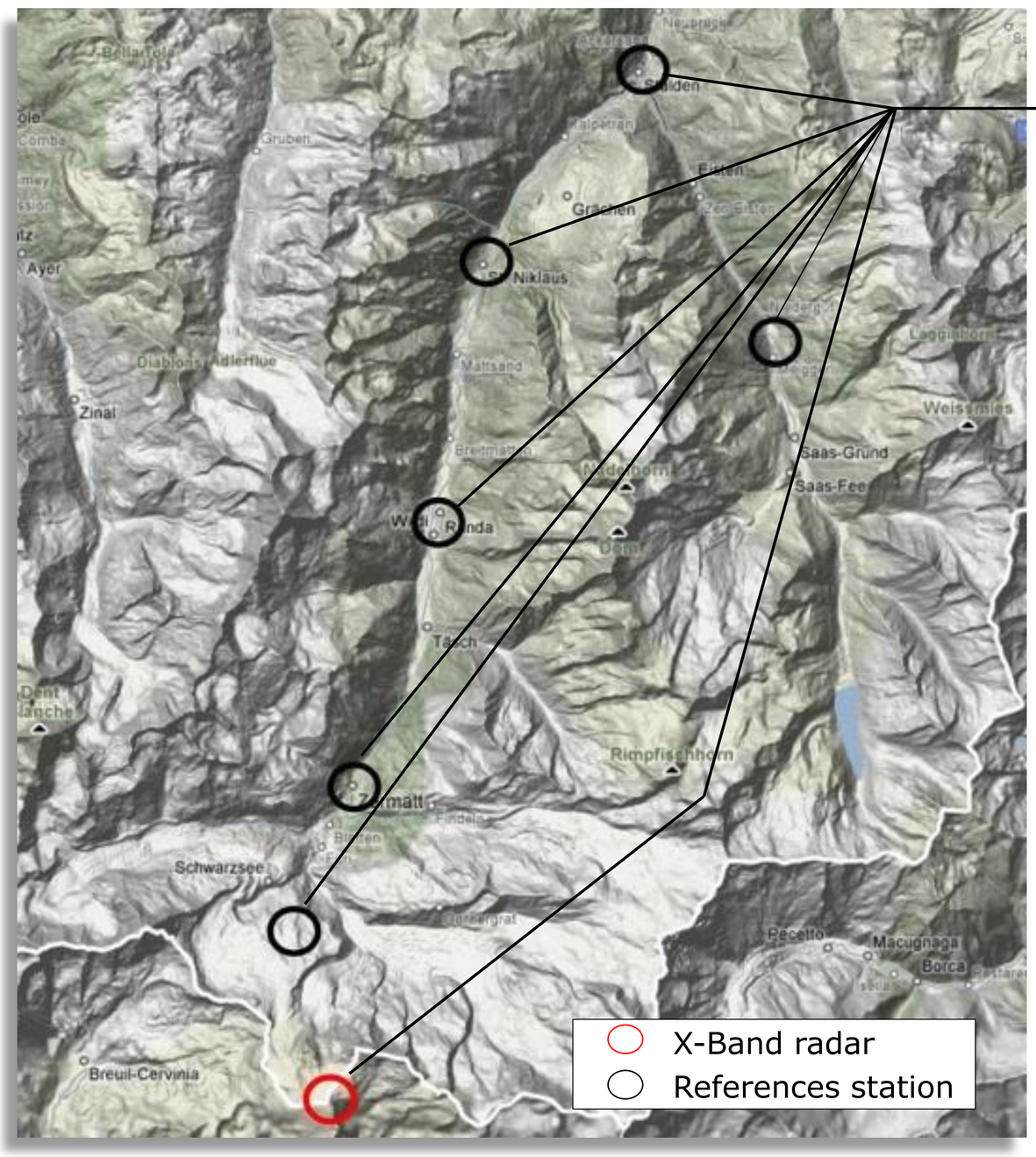


Fig.3: Data transmitter unit

Automated data transfer through the Swisscom mobile net

Use of SwissEx technology?



GSN server located at ETHZ (Fig.4)

Data processing:

- Nowcasting tool based on X-band radar data
- Calibrated X-Band radar maps
- Rainfall based hazard indexes
- Data disaggregation techniques (space – time)
- Precipitation field maps based on multisensoral precipitation measurements
- Inference of statistical and scaling properties of precip. data

Publication of processed data on the SwissEx website (Fig. 5)

GSN Middleware for Sensor Networks

Fig.4: GSN server

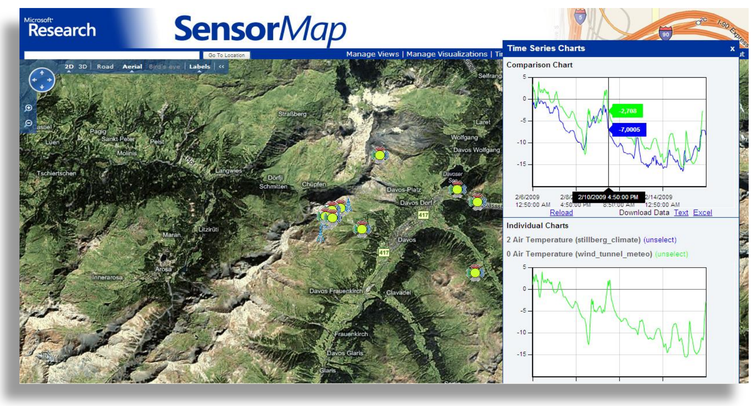


Fig.5: Remotely accessible data

Data processing tools are under development and will be available on the SwissEx website for the scientific community and the public in general by the end of 2010.

More information on APUNCH can be found here: http://www.cces.ethz.ch/projects/hazri/apunch/projects

www.swiss-experiment.ch

cces Competence Center Environment and Sustainability
ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich
eawag aquatic research
MICS
SLF
WSL
EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
Microsoft Research
FNSNF FONDS NATIONAL SUISSE SCHWEIZERISCHER NATIONALFONDS FONDO NAZIONALE SVIZZERO SWISS NATIONAL SCIENCE FOUNDATION