

i-Box: Boundary Layer Measurement Platform in Very Complex Terrain

Mathias Rotach, Ivana Stiperski
Institute of Meteorology and Geophysics,
University of Innsbruck

email: Mathias.Rotach@uibk.ac.at

Innsbruck Box (i-Box)

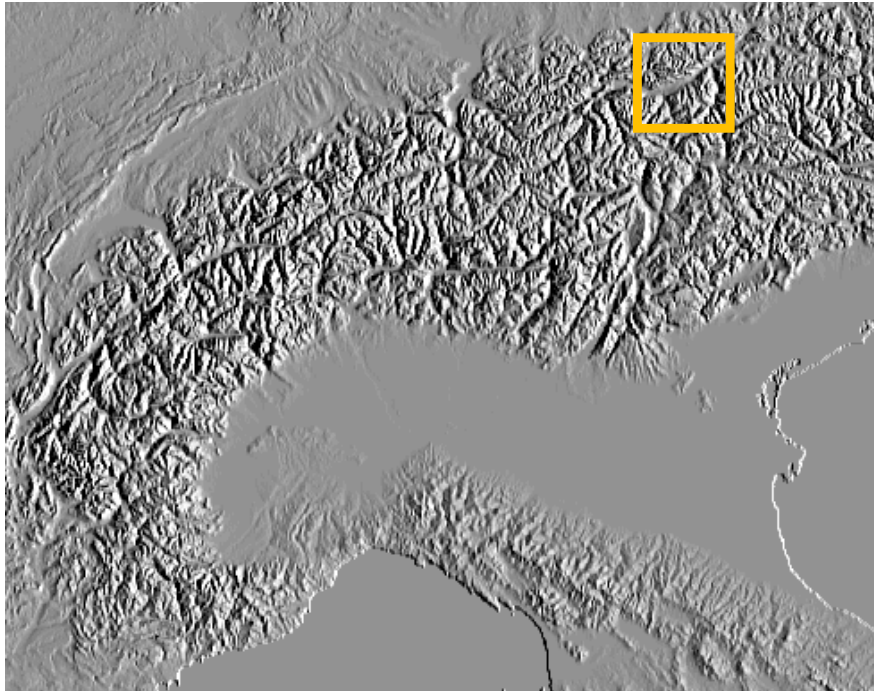


→ **Platform** for studying boundary layer processes in complex terrain

→ **Integrated approach** based on two pillars :

- A. long-term reference turbulence measurements and
- B. high-resolution numerical modeling in very complex terrain

A. Long Term Measurements



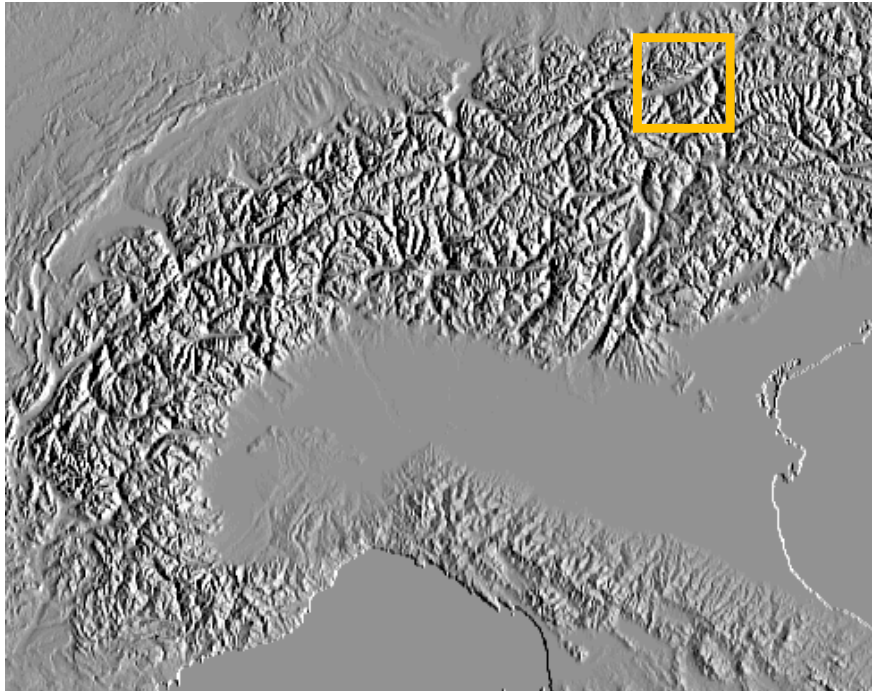
Long Term: several years
The focus area: Inn Valley
→ Straight (NE-SW)
→ Complex: Side Valleys, Foothills,
high topography (2200 m)



Why Box ?

→ Point/column measurements
are not enough
→ Measurements and modeling
in a 3D volume

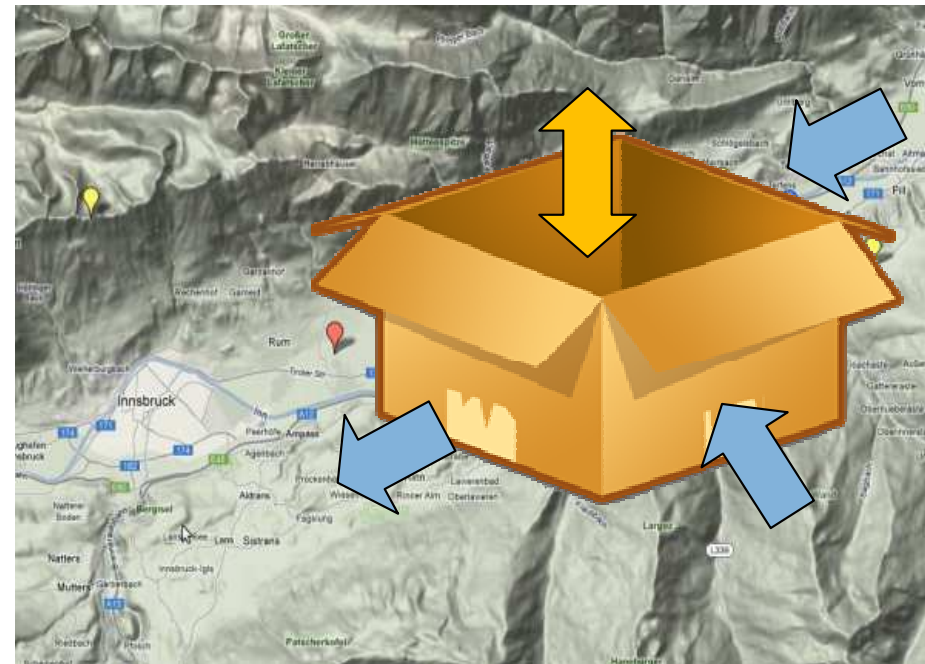
A. Long Term Measurements



Long Term: several years
The focus area: Inn Valley
→ Straight (NE-SW)
→ Complex: Side Valleys, Foothills,
high topography (2200 m)

Why Box ?

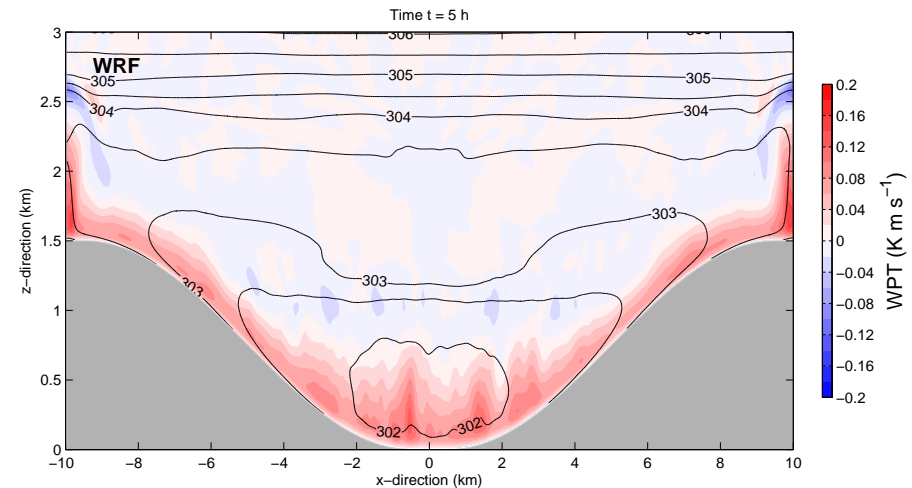
→ Point/column measurements
are not enough
→ Measurements and modeling
in a 3D volume



B. Virtual i-Box

High resolution Numerical Modeling

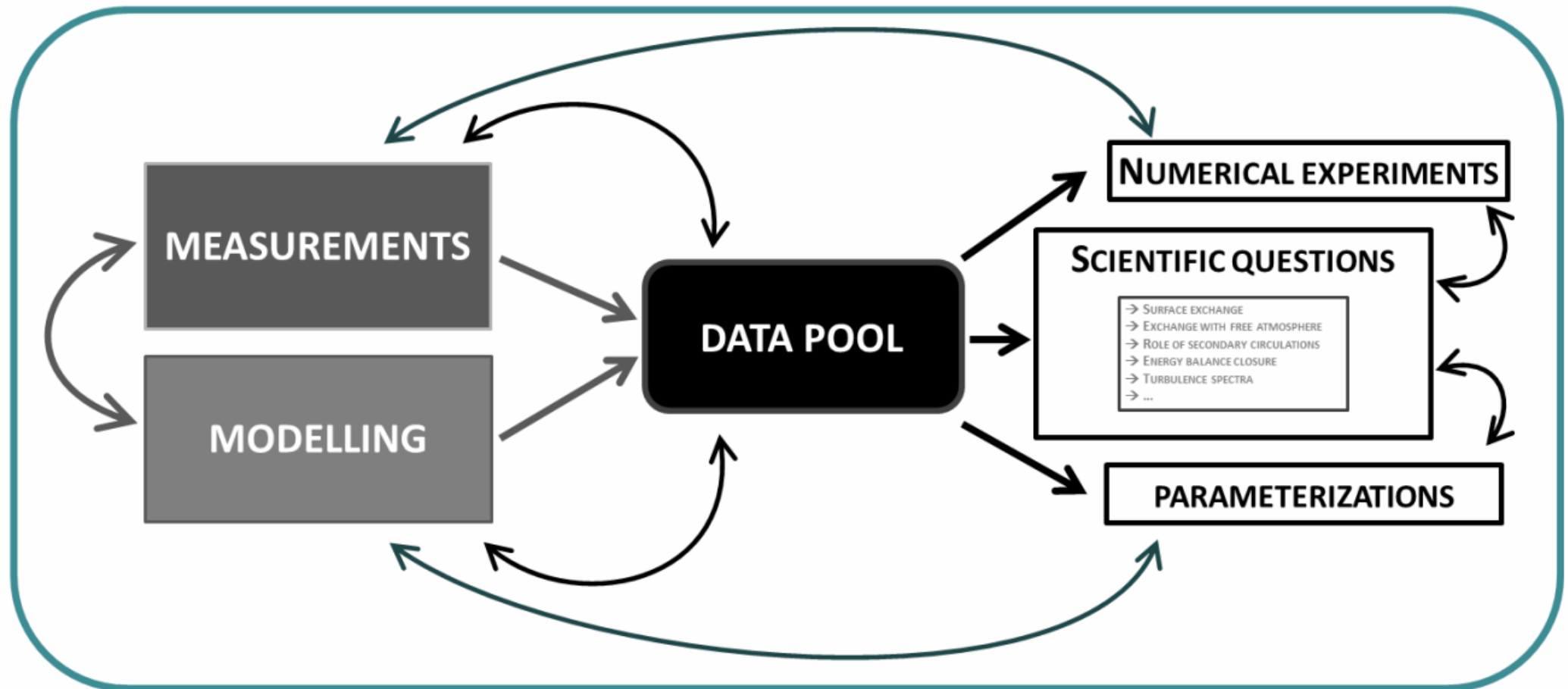
- Idealized and Real case
- Mesoscale and LES



Numerical modelling + Measurement used in two-fold way:

1. Reproducing measurements – model verification
2. Providing the data

i-Box Iterative Approach

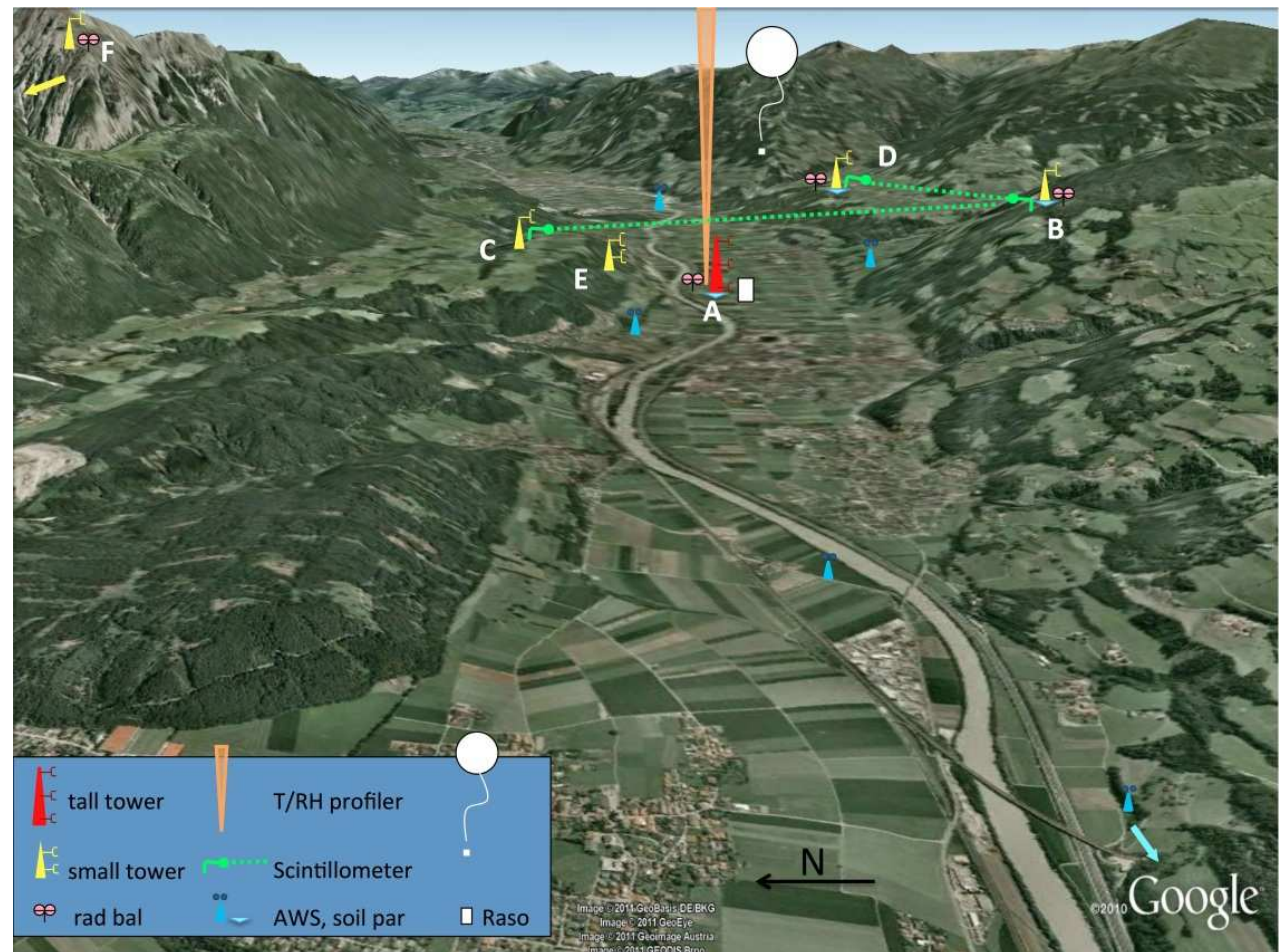


Characteristic Sites

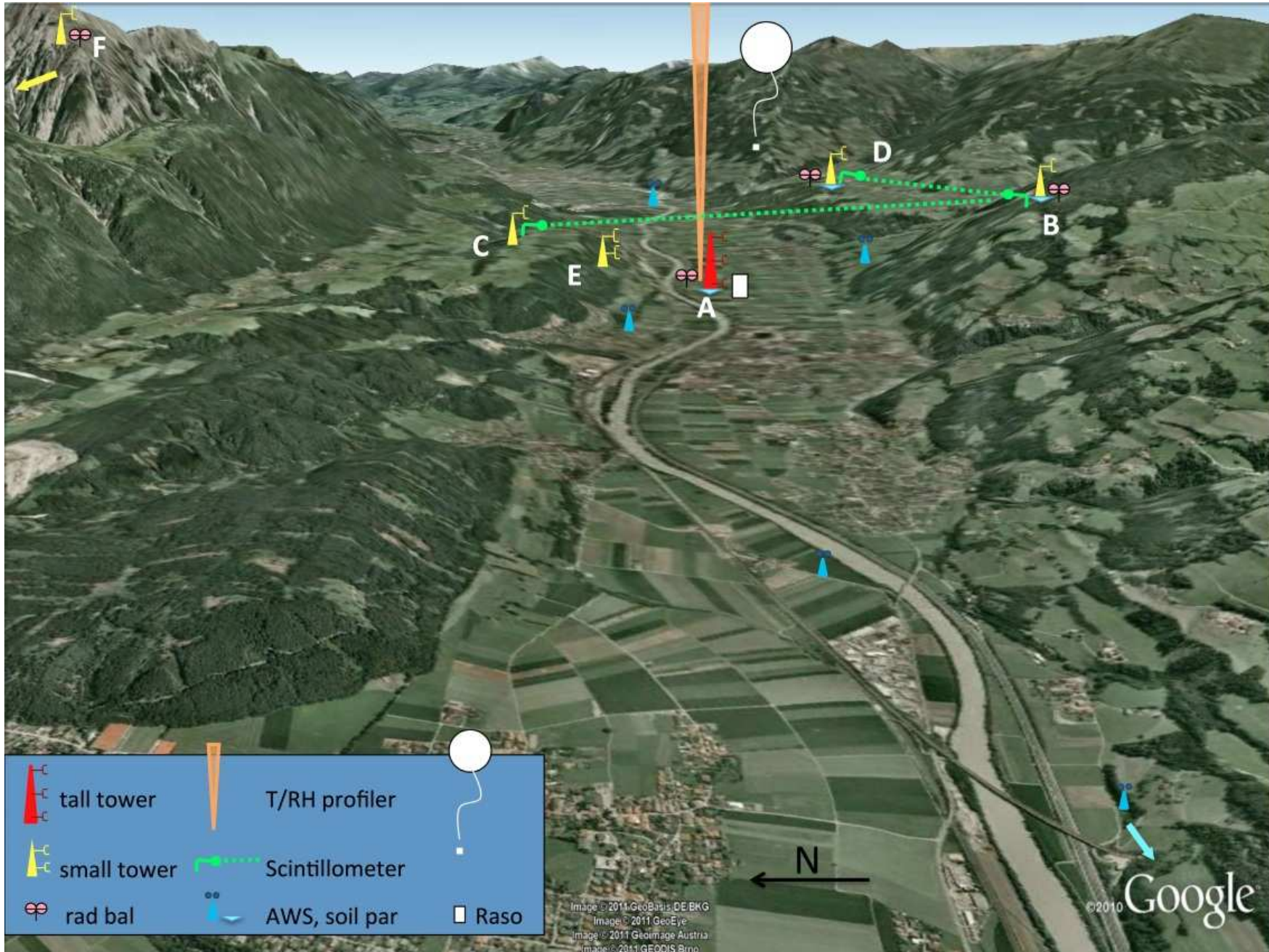
→ Chosen to be representative of specific surfaces and topographic features (universality of the results)

- Valley Bottom,
- North and South oriented Steep slope
- North and South oriented Flat slope (Foothills)
- Mountain Top

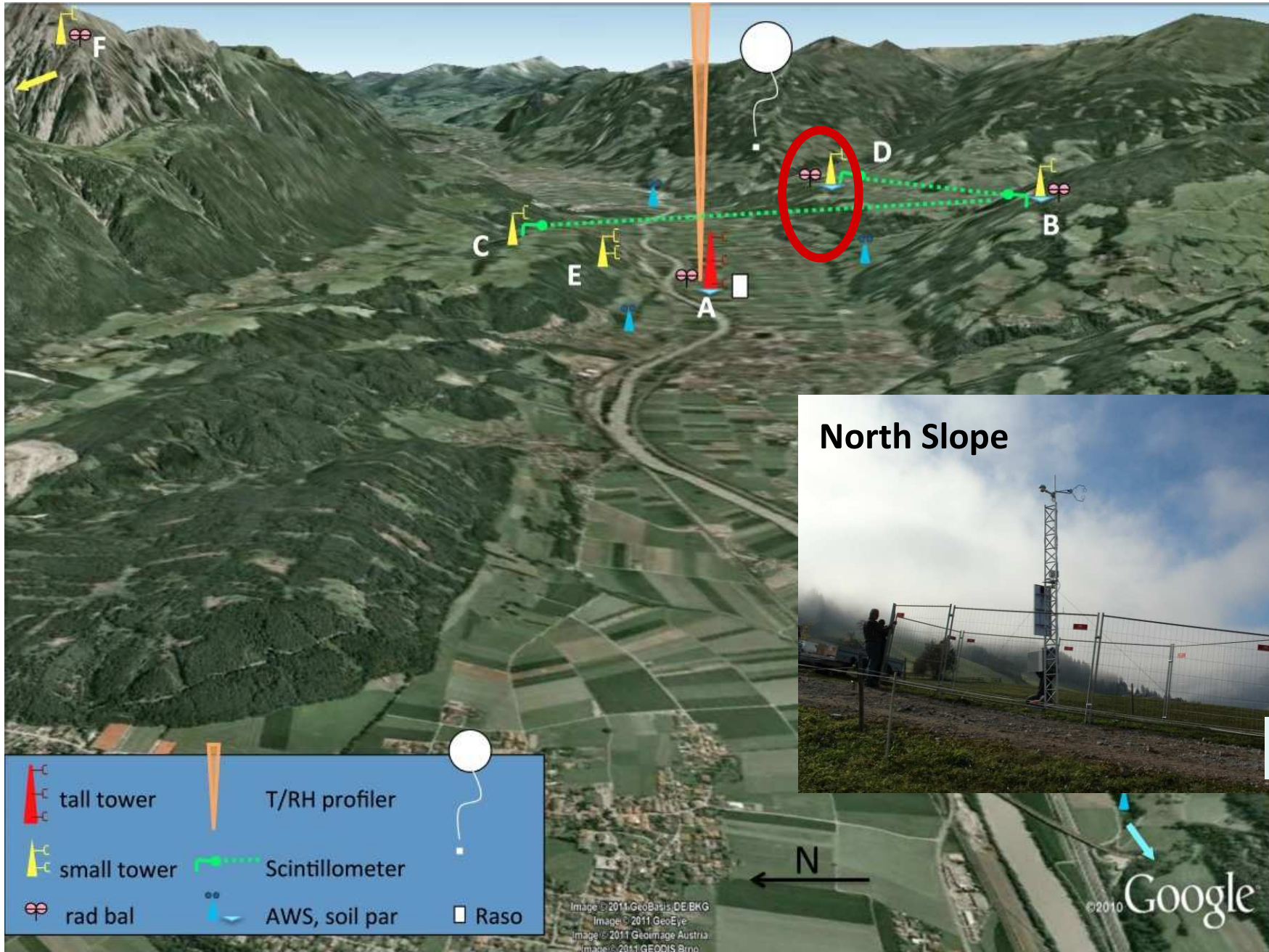
→ Turbulence towers
→ Remote sensing



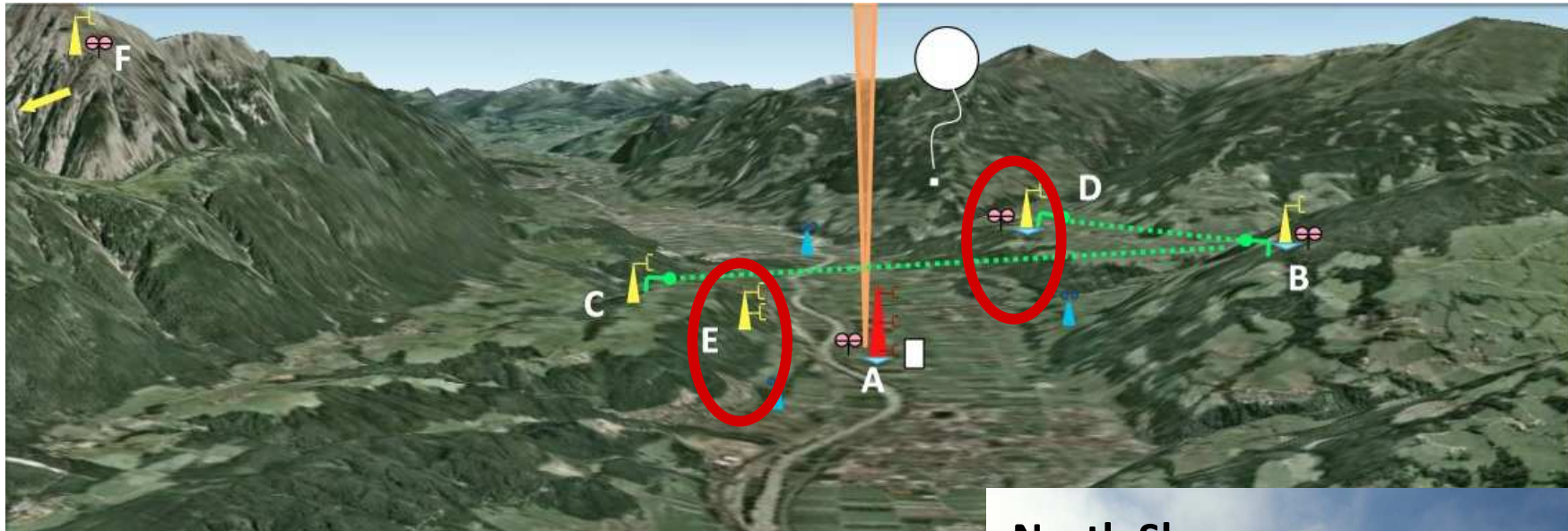
Characteristic Sites



Characteristic Sites



Characteristic Sites








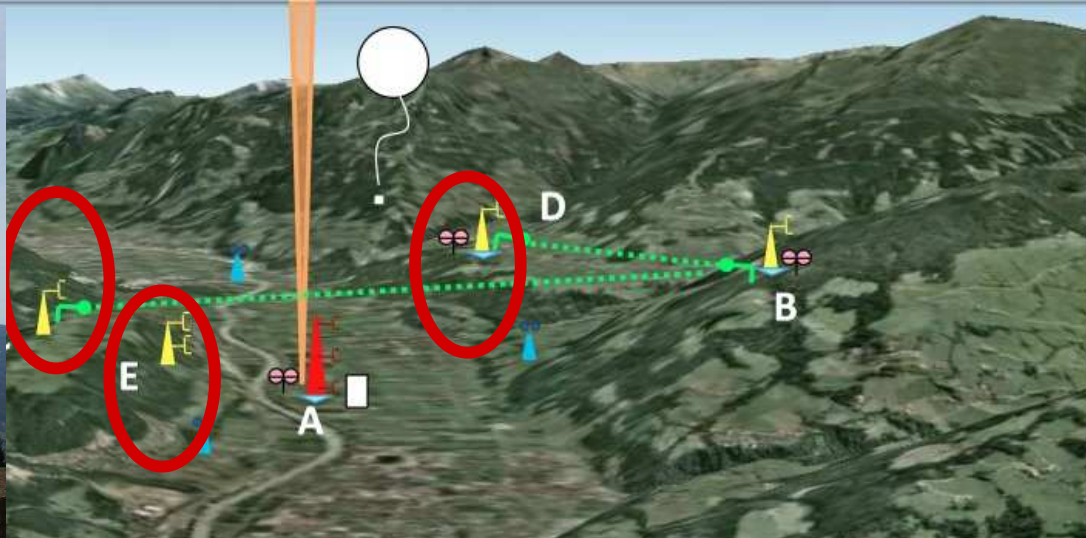

	small tower		Scintillometer		Raso
	rad bal		AWS, soil par		



Image © 2011 GeoEye, Inc. DE/BKG
 Image © 2011 GeoEye
 Image © 2011 GeoImage Austria
 Image © 2011 GEODIS Brno

Characteristic Sites



	small tower		Scintillometer		Raso
	rad bal		AWS, soil par		

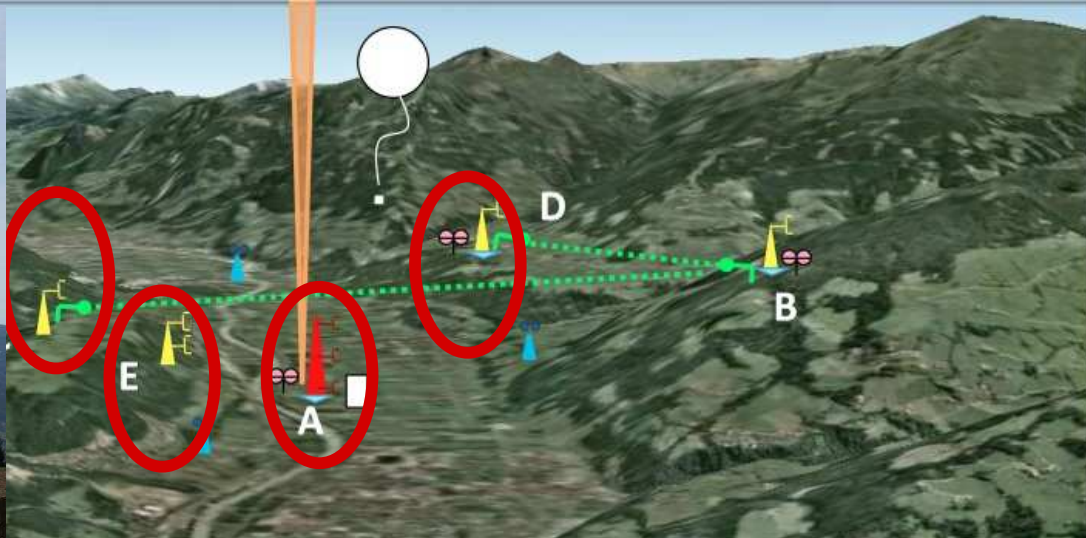


Characteristic Sites

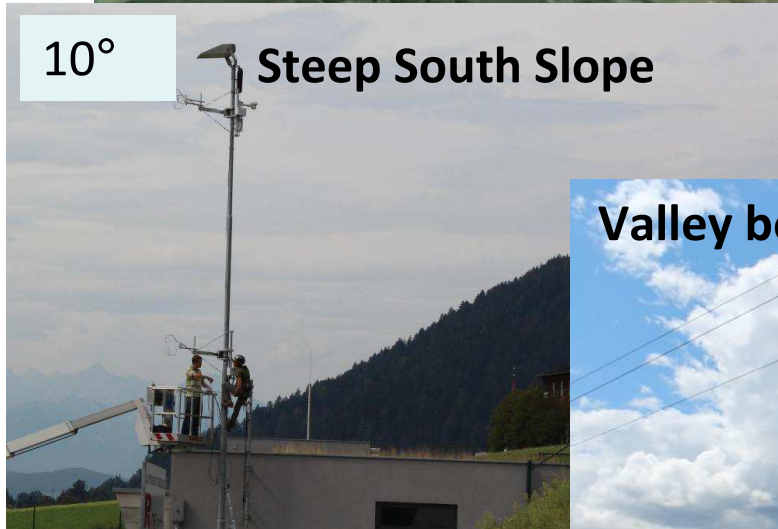
Flat South Slope



1°



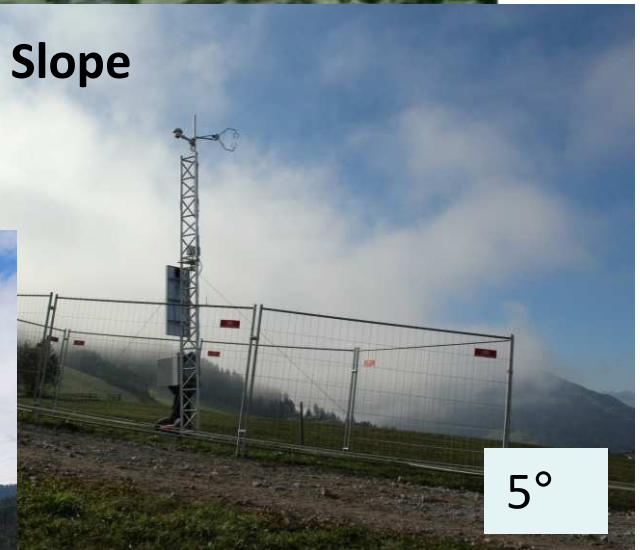
North Slope







10°

Steep South Slope

Valley bottom

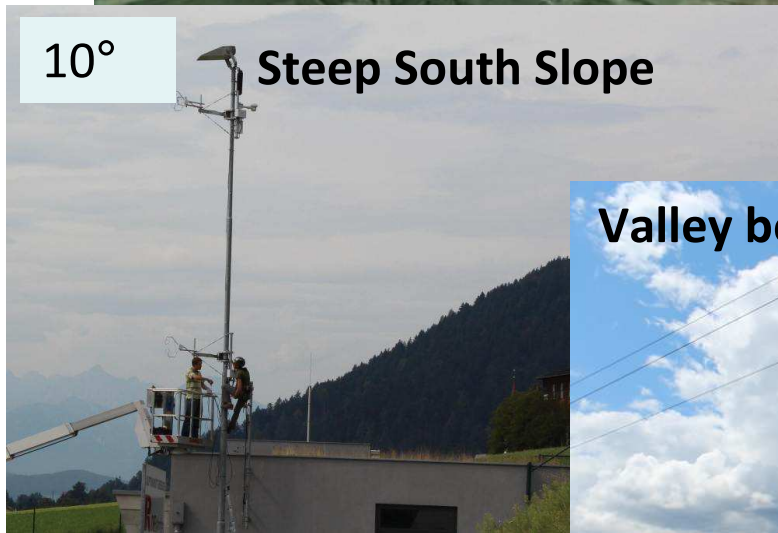
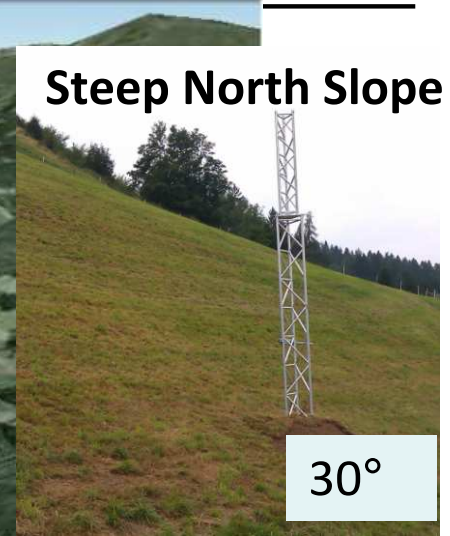
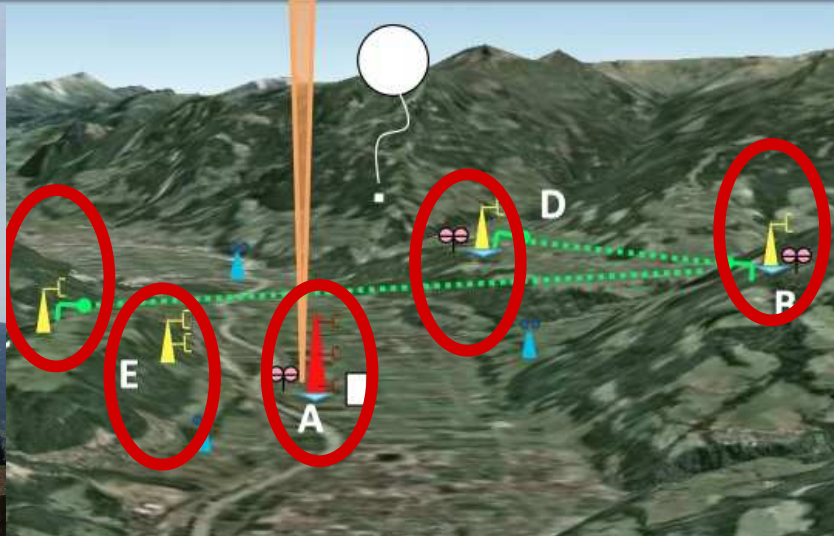


5°

	small tower		Scintillor
	rad bal		AWS, so



Characteristic Sites



	small tower		Scintillon
	rad bal		AWS, so

C. Which Scientific Questions?

What is the boundary layer structure in complex terrain?

→ Mechanism of exchange with free troposphere

→ **Surface inhomogeneity**

→ **Scaling in complex terrain**

→ **Energy balance closure**

→ Surface exchange

→ Role of secondary circulations

→ Energetics of thermally driven flows

→ Turbulence spectra

→ ...
