

An aerial photograph of a mountain range with significant snow cover. The mountains are rugged and layered, with snow filling the valleys and clinging to the slopes. The sky is clear and blue. The text is overlaid on the image.

TherMap 1-03

Generating thermal maps using
topographic models

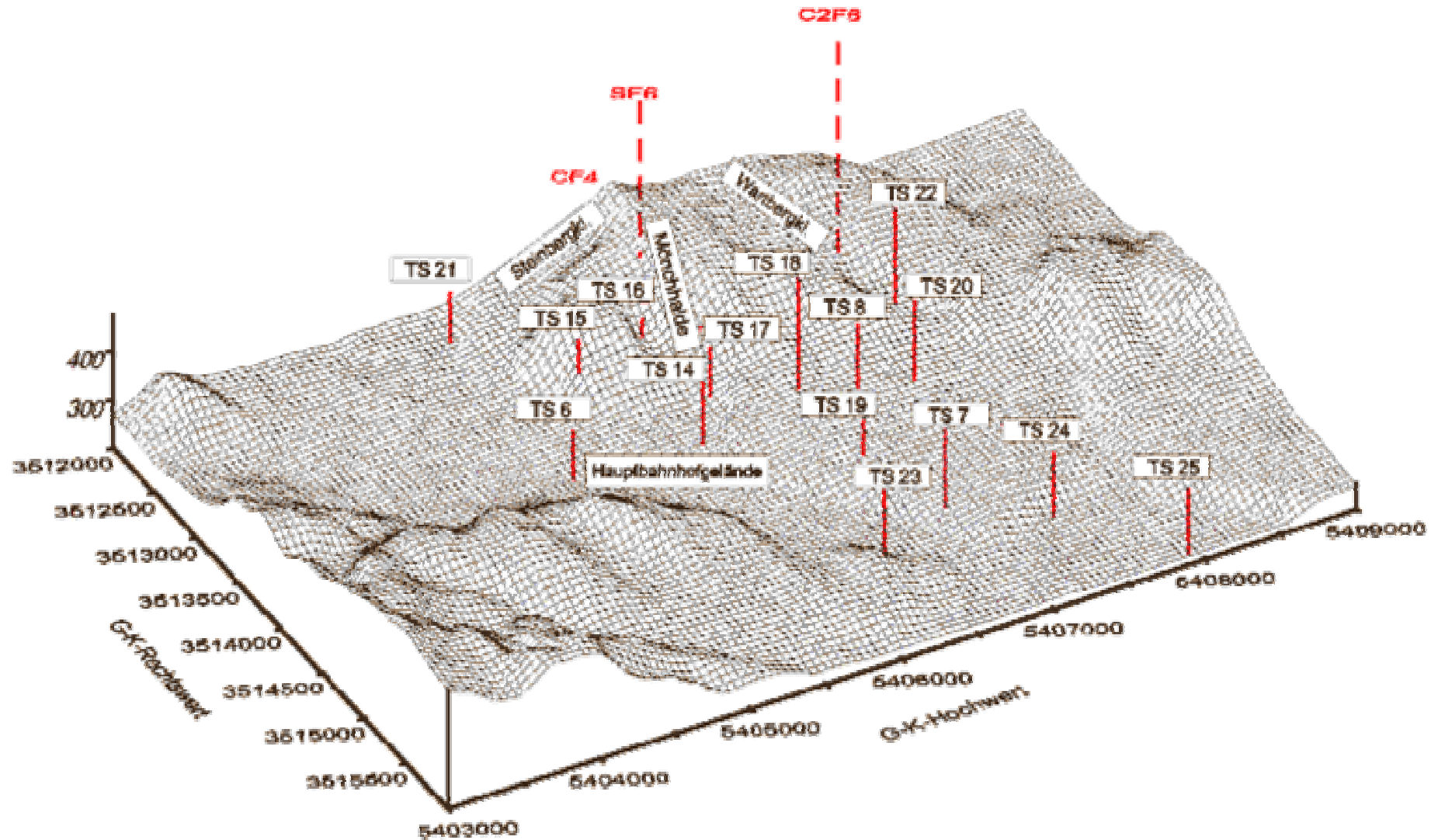
Discussion on next steps

Beda Sigrist

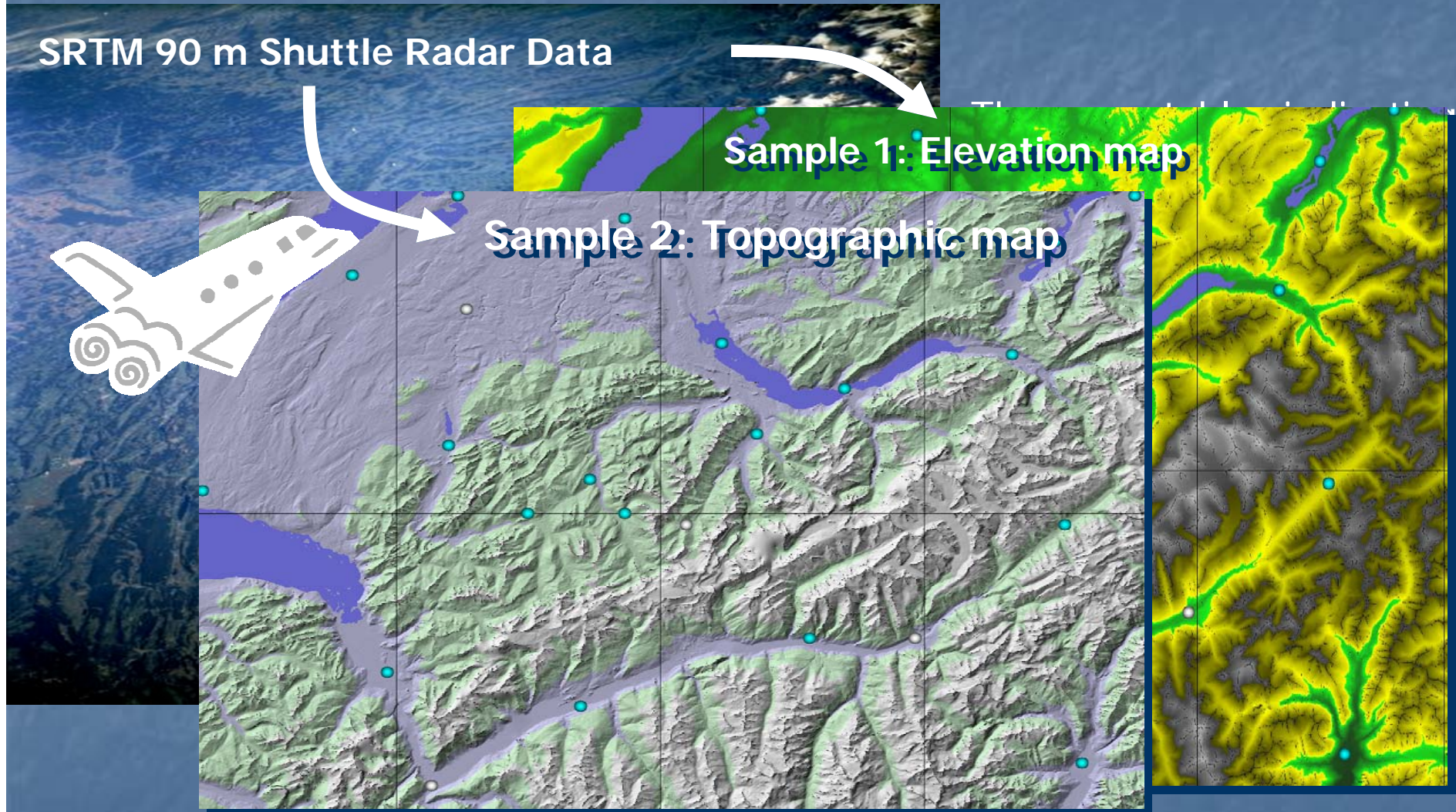
Contents

- Topographic models
- Irradiation
- Temperature 2006 (v. 0.62)
- Thermal pressure 2007 (v. 1.01)
- Extracts for in-flight use 2008 (v. 1.03)
- Discussion of next steps

A topographic model is a digitized land surface



Computing maps based on SRTM data



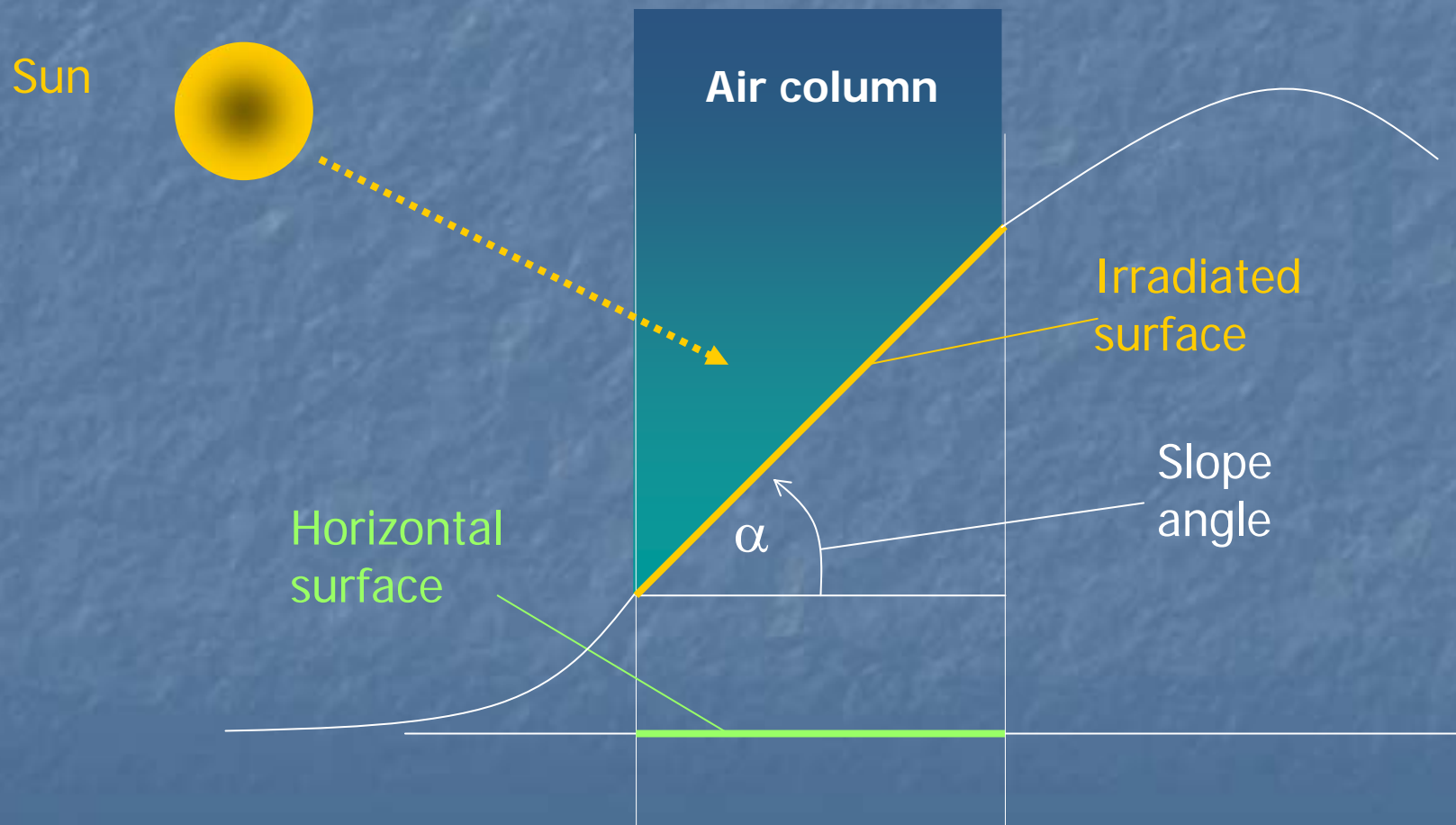
Local irradiation depends primarily on

~1.3 kW/m²
in space

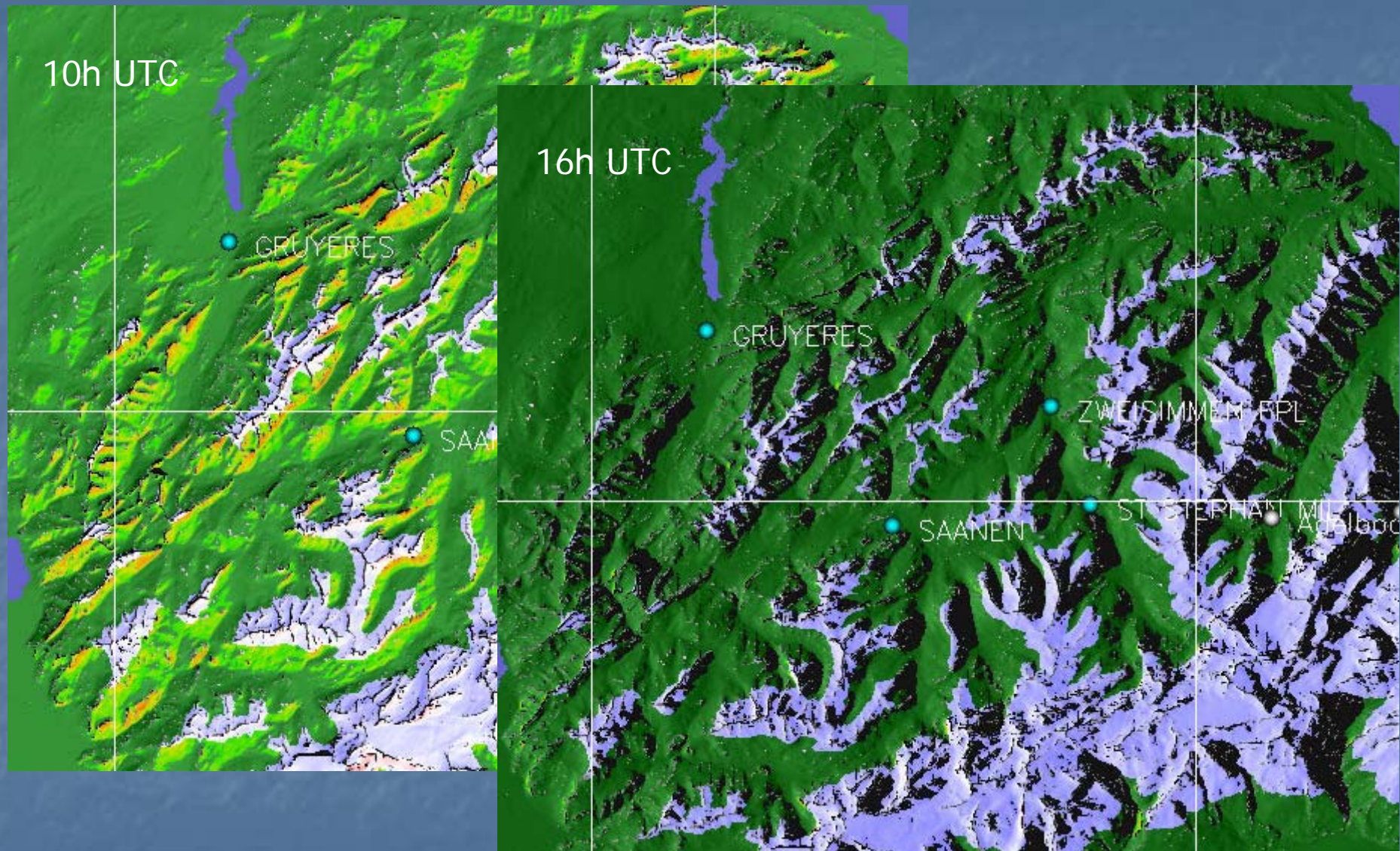
1. the direction of the sun, i.e.
 - the geographical position
 - the date and the hour
2. the atmosphere, i.e.
 - the altitude
 - The transparency of the air (turbidity)

TherMap assumption : Constant visibility of 12 km (for turbidity)

Slopes reinforce **irradiation** like solar pannels



Example: Irradiation, April 20



Surface **temperature** is a better thermal indicator than irradiation

Temperature increase =
Cumulative irradiance minus radiation losses

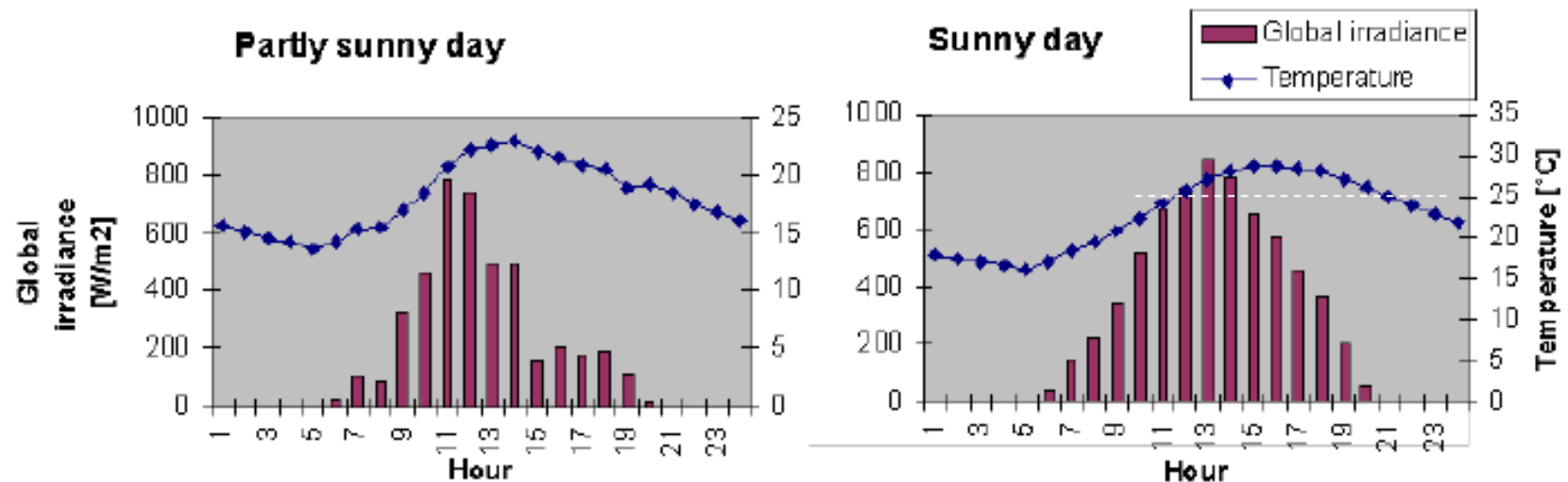


Fig. 7.1.11: Example of hourly values of temperature and global irradiance for 2 different types of days (partly sunny, sunny) for **Locarno-Magadino** CH.

Solar Engineering Handbook Part 2, "Temperature Theory", ed. 2003, Meteotest, http://www.meteotest.ch/en/mn_dl?w=ber

Temperatures peak about 2h after maximum irradiance

Factors reducing temperature



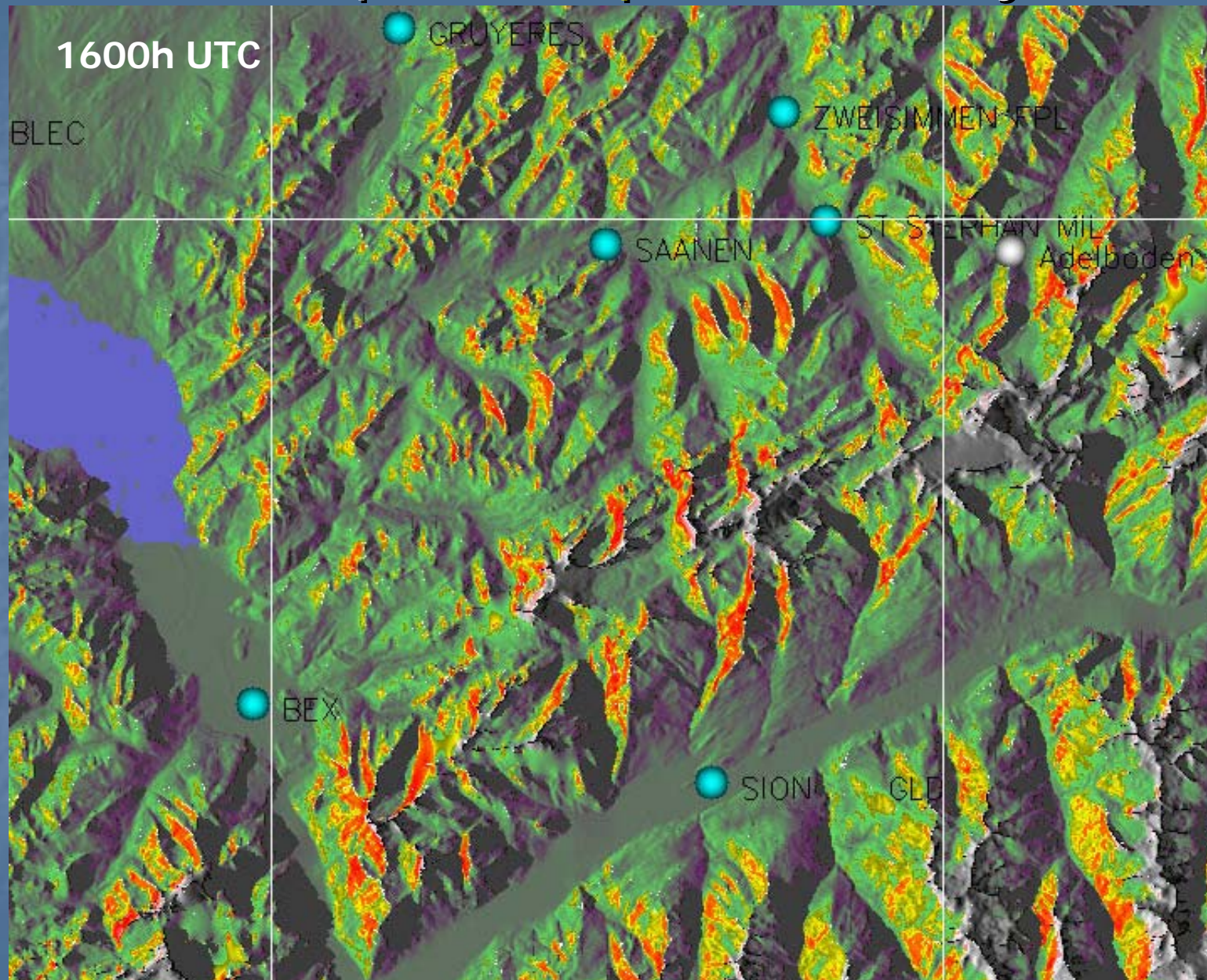
Albedo of snow covered surfaces (seasonal)

Vegetation diminishes also with slope !

Forest zones essentially between 700 – 1500 m

Vegetation activity by season, altitude and latitude

Example: Temperature, May 6

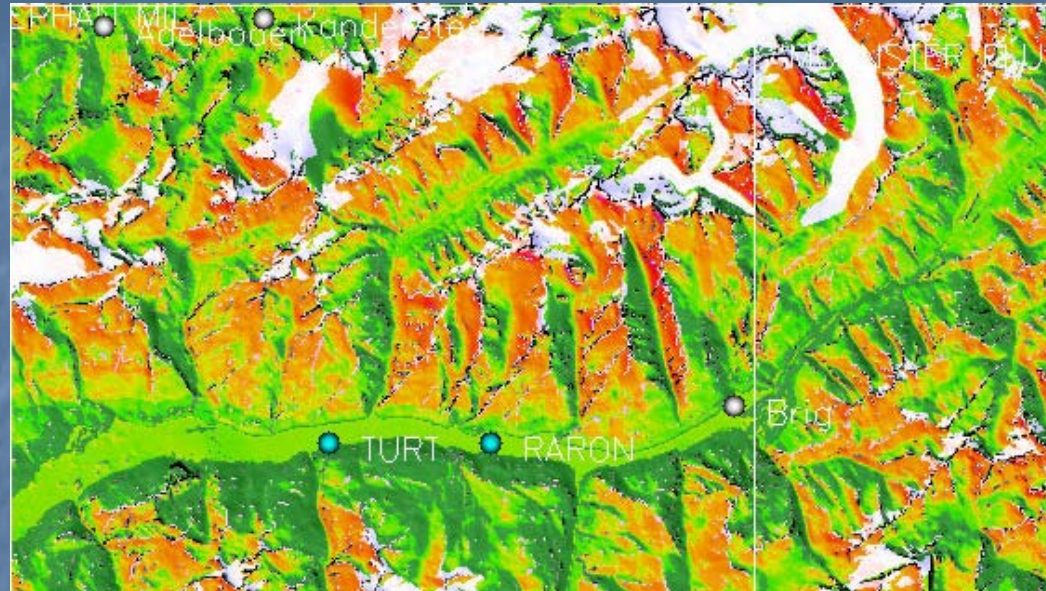


- **TherMap 0.62 of 2006** was essentially based on irradiation and temperature
- **TherMap 1-01 of 2007** went one step further

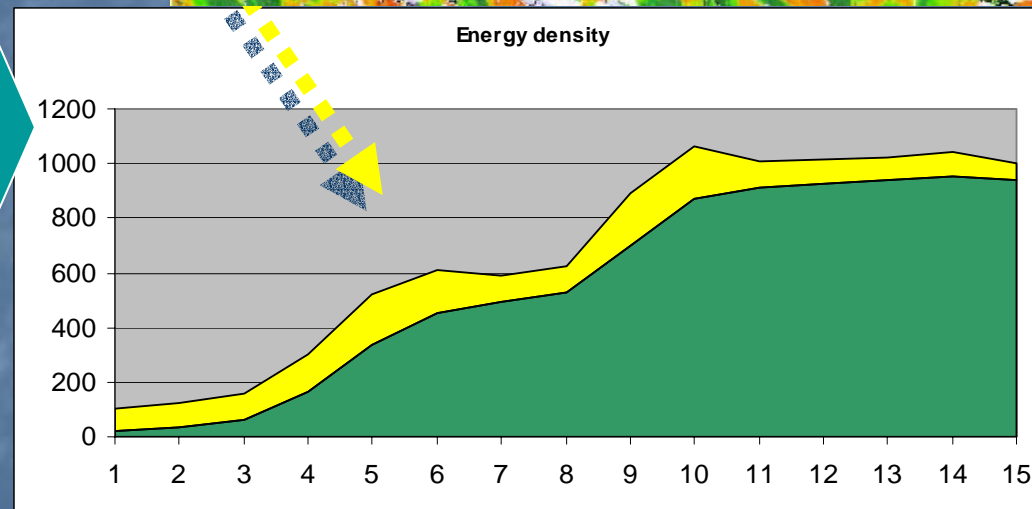
Why and how ?

Temperature still not best thermal indicator

Valais, July 20:
Temperature increases are too wide-spread

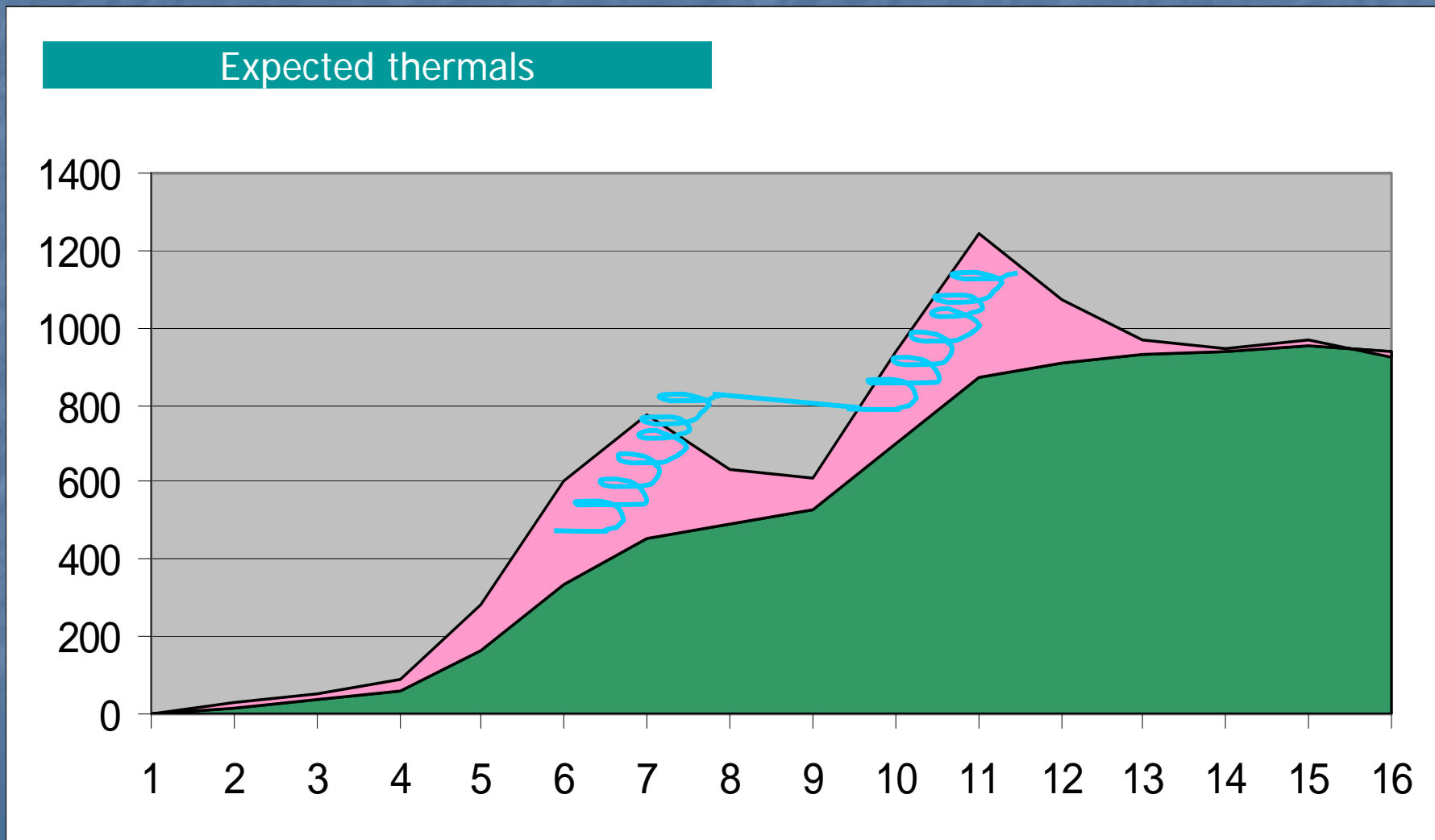


Reason:
Little variation of cumulated irradiance

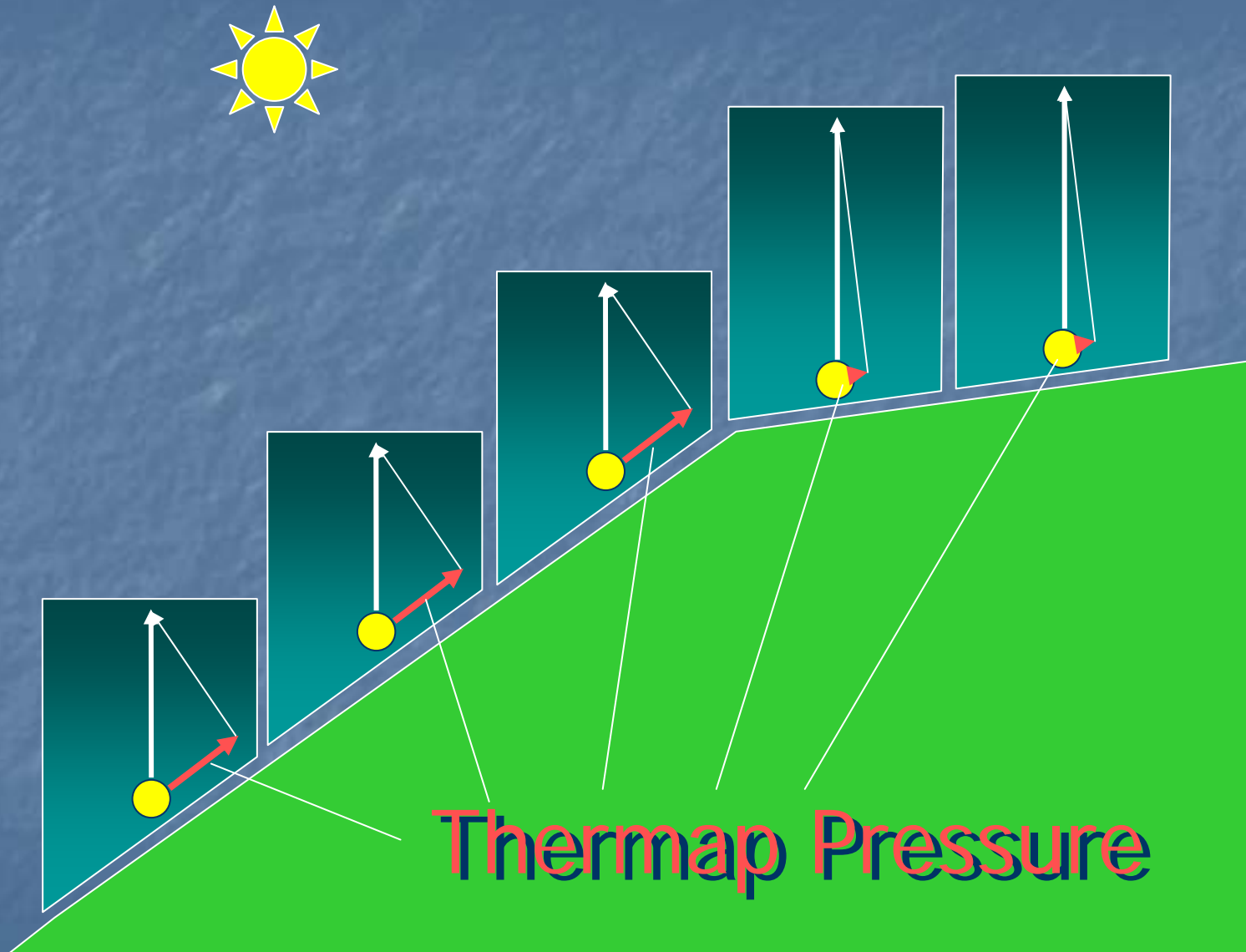


But is there a better model ?

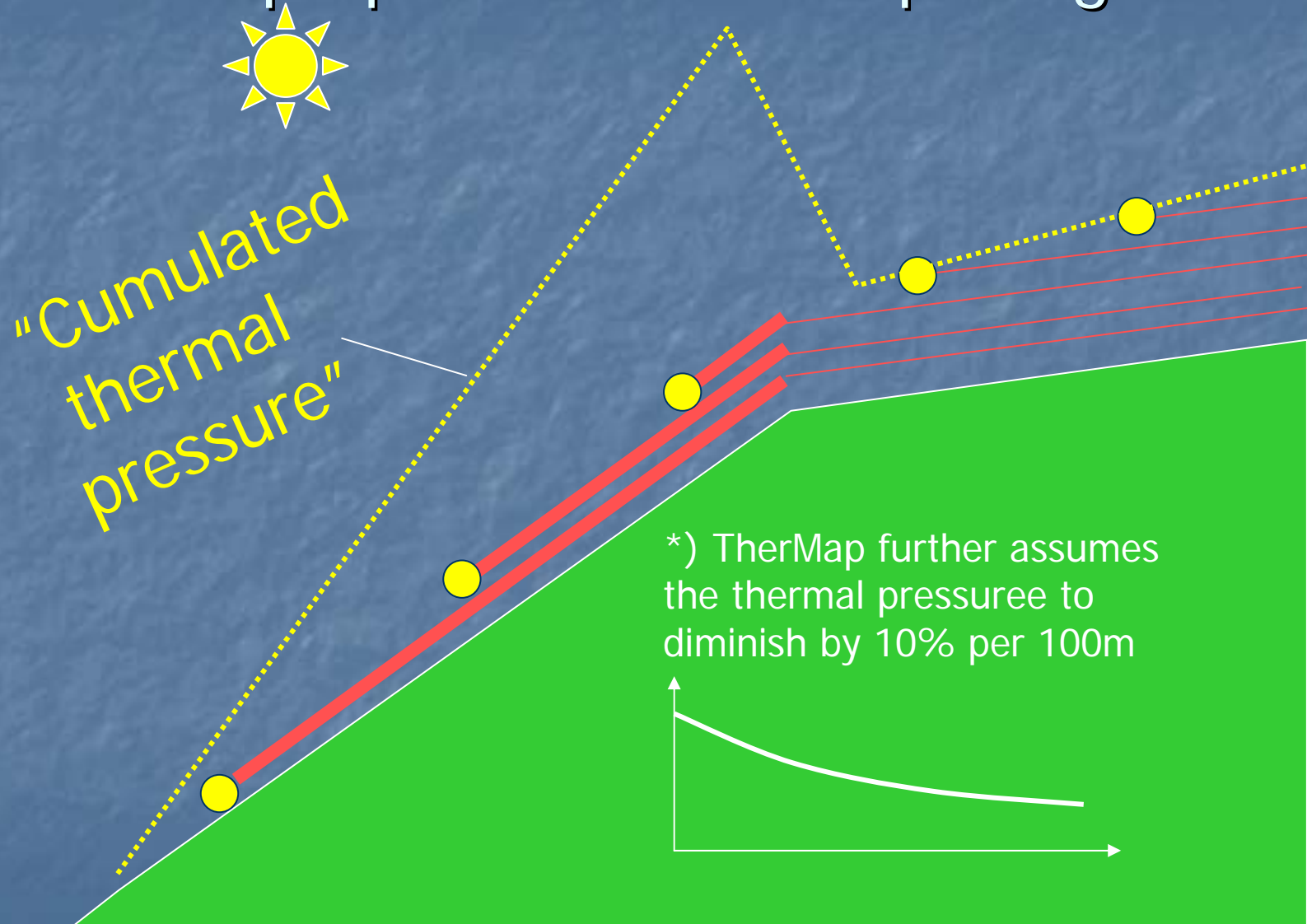
Thermals seem to depend on the heat cumulated along the lines of steepest ascent



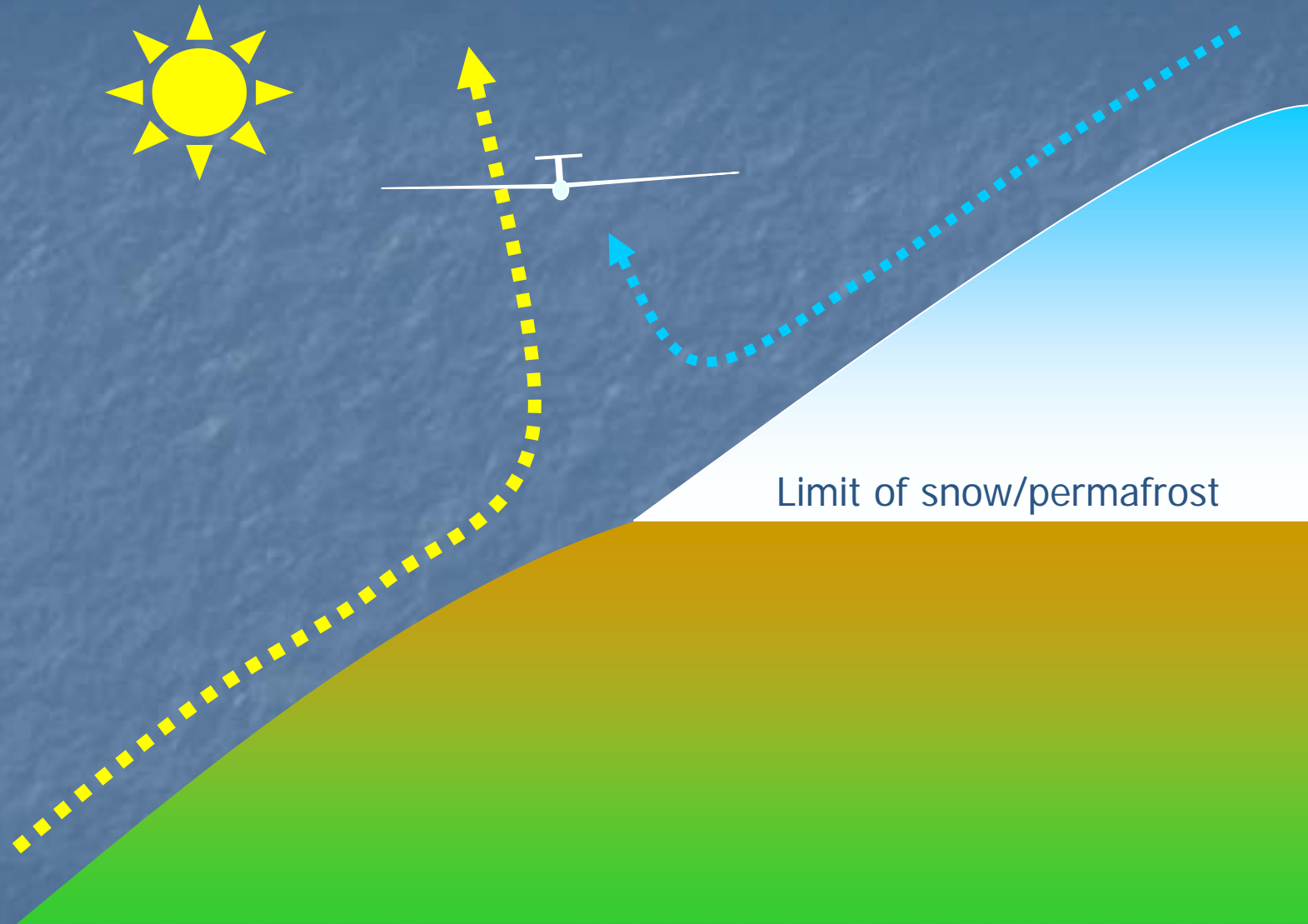
The basic "Thermal Pressure" model



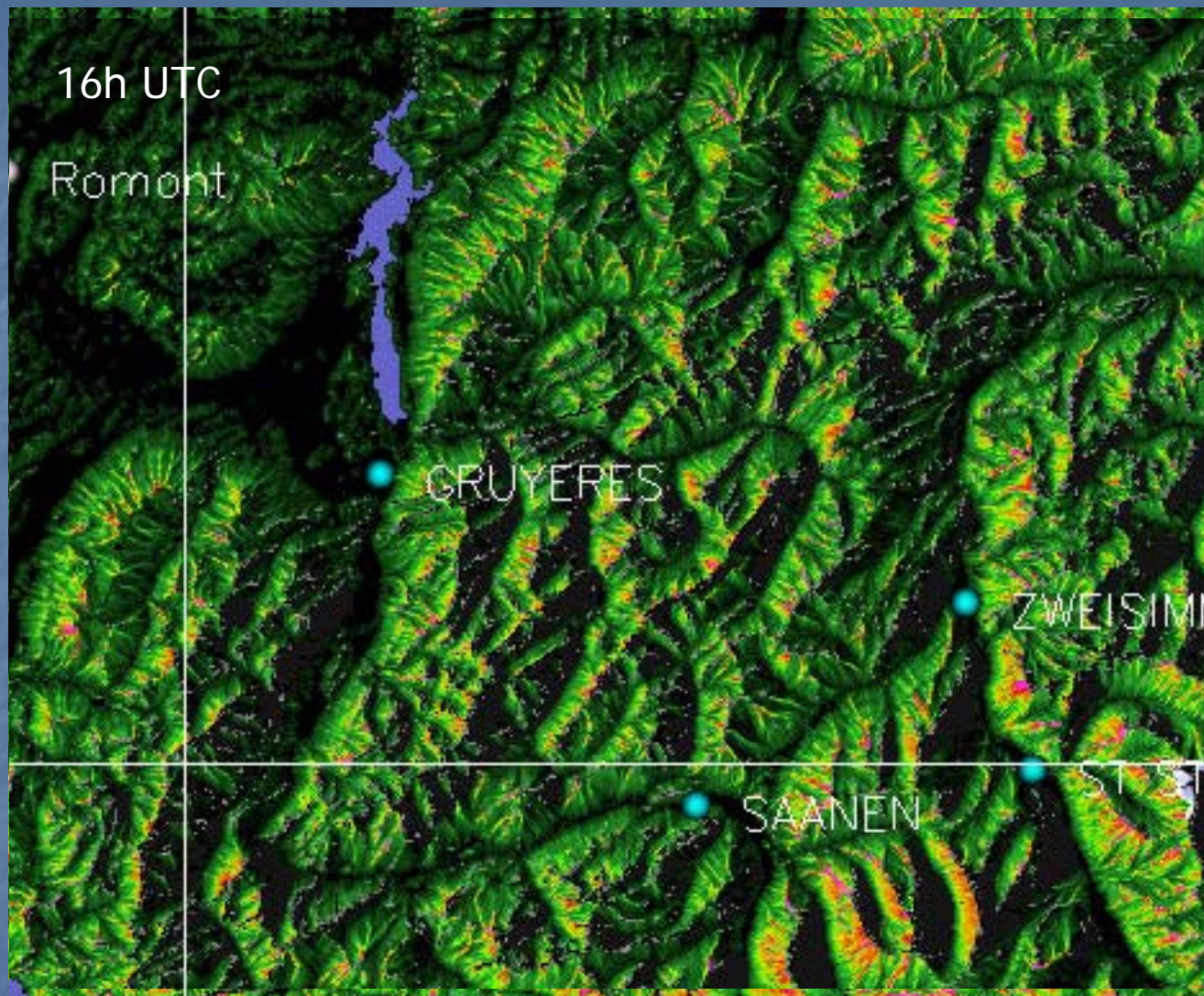
The "Thermap Pressure" is then distributed in proportion to the slope angle



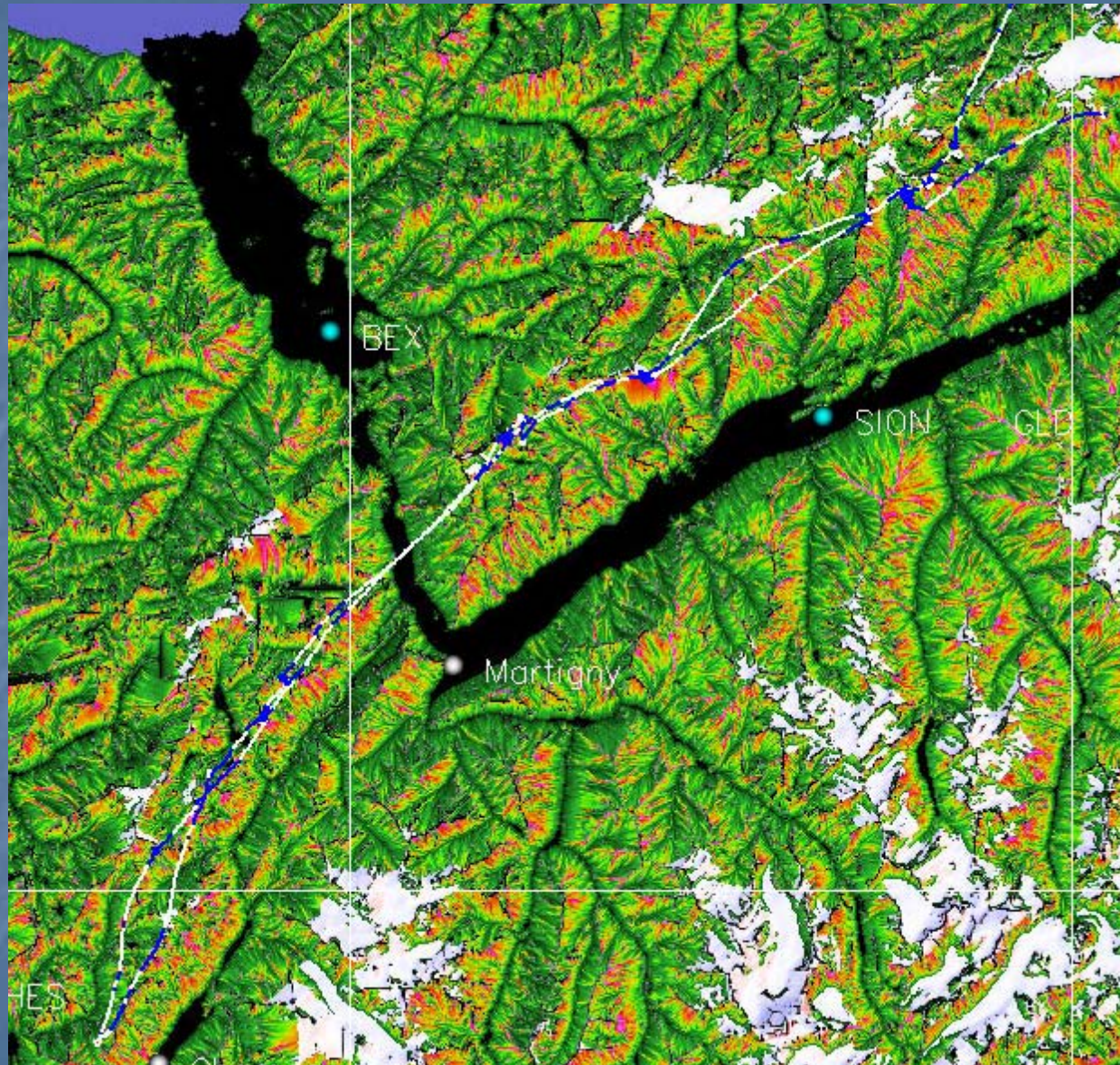
TherMap also considers the snow limit



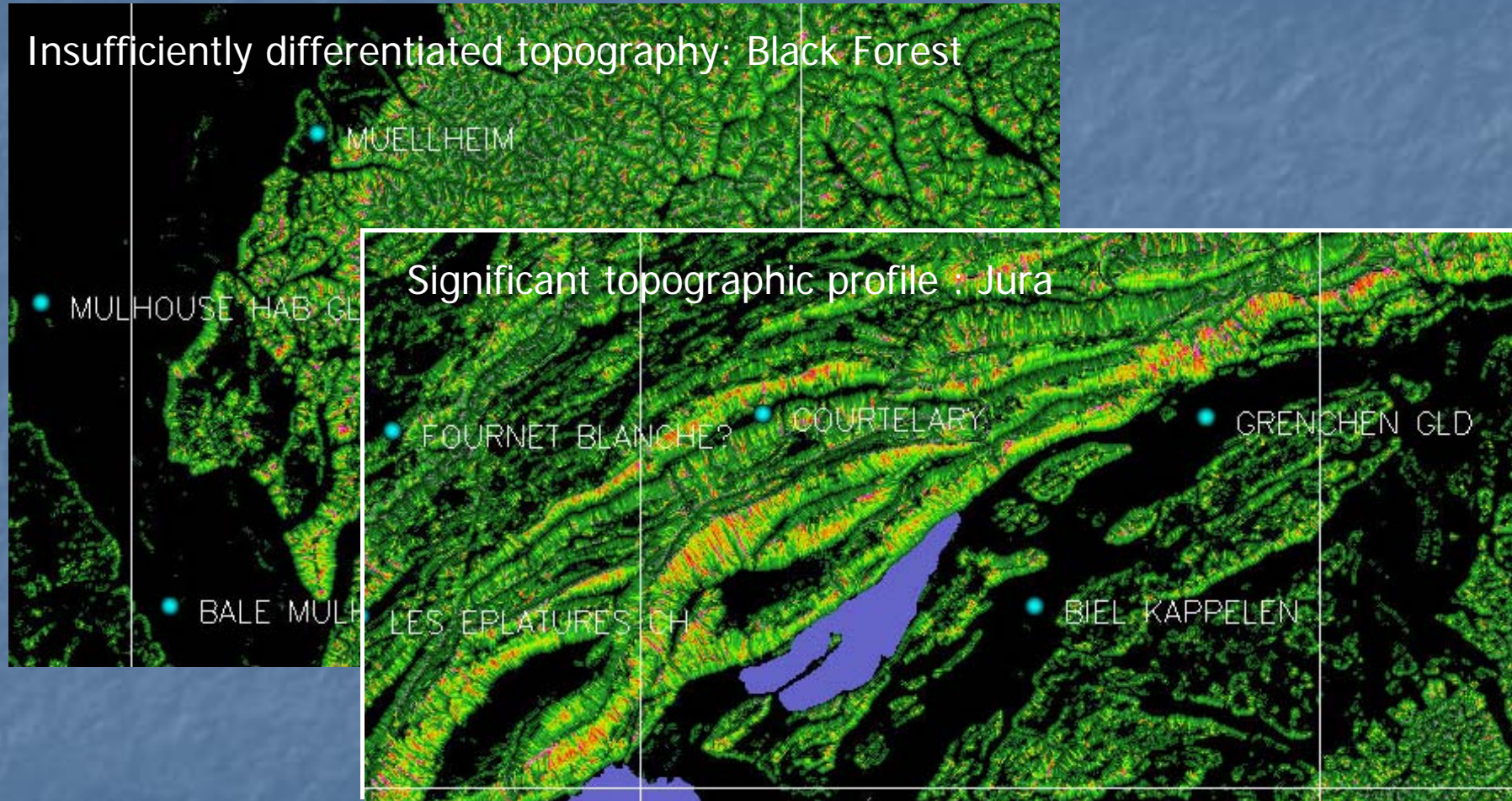
TherMap 1-01, May 4



Validation example, June 15



TherMap works for regions with significant topographic profiles



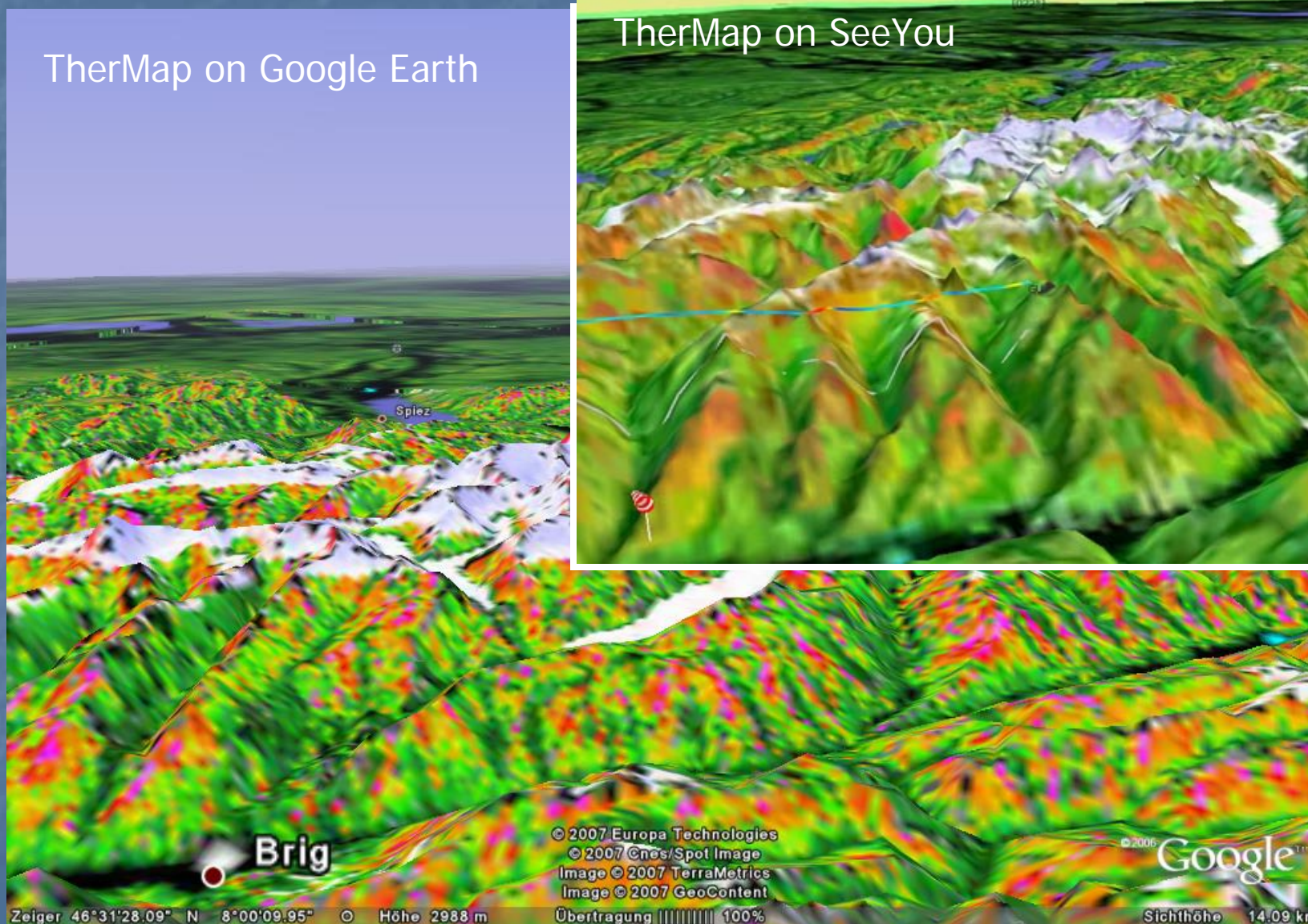
Present coverage of TherMap

- Maps available in **Internet** (free download of individual maps) ou **CD**
 - CD1: Alps of Switzerland, France, and Austria
 - CD2: South of Europe (Apennine, French Alps, Pyrenees)

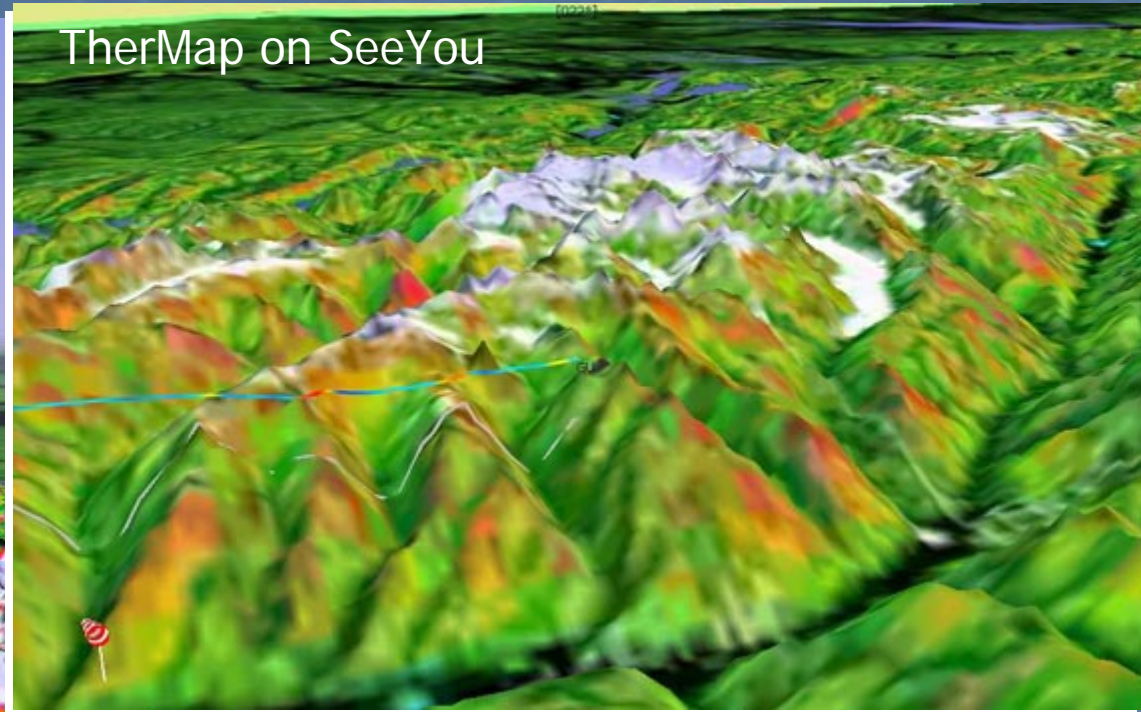


The (Raster) maps can also be imported into SeeYou or Google Earth and viewed in 3D

TherMap on Google Earth



TherMap on SeeYou



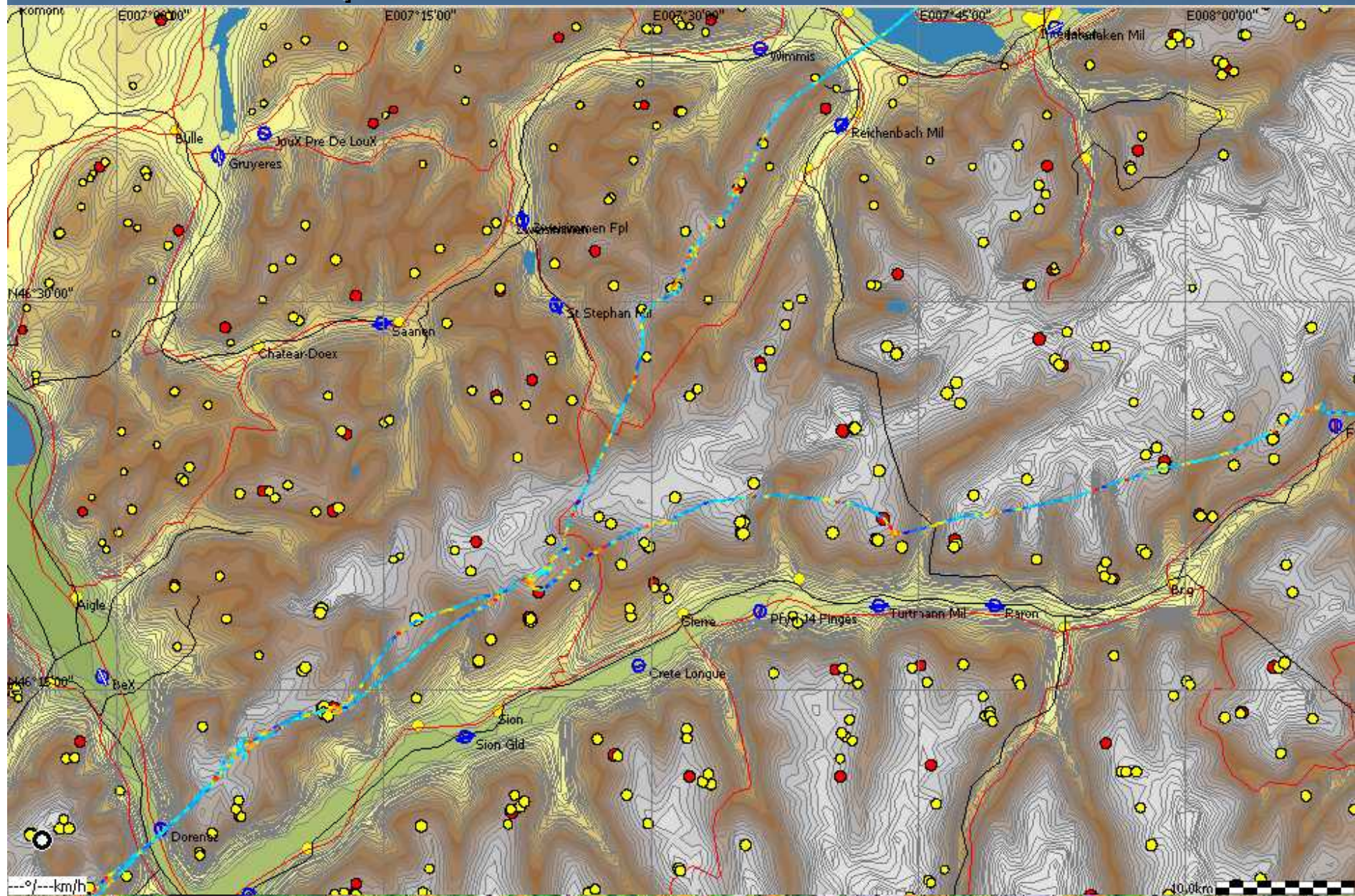
TherMap 1.03: **Extracts** for in-flight use

Issues to be resolved:

- Image **resolution** and memories of most mobile devices much smaller than those of PCs
- **Displays** of most devices (typically DPAs) hard to read under daylight conditions
- Need to simultaneously see **flight navigation** maps and TherMap hotspots.



Example of extract: June 15 10hUTC



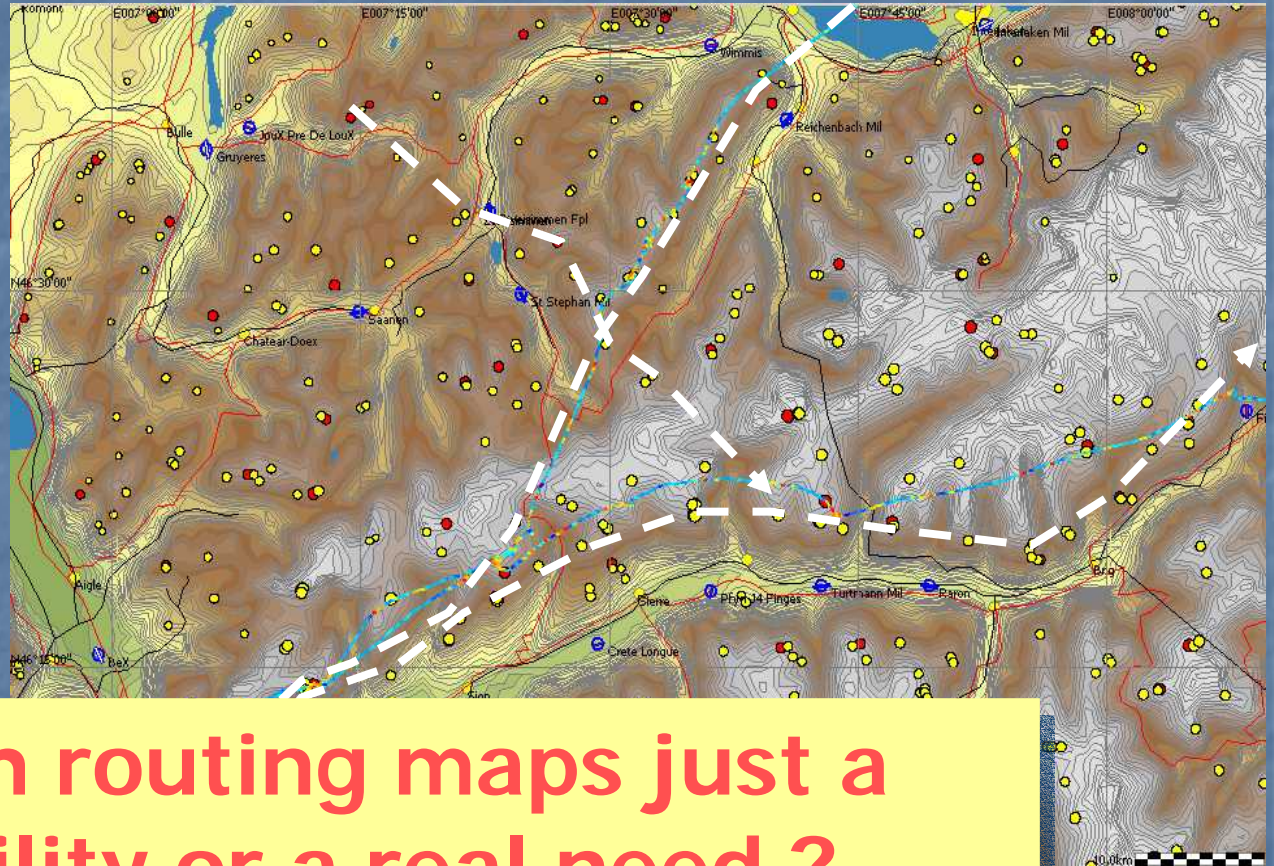
Issues with TherMap Extract Files

- Hotspot **selection** criteria (too few vs. too many)
- Making **extraction files** for different mobile navigator systems (starting with OpenAir format)
- Optimum in-flight use:
 - **Limited attention** during flight
 - Correct **interpretation** of effect of altitude and meteorological factors (wind, cloud cover and base etc.)
 - Readability of **displays**
(how about Altair (XCSoar)?)

Is In-flight use of TherMap really worth the effort ?

Proposal received for strategic extensions of TherMap

- “Optimum routing” maps (highways) by
 - Main flight axes
 - Season
 - Daytime
- Could also be a training tool



Are such routing maps just a possibility or a real need ?

Thank You



Some Sites Quoting TherMap

www.segelflug.ch Fédération CH

www.streckenflug.at Fédération AT

www.pa.op.dlr.de/ostiv OSTIV

www.fai.org FAI

<http://www.naviter.si> SeeYou

www.schaenis-soaring.ch

www.juniorgliding.ch Equipe nationale junior

<http://www.sgow.ch>

www.gliding.ch

<http://ozreport.com> (USA)

www.aviation-international.aero (France)

<http://www.aerodrome-gruyere.ch/thermap>

etc.