

# SnowImager

The *SnowImager* is a field measurement instrument that uses near-infrared (NIR) imaging to determine physical snow parameters. It enables fast, accurate, and standardized retrieval of two-dimensional specific surface area (SSA) images and a vertically resolved density profile with millimetre-scale resolution.



## How it works – Data Acquisition

The SnowImager uses NIR illumination and cameras inside a light-tight housing to capture the reflectance of a snow profile by placing the device directly against it. For each measurement, a dark reference image and an illuminated reflectance image of the same area are recorded. For density retrieval, an additional image is acquired using a cover plate with vertical slits. The device stores all images and metadata for post-processing.

### Foldable unit (displayed)

Unfolded: 440 × 500 × 330 mm;  
Folded: 440 × 500 × 110 mm;  
Weight: ~6.7 kg.

### Non-foldable unit

440 × 470 × 330 mm;  
Weight ~5.0 kg.

## Key Features

- Standardized 2-D SSA maps
- Standardized vertical density profiles
- Millimetre-scale resolution
- Clear layer boundaries
- Detection of thin ice crusts
- Field-tested in extreme conditions
- Fast setup and simple operation
- SnowImagerPro software for post-processing

## Components



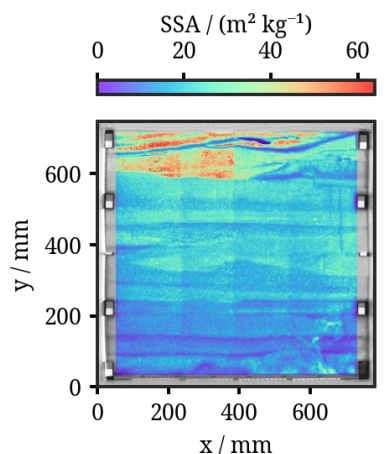
- 1) NIR Illumination
- 2) Upper Camera
- 3) Lower Camera
- 4) Reflectance Targets
- 5) Target Folding Handle
- 6) Unfolding Handle

## How it works – Data Processing

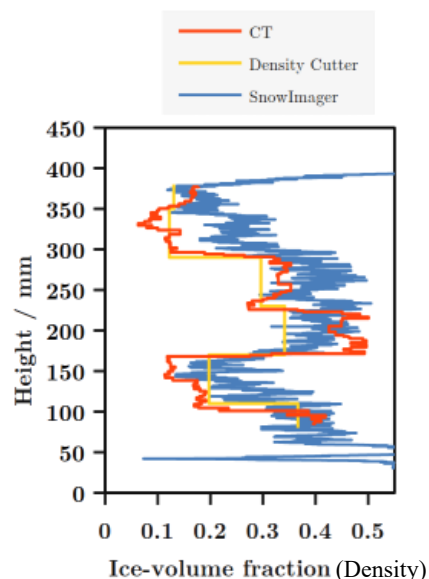
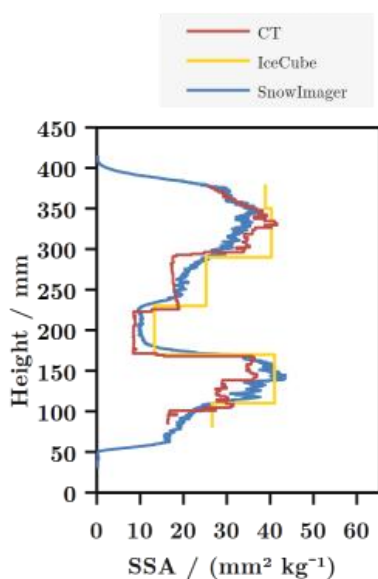
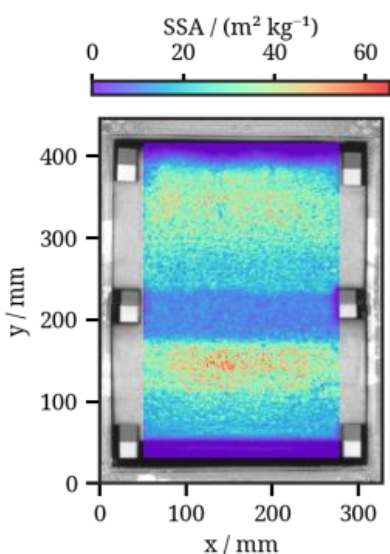
With the SnowImagerPro software, NIR reflectance images are evaluated based on reflectance variations within the snowpack, which are directly linked to the snow microstructure, to derive a two-dimensional SSA image and a corresponding vertical SSA profile by horizontal averaging at each depth.

For density retrieval, the method exploits the penetration of near-infrared light into the snowpack: in high-density snow, light penetrates only shallowly and remains confined, whereas in low-density snow, light penetrates deeper and spreads laterally. Based on the known SSA and the resulting reflectance patterns, snow density is derived as a continuous vertical profile representing variations in ice volume fraction with depth.

## Data Products



- High-resolution SSA imaging reveals detailed snow stratigraphy
- Thin ice crusts and subtle layer transitions are clearly resolved
- Vertically averaged SSA and density profiles
- Ice volume fraction and density are directly proportional and both can be derived with SnowImagerPro
- Good agreement between SnowImager,  $\mu\text{CT}$ , and IceCube / Density Cutter reference measurements
- The standardized workflow ensures reproducible and comparable measurements across different field sites



For purchase options, field deployments, or collaborative projects, please contact: [info@nivilux.ch](mailto:info@nivilux.ch)

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