ILCS Intermediate Layer Core Scanner

High resolution test system designed for inspecting ice bore samples

FEATURES

- Monochrome scanner system
- Scan size 105 x 1200 mm^2
- Max. ice core dimensions: 1200 x 103 x 50 mm^3 (length x width x height)
- Resolution 51 µm, 2048 x 23684 pixels (approx. 48.5 MByte)
- High resolution visual stratigrahy for imaging ice core laminar structures and then dating the samples
- 2x LED line light for dark-field illumination
- Operating temperature down to -25 °C

- Interface: GigE
- Microstructure mapping in polar ice cores

DESCRIPTION

The Intermediate Layer Core Scanner was specially developed to analyse ice cores using visual stratigraphy. It is used to examine samples up to 1.2 m in length with a resolution of 51 µm. The ILCS ILCS-2048-105-1200-Sys uses dark-field illumination in order to visualize the laminar structure of polar ice cores.

Scanner head
It consists of a monochrome line scan camera type SK2048GSD-4L with 2048 pixels and Gigabit Ethernet interface. A sample with 105 mm width and up to 1200 mm can be scanned with a speed of up to 22.7 mm/s. Total scanning time is ~53 s for an ice core sample of 1200 x 103 x 50 mm^3.

Dark field illumination - Visualizing ice layers for dating the ice cores

The annual variations in the amount of precipitation and the deposition of mineral dust and other particles lead to a layered structure of the ice. Visual stratigraphy visualizes these climate induced annual variations and helps to date the ice cores by counting the layers. Global climatic events, such as the eruptions of volcanoes are sometimes visible when the layers contain ash particles. After microtoming the sample on both sides, the layered structure is captured using the line scan camera based ILCS. The camera located above the sample is moved synchronously to an indirect light source, that is mounted on two sides below the sample. The LED light is focussed and directed at an angle. Only light scattered from the sample is directed back into the camera, direct light from the illumination unit does not reach the sensor. The figure in the right shows a stratigraphic image. Transparent ice appears dark while bubbles or dust particles appear as bright visible layers. The number density of layers in a core section characterizes the climate. Colder periods show more and brighter layers, whereas transparent, thus dark ice, indicates that the ice was formed during a milder climate period. Colored layers indicate volcanic ash layers.

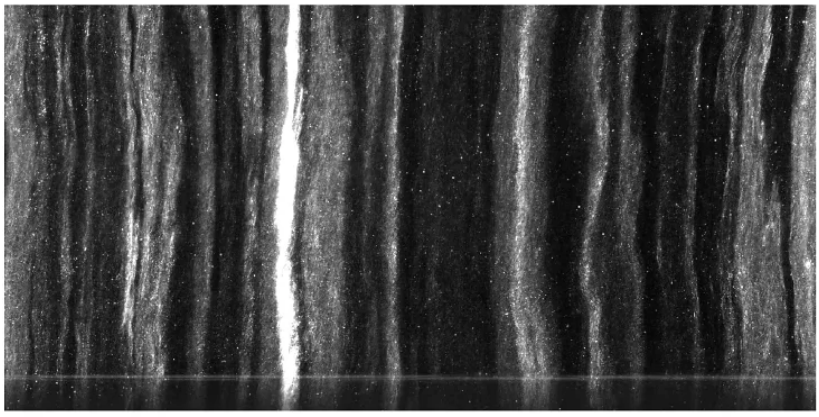
High resolution imaging in harsh environments

As the analysis of the microstructure needs to be done in the field during drilling as well as in the lab, the line scanners developped fo analyzing ice cores need to be robust and insensitive to the harsh environment. The components used (mechanical, optical as well as electrical) are designed to work properly at temperatures down to –25°C . Despite its dimensions, the ILCS is built in a compact way and can be shipped using a reusable, easy-to-handle packing. It is stable and robust enough to endure the long and bumpy ride to and from the drilling site. Both scanners -LASM and ILCS- have been used in the field in Antarctica as well as in Greenland multiple times. Whenever drilling is not ongoing they are used in the lab, e.g. at AWI in Bremerhaven or at the University of Alberta.

More information on dark-field illumination stratigraphy of ice cores can be found on https://www.ualberta.ca/science/research-and-teaching/research/ice-core-archive/services.html

More information on microstructure mapping of ice cores using the LASM can be found on https://www.awi.de/forschung/geowissenschaften/glaziologie/werkzeuge/microstructure-mapping.html.

DEEPICE Project
http://pastglobalchanges.org/science/end-aff/deepice



TECHNICAL DATA

ILCS Intermediate Layer Core Scanner

Sensor Head	
Line Sensor	2048 pixels
Scan width	105 mm
Max. Scan length	1200 mm
Resolution	51 µm / pixel, 2048 x 23684 pixels
Features	White Balance / Shading Correction, Anti-Blooming, Integration Control
Illumination	2 x LED Line illumination, dark-field illumination
Scanning velocity	up to 27.3 mm/s
Object weight	up to 114 kg (without granite base plate)
Base unit dimensions	1630 x 630 x 700 mm
Operating temperature	down to -25°C

TECHNOTES

- Line Scan Camera Basics (10)
  What are Line Scan Cameras? How do you create an image? etc.
  - What are Line Scan Cameras?
    Introduction and advantages of Line Scan Cameras
  - Creating an image using Line Scan Cameras
    How to create an image, definition of line frequency, and how to improve an image

- Optical resolution
  Definition and comparison to conventional area cameras
- Synchronization
  Reasons for synchronization and definition of different synchronization modes
- Shading correction and white balance
  Why do you need shading correction and how to use white balance
- Sensor alignment
  How to properly align the line scan camera sensor
- Blooming and Anti-Blooming Correction
  What is blooming and how to correct it
- Spectral sensitivity
  Spectral sensitivity of different line sensors
- True color imaging technologies
  Color Calibration of RGB cameras
- Bright and dark-field illumination
  Details about the different illumination techniques.

- Setting up a Line Scan Camera
  Evaluation of correct focus
- Article - Rapid microstructure analysis of polar ice cores
  Analyzing past climates using the Large Area Scan Microscope.

DOWNLOADS

Article_IceCoreAnalysis.pdf (Technote)

RELATED PRODUCTS

LASM - LARGE AREA SCAN MACROSCOPE	High resolution scanner system e.g. for ice core research

This is a printout of the page
https://sukhamburg.com/products/linescancamera/scannersystems/microstructuremapping/ilcs.html from 4/23/2024

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