

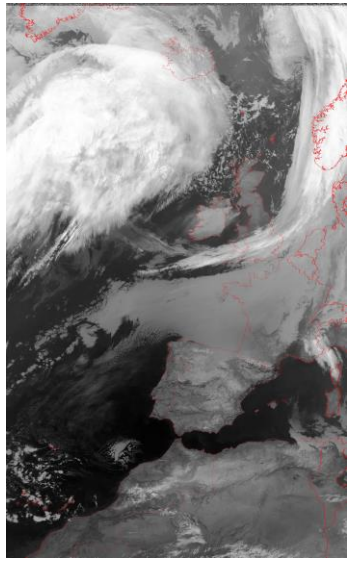
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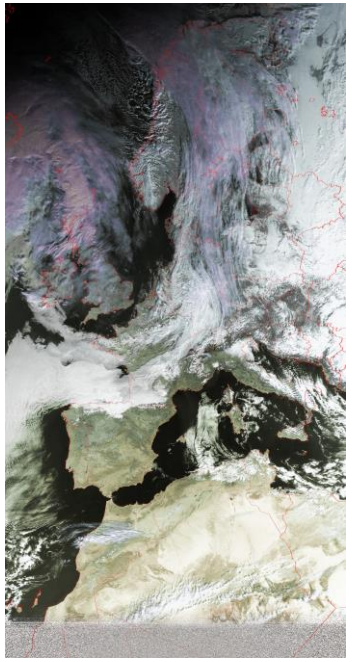
Operational activities, data reception and ECV (snow) retrievals at UniBern processing facilities

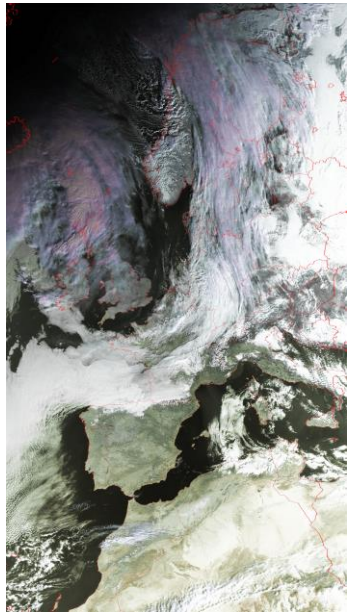
Stefan Wunderle, Christoph Neuhaus, Helga Weber
Oeschger Centre for Climate Change Research
Institute of Geography
University of Bern

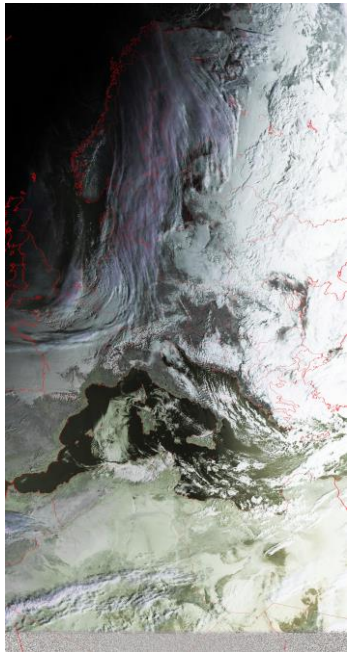










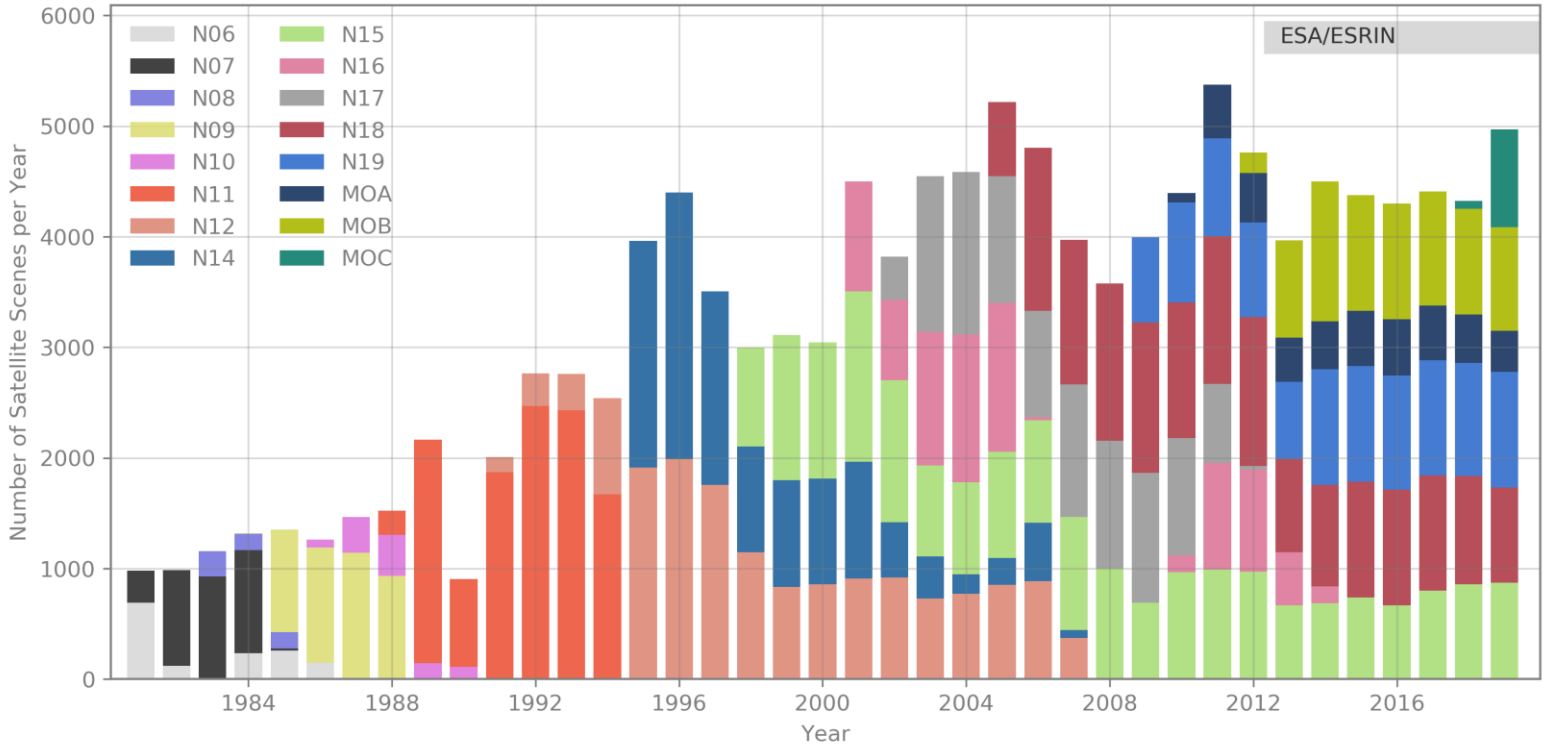


10-11 overflights in 24h; archived and processed at our facilities.

05. February 2023

European 1-km AVHRR archive hosted at ESA includes data from University of Bern, Dundee Satellite Receiving Station and ESA holdings. Period: 1981 - 2021

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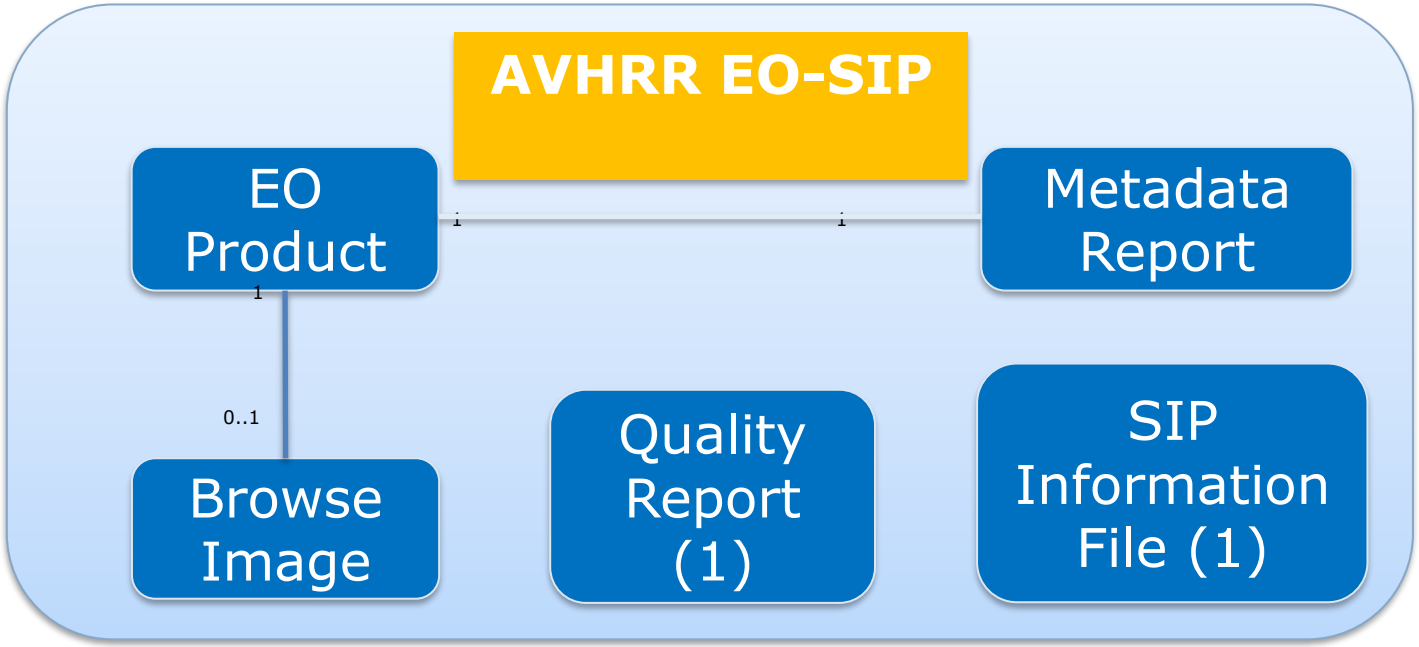


- Two-ten overpasses per day.
- Dataset consists of more than **250.000 data products** harmonized and consolidated through a dedicated ESA project (Heritage Space Programme).
- All accessible **free of charge via ESA dissemination services.**
- **Archived for unlimited time by ESA.**
- Processing to Level-1c planned.

EO-SIP package (Earth Observation – Submission Information Package)

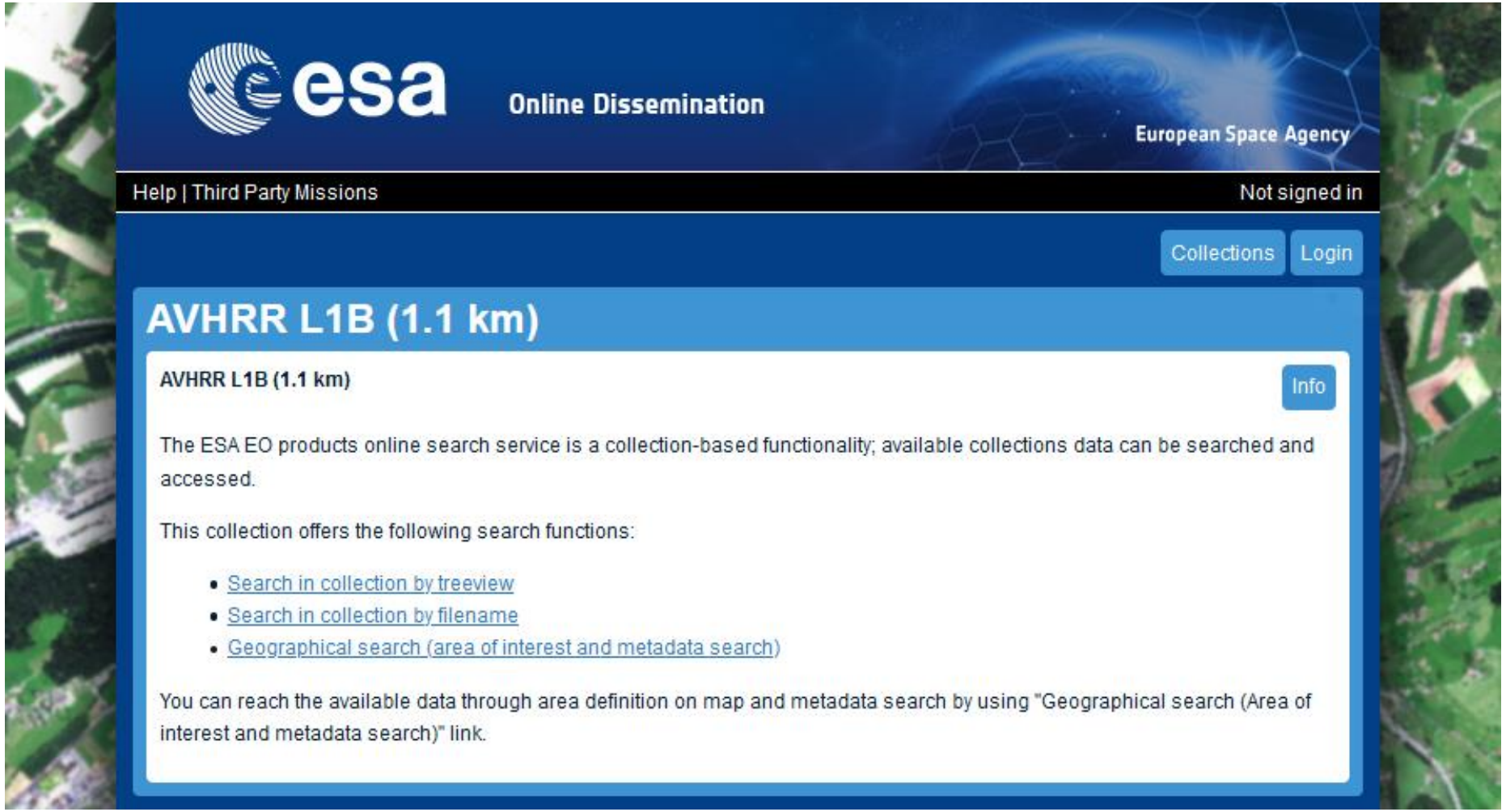
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- EO-SIP package structure, content and metadata attributes for the AVHRR products in scope, in line with the ESA Next Generation Multi-Mission PDGS Infrastructure, to be used for archiving and dissemination.



ESA Online Dissemination – AVHRR L1B data

https://tpm-ds.eo.esa.int/oads/access/collection/NOAA_AVHRR_L1B_LAC



esa Online Dissemination

European Space Agency

Third Party Missions on Earth Online | Not signed in

Collections | Login

Tree view: year, month and day

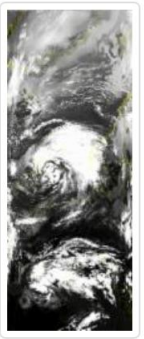
AVHRR L1B (1.1 km) Info

Collection	AVHRR L1B (1.1 km)
Year	1985
Month	05
Day	24

Available products (3)

N09_RPRO_AVH_L1B_1P_19850524T131432_19850524T132907_002301_v0100.ZIP

Download Product | Product Info | Browse | Download Metadata File | Download Quality Report



Start Date:	1985-05-24T13:14:32Z
Stop Date:	1985-05-24T13:29:07Z
Orbit:	2301
Orbit Direction:	ASCENDING
Product Type:	AVH_L1B_1P
Satellite:	NOAA 09

esa Online Dissemination

European Space Agency

Third Party Missions on Earth Online | Not signed in

Collections | Login

Tree view: year, month and day

AVHRR L1B (1.1 km) Info

Collection	AVHRR L1B (1.1 km)
Year	2020
Month	09
Day	19

Available products (10)

N19_RPRO_AVH_L1B_1P_20200919T174836_20200919T180150_059871_v0100.ZIP

Download Product | Product Info | Browse | Download Metadata File | Download Quality Report



Start Date:	2020-09-19T17:48:36Z
Stop Date:	2020-09-19T18:01:50Z
Orbit:	59871
Orbit Direction:	ASCENDING
Product Type:	AVH_L1B_1P
Satellite:	NOAA 19



A few examples of the developments and operational services developed by RSGB

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Pre-processing of AVHRR data; calibration and geocoding/ orthorectification

- Aerosol Optical Depth (AVHRR, SEVIRI)
- Probability Cloud Mask (PCM)

Atmosphere

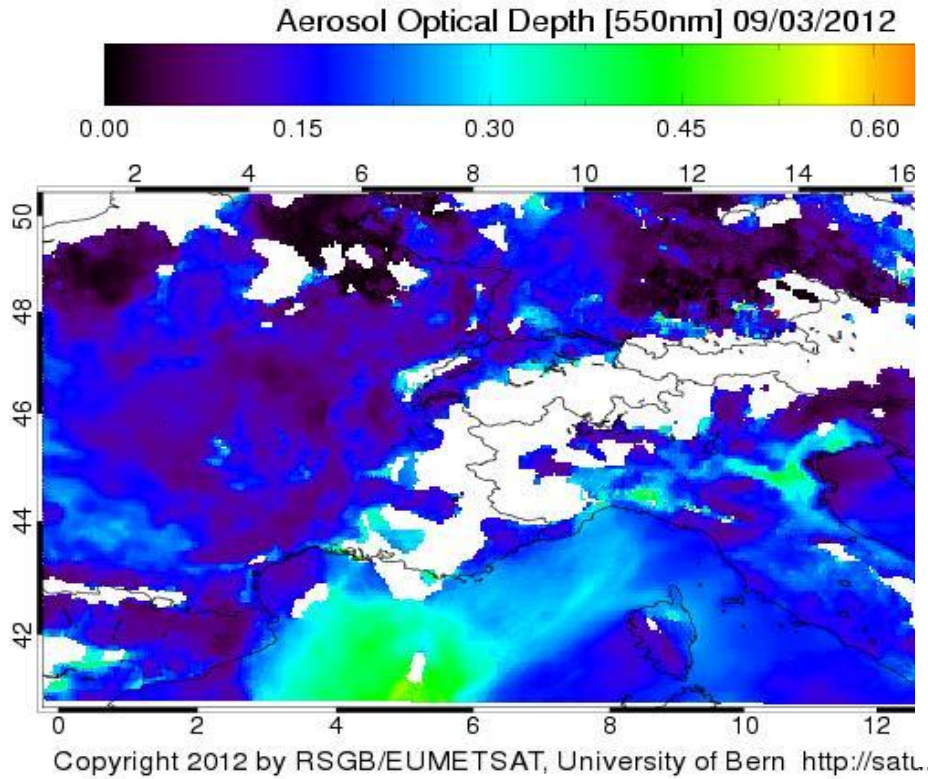
- Albedo, Vegetation Dynamic, Fire
- LSWT and Lake ice (AVHRR and VIIRS)
- Snow Cover Fraction (AVHRR, MODIS)

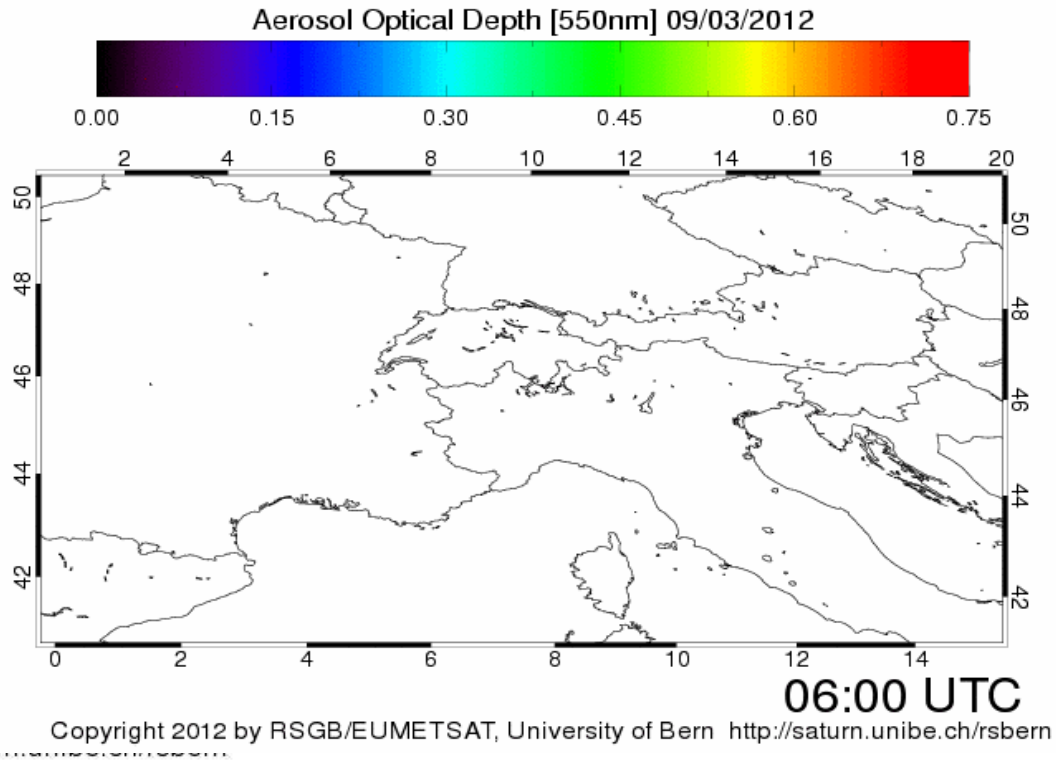
Land



Aerosol Optical Depth (AOD) derived from AVHRR and SEVIRI

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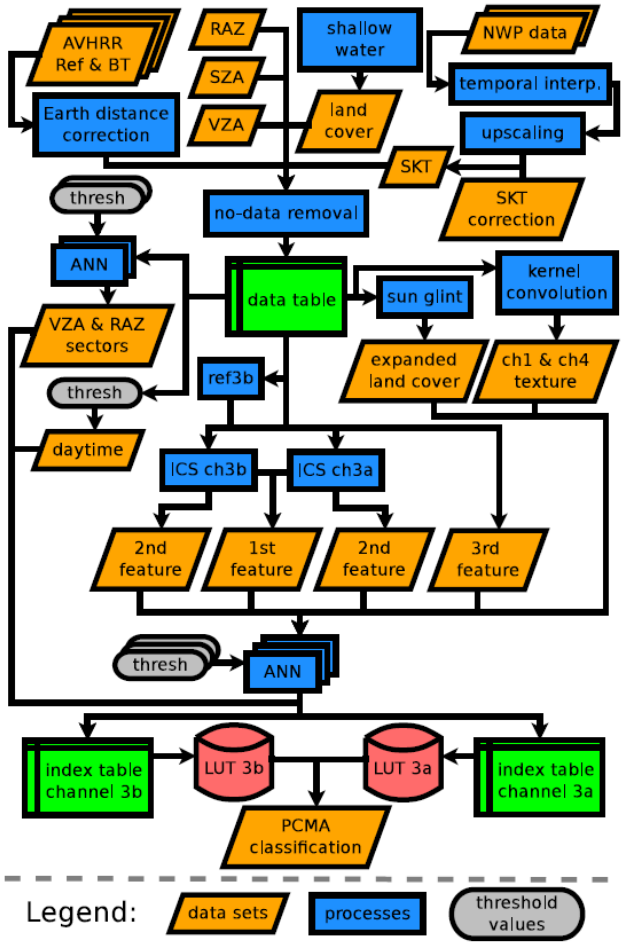
Riffler, Michael; Popp, Christoph; Hauser, Adrian; Fontana, Fabio; Wunderle, Stefan (2010). *Validation of a modified AVHRR aerosol optical depth retrieval algorithm over Central Europe.* Atmospheric Measurement Techniques (AMT), 3(5), pp. 1255-1270

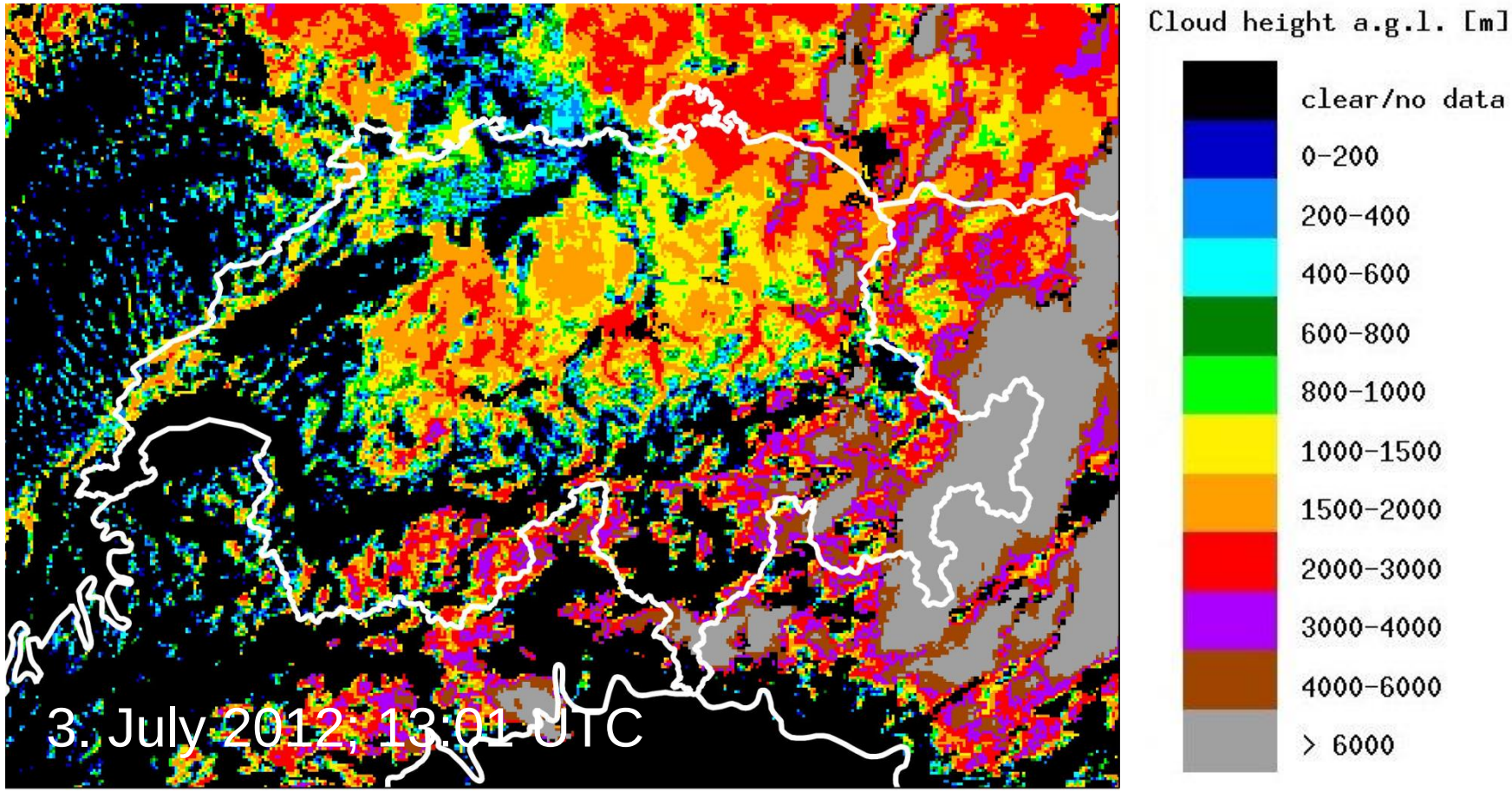
Popp, Christoph; Hauser, Adrian; Foppa, Nando; Wunderle, Stefan (2007). *Remote sensing of aerosol optical depth over central Europe from MSG-SEVIRI data and accuracy assessment with ground-based AERONET measurements.* Journal of geophysical research, 112(D24), D24S11.



Cloud Probability Mask (PCM) and cloud height derived from AVHRR

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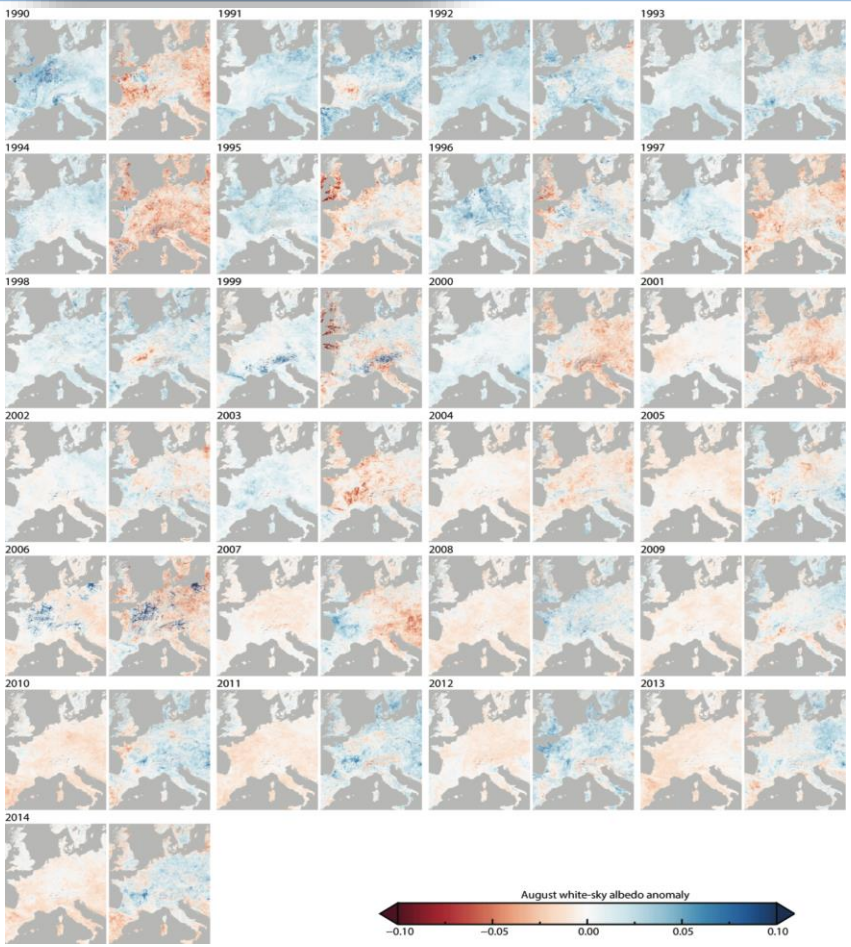


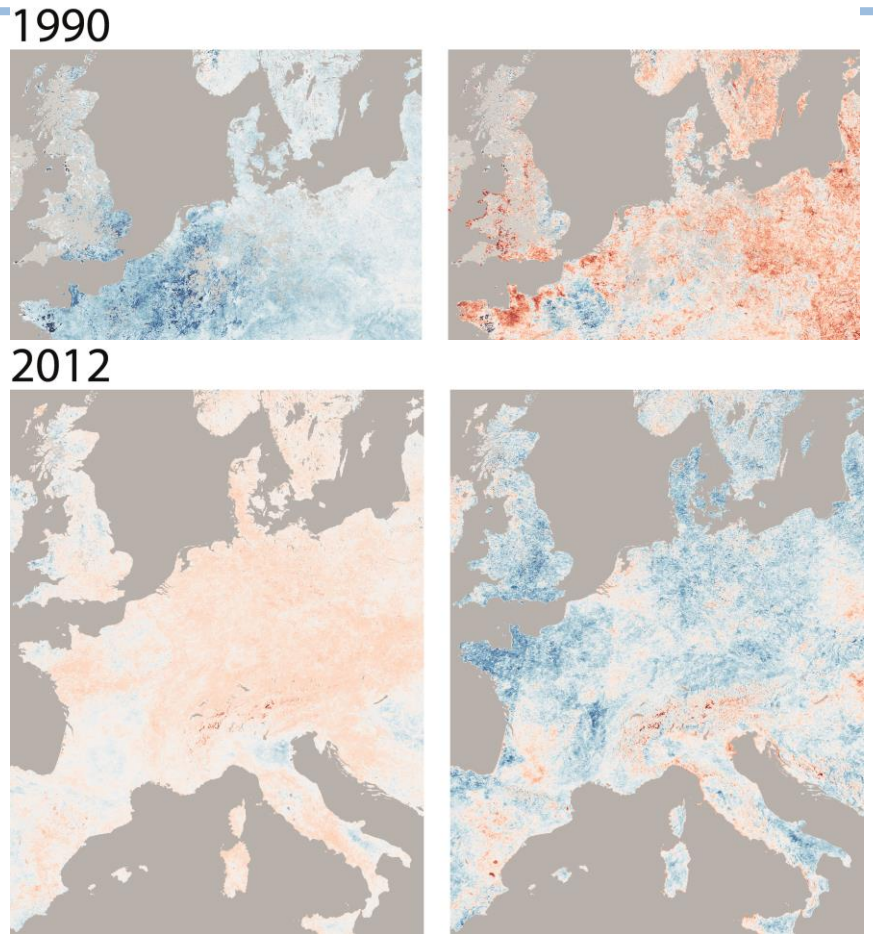
Musial, Jan Pawel; Hüsler, Fabia; Sütterlin, Melanie; Neuhaus, Christoph; Wunderle, Stefan (2014). *Probabilistic approach to cloud and snow detection on Advanced Very High Resolution Radiometer (AVHRR) imagery.* Atmospheric Measurement Techniques (AMT), 7(3), pp. 799-822



Albedo 1990 - 2014
annual August white-sky albedo anomalies
VIS (left) and NIR (right)

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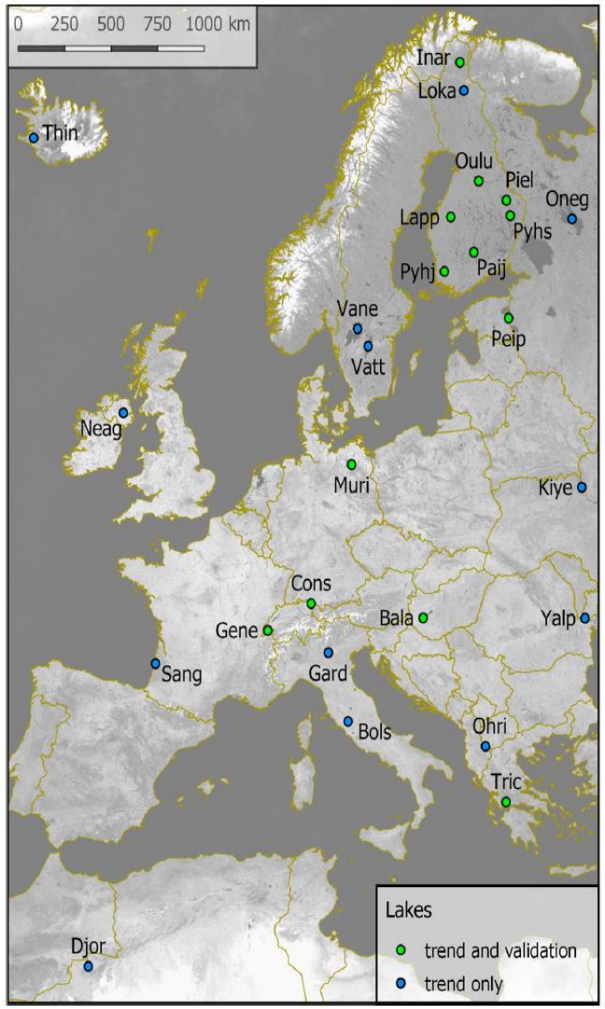


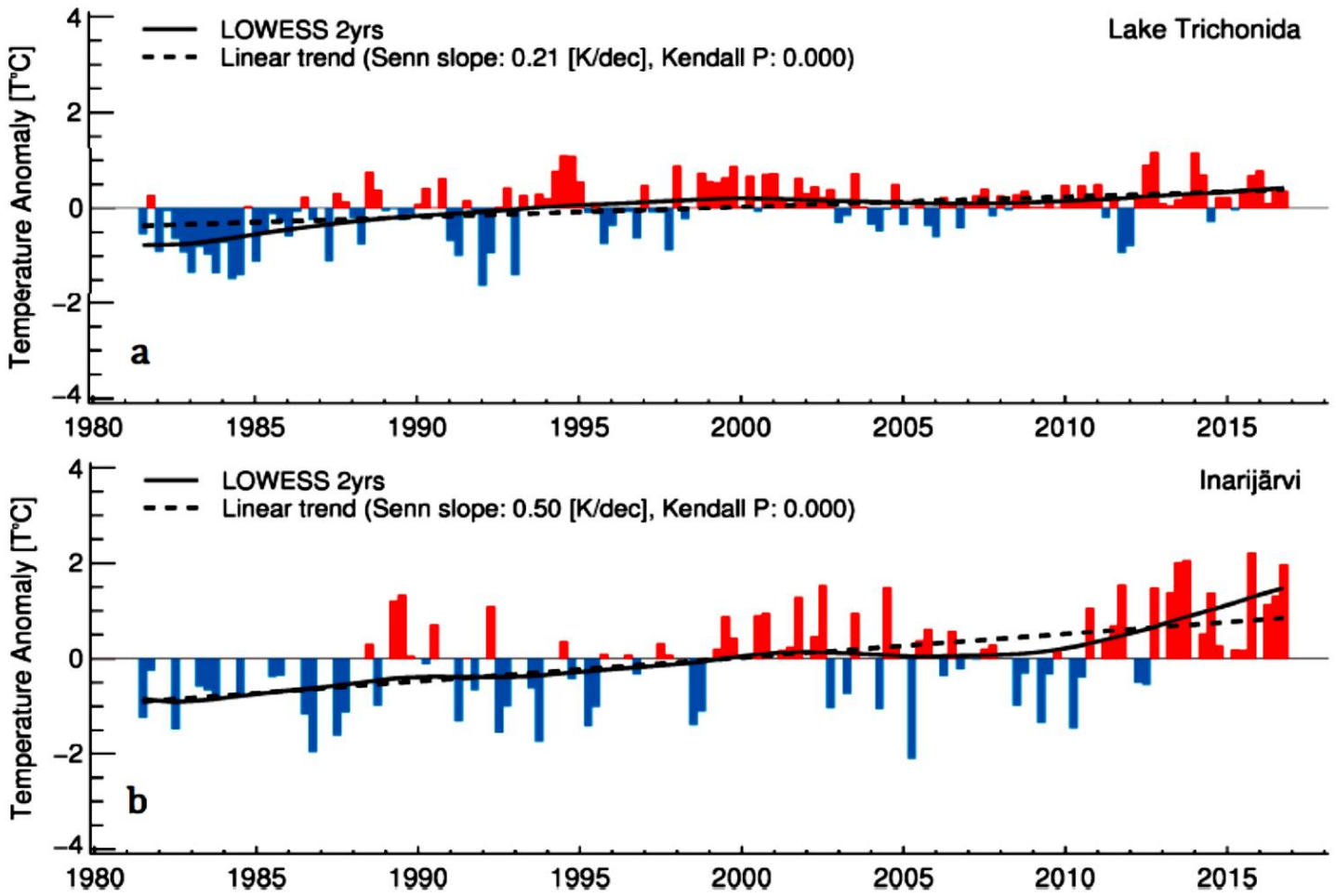
Sütterlin, Melanie; Stöckli, R.; Schaaf, C. B.; Wunderle, S. (2016). *Albedo climatology for European land surfaces retrieved from AVHRR data (1990-2014) and its spatial and temporal analysis from green-up to vegetation senescence.* Journal of Geophysical Research: Atmospheres, 121(14), pp. 8156-8171.



Lake Surface Water Temperature LSWT

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Lieberherr, Gian; Wunderle, Stefan (2018). *Lake Surface Water Temperature Derived from 35 Years of AVHRR Sensor Data for European Lakes.* Remote sensing, 10(7),

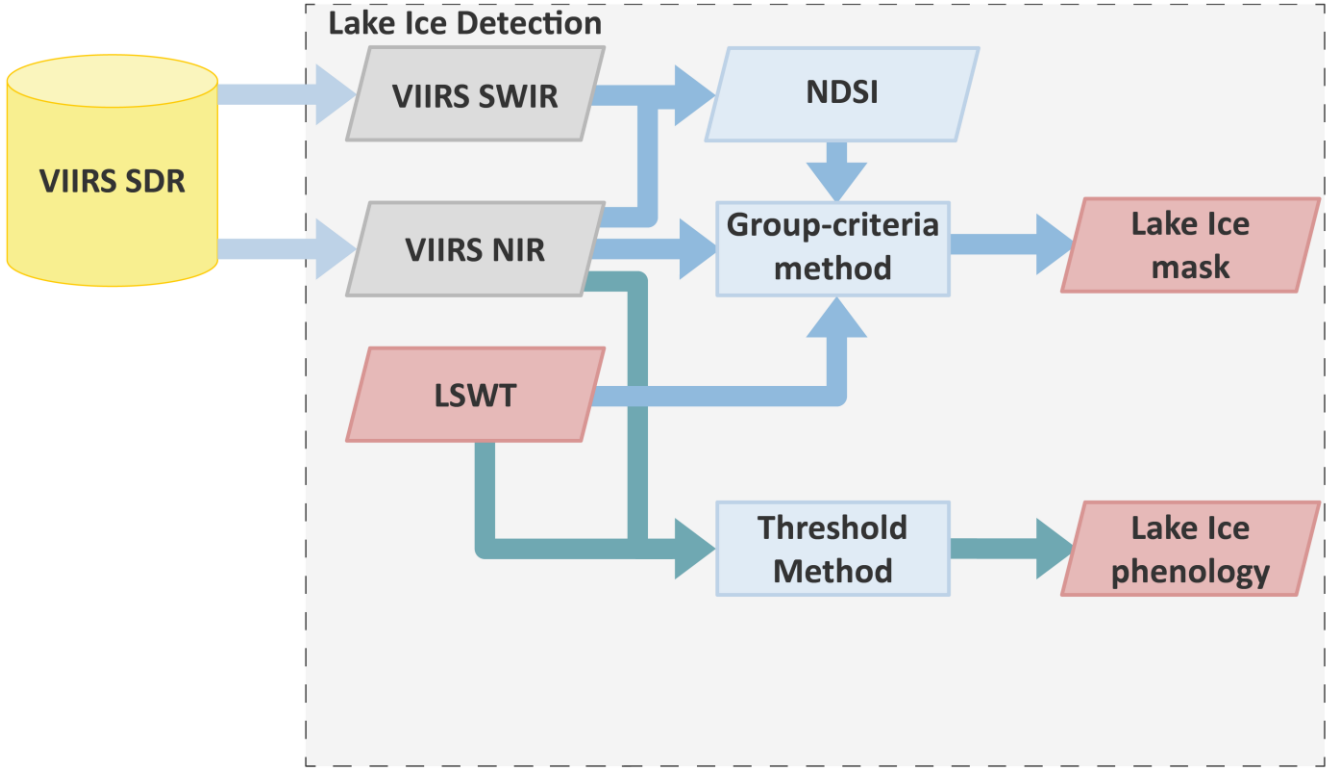


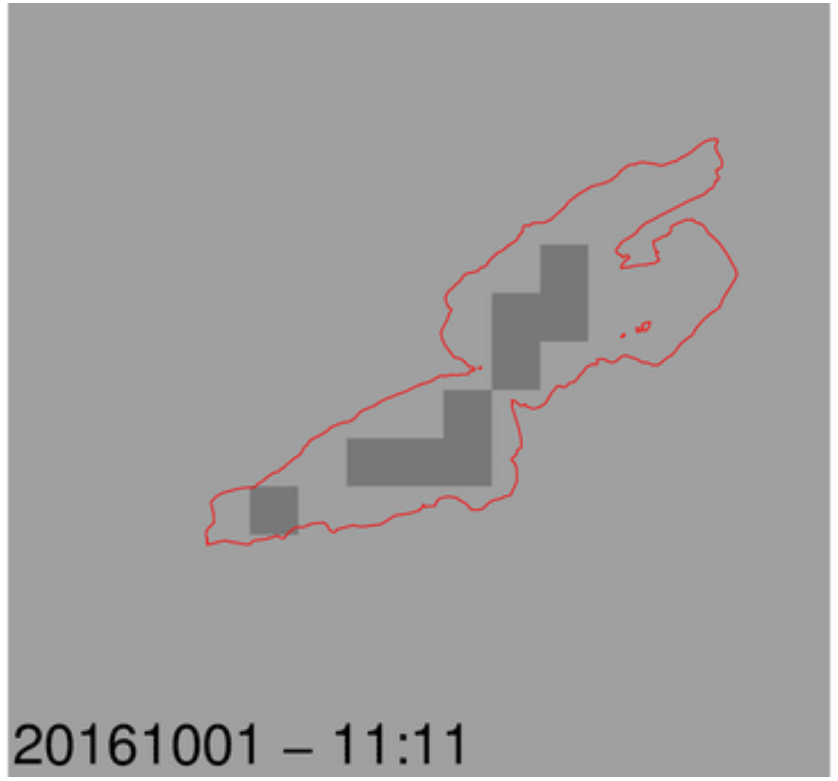
Lake ice detection for Lake Sils in winter 2016/2017 (Oct. – Mar.); VIIRS I channels

Lake Ice mask:

open water; lake ice; cloud cover; cloud over water/ice

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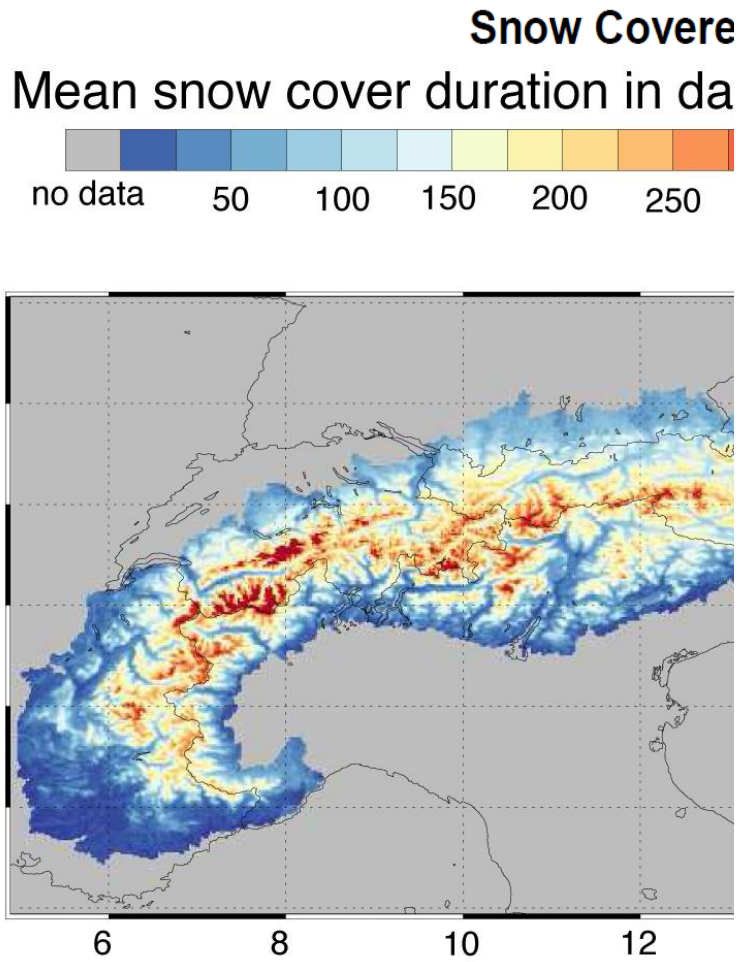


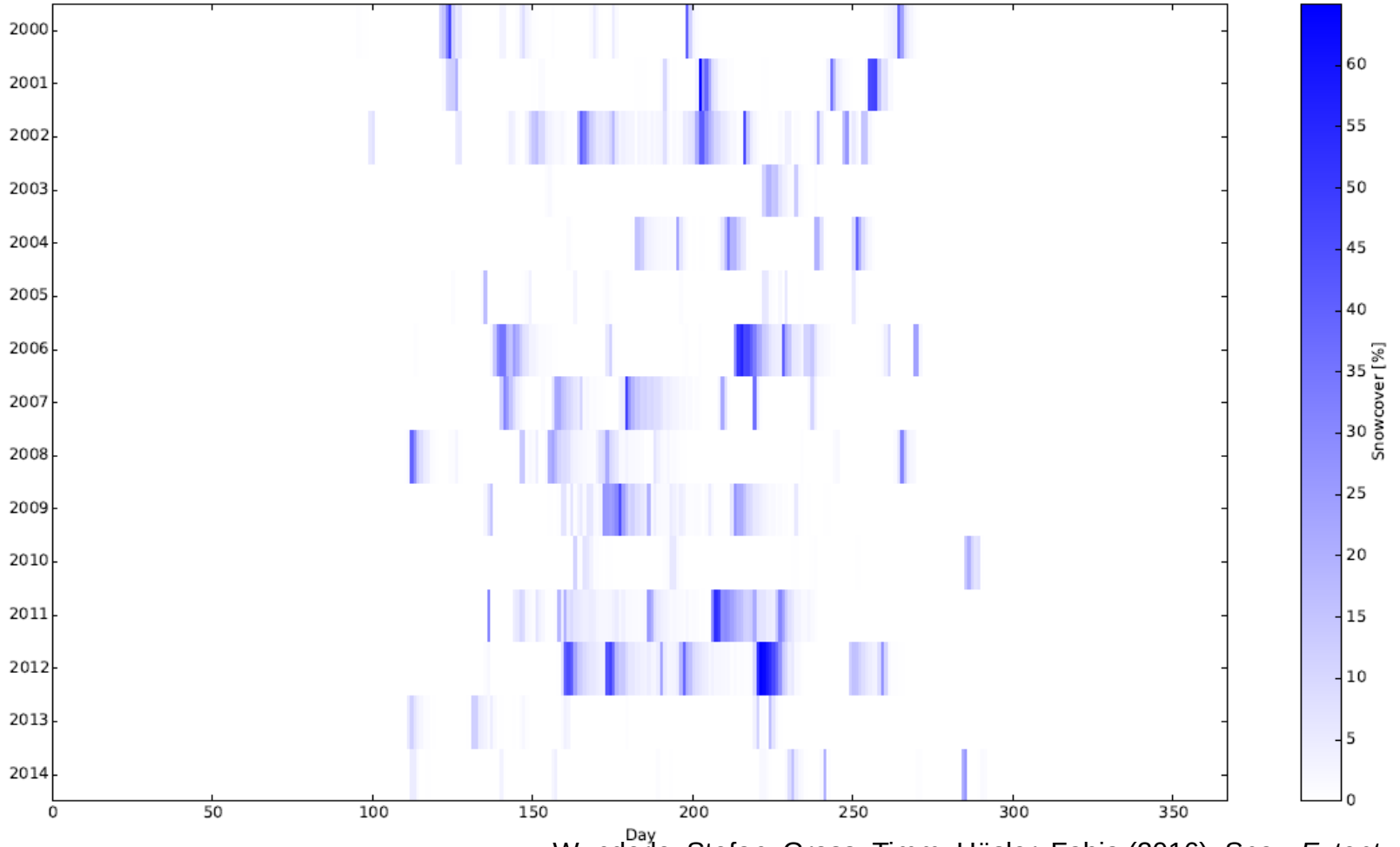


Snow covered Area (SCA) based on AVHRR LAC data (1982 – 2017); SCA Lesotho based on MODIS (2000 – 2014)

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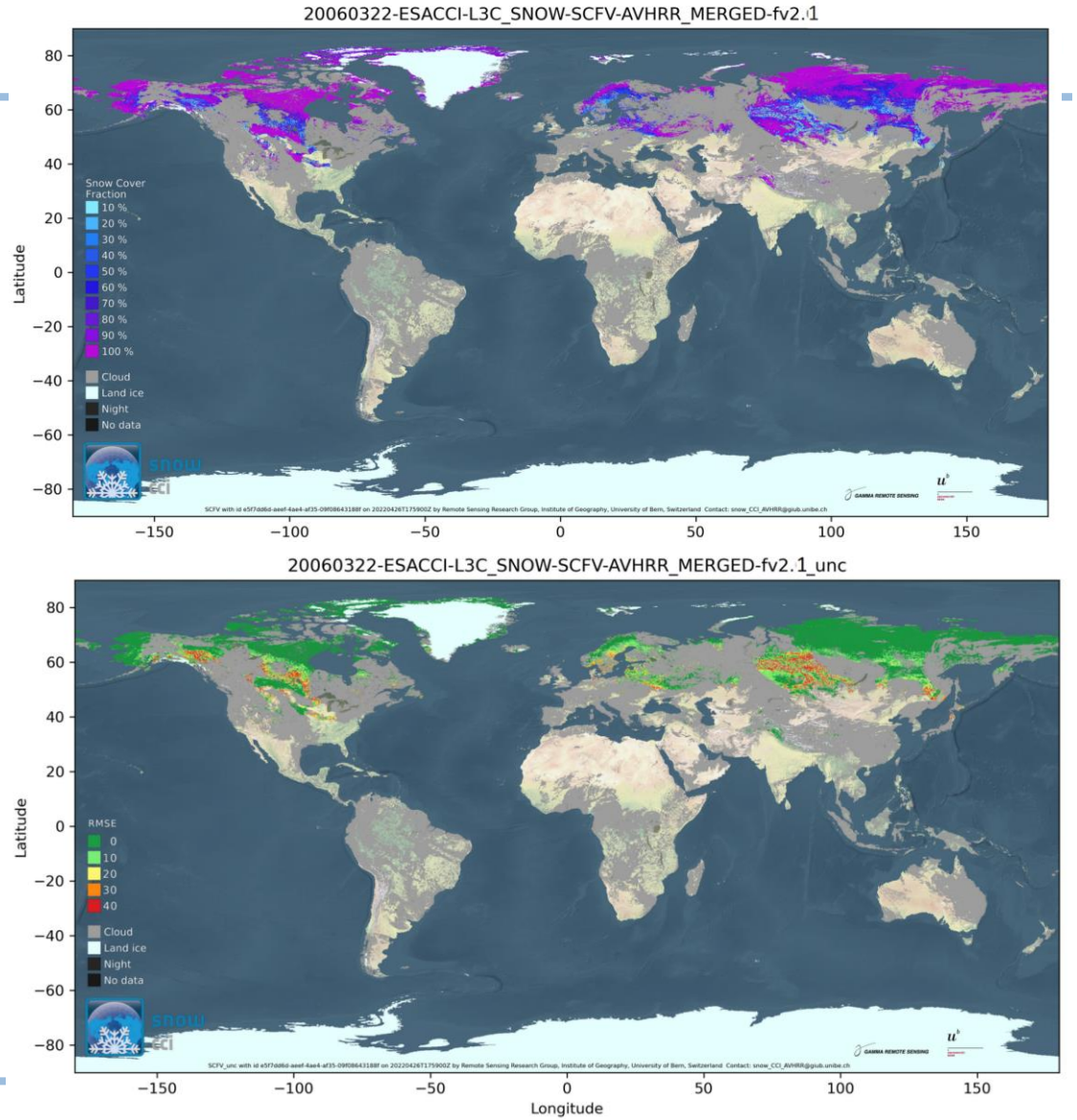
Hüsler, F., T.Jonas, M.Riffler, J.P.Musial, S. Wunderle (2014): A satellite-based snow cover climatology (1985 -2011) for the European Alps derived from AVHRR data. The Cryosphere, 8, 73-90

Wunderle, Stefan; Gross, Timm; Hüsler, Fabia (2016). *Snow Extent Variability in Lesotho Derived from MODIS Data (2000–2014).* Remote sensing, 8(6), p. 448

AVHRR Snow Cover Fraction (global) by University of Bern

- Aim: consistent SCFV/SCFG (1978 – 2023)
- Data source:
  - AVHRR GAC, reprocessed by EUMETSAT
  - Morning and afternoon passes
  - CLARA-A3 daily composites from CM SAF
- Retrieval scheme:
  - NDSI, Scamod and tailored thresholds
  - spatial and temporal adapted transmissivity based on NDVI
  - Cloud probability based on CLARA-A3

Right: SCFV and uncertainty (20060322) based on AVHRR GAC



Research based on global AVHRR data (4 x 4km) from 1982 - 2018

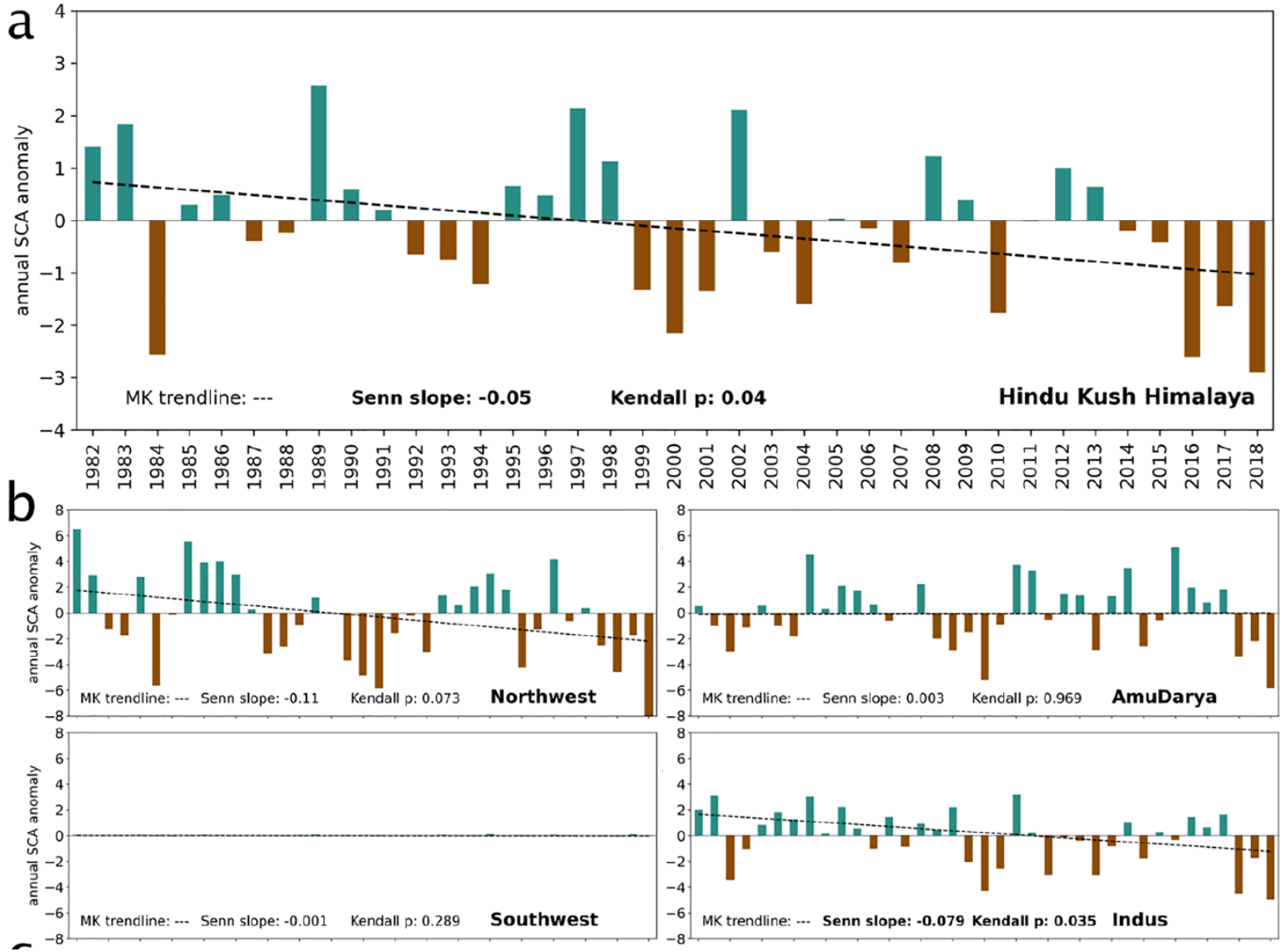
scientific reports

OPEN

Revealing four d
cover dynamics
Himalaya

K. Naegeli[1,2]✉, J. Franke[1], C. Neuhaus[1], N.

Knowledge about the distribution and dynami
for climate studies, hydrology or hazards asse
Himalaya both in space and time. Previous stu
of snow melt on the local hydrological system.
to evaluate SSC dynamics for the entire HKH a
a 0.05° spatial and daily temporal resolution. C
based time series of snow cover information. W
We find significantly decreasing SSC trends in
tendency from mid-spring to mid-fall, indicati
temporally resolved long-term data basis, we
character of seasonal snow cover and its cross
downstream regions.



Naegeli et al. 2022: https://www.nature.com/articles/s41598-022-17575-4.pdf



Operational activities, data reception and ECV (snow) retrievals at UniBern processing facilities

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> Summary

— A homogenous and consolidated AVHRR LAC time series (1981 – 2021) is now available via ESA dissemination service.

— More than 200.000 AVHRR data (level 1b) covering Europe are ready to be used

— Approx. 55.000 CEOS Sharp-1 segments were rescued, re-processed in a consistent way (EO-SIP) and are accessible via ESA dissemination service, too.

— During the last years we have developed many retrieval schemes to support the generation of time series for many ECVs.

— The developed procedures can either be used for near real time production or the generation of time series of the last 40 years.