Lake Ice Detection from VIIRS Data
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OVERVIEW

Ice cover on lakes plays an essential role in the physical, chemical, and biological processes of freshwater systems (e.g., influences vertical mixing), and it also has many economic implications (e.g., for hydroelectricity). Variability and trends in the seasonal pattern of lake ice dynamics represent robust and direct indicators of climate change. Satellite remote sensing has proven its great potential for detecting and measuring the ice cover on lakes. Therefore, within the framework of the Global Climate Observing System (GCOS) Swiss project, “Integrated Monitoring of Ice in Selected Swiss Lakes,” the Remote Sensing Research Group of the University of Bern (RSGB) aims to retrieve lake ice phenology dates from data acquired in the fine-resolution imagery (I bands) of the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor.

The thermal I-channel of the VIIRS sensor (I05), which combines a high temporal resolution (1–5) of the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor.

DATA & METHODS

VIIRS Imagery (I) Band Sensor Data Record (SDR)

Data files
- Calibrated sensor radiometric data (radiance, reflectance, and brightness temperature)
- 5 channels with spectral bands in the VIS, NIR, SWIR, MWIR, and LWIR regions

Geolocation files
- GIMGO (Ellipsoid Geolocation)
- GITCO (Ellipsoid Terrain Corrected Geolocation)

Geolocation Accuracy

There is a clear difference between data projected using GIMGO and GITCO, especially in the mountainous rugged terrain. The data projected based on the terrain-corrected geolocation information GITCO matches closely with lake masks derived from Open Street Map data.

CONCLUSION & OUTLOOK

- Data projected using the terrain corrected geolocation information GITCO shows a high accuracy -> only GITO will be applied for further processing.
- First brightness temperature simulations and PMW coefficients resulting from the RTTOV runs with configurations for VIIRS are reasonable.
- LSWT retrieval using coefficients resulting from PMW model.
- Implementation of VIIRS cloud masks.
- Validation of LSWT retrievals with temperature measurements (KT15.85 IPP).
- Development of threshold method to extract timing of phenological events.