INFORM

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Stratification Products

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DATA

For testing a newly developed stratification algorithm, several satellite images of Landsat 8 (USGS) and MERIS (ESA) of Lake Constance have been processed. Lake Constance is a deep clear lake located at the border between Germany, Austria and Switzerland. The dates have been selected according to existing validation data and suitable image quality.

In situ data gathered through routine measurements of the Lake research Institute of the State Institute for the Environment, Measurements and Nature Conservation of Baden-Wuerttemberg has been provided within the water information system BOWIS of the International Commission for the Protection of Lake Constance (IGKB). The data was given in terms of a transmission and it was converted to Total Suspended Matter (TSM) by $T = exp(-\kappa \ (c(TSM)) \ *z)$, where z was 1 and $k \ (c(TSM)) = 0.17*c(TSM)$.

METHODOLOGY

At first, standard Modular Inversion and processing System (MIP) atmospheric and adjacency correction has been applied to the satellite data as well as the standard MIP absorber retrieval, described in detail in Heege et al. (2014) and Kiselev et al. (2014). As an input for the new stratification algorithm, the atmospheric corrected remote sensing reflectance (Rrs) spectra and the absorption values were used to determine a best-fit two layered water body with different levels of TSM in the two layers. Thus it has three resulting values:

1) the upper layer TSM concentration
2) the interface depth and
3) the lower layer concentration.

The lower level concentration is just given as the ratio of lower layer to upper layer.

PRODUCTS

The stratification algorithm that has been developed calculates the best fit two layered model with three parameters: upper and lower layer TSM concentration and interface depth. The following examples show the results of this algorithm applied to lake Constance using Landsat 8 data from 2014-08-04 and 2015-06-04.
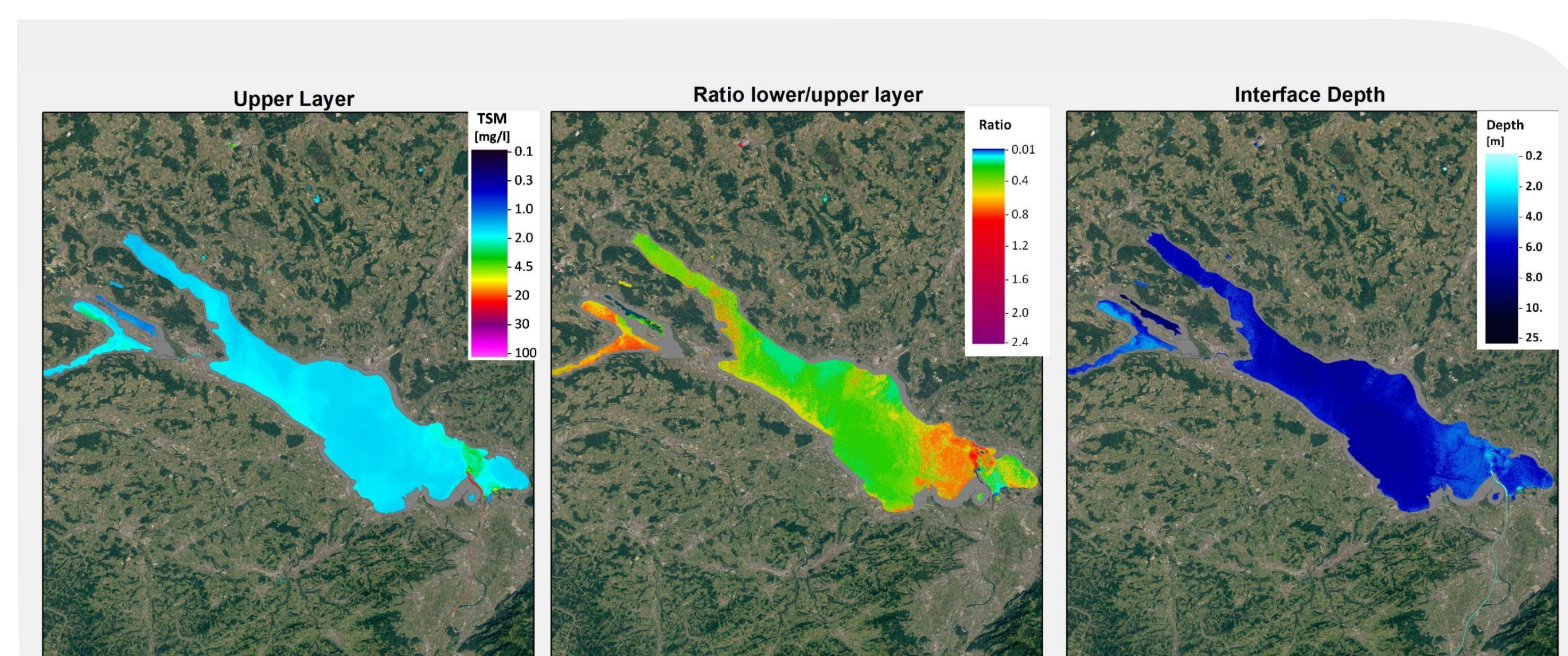

Figure 1: Stratification products Lake Constance 2015-06-04
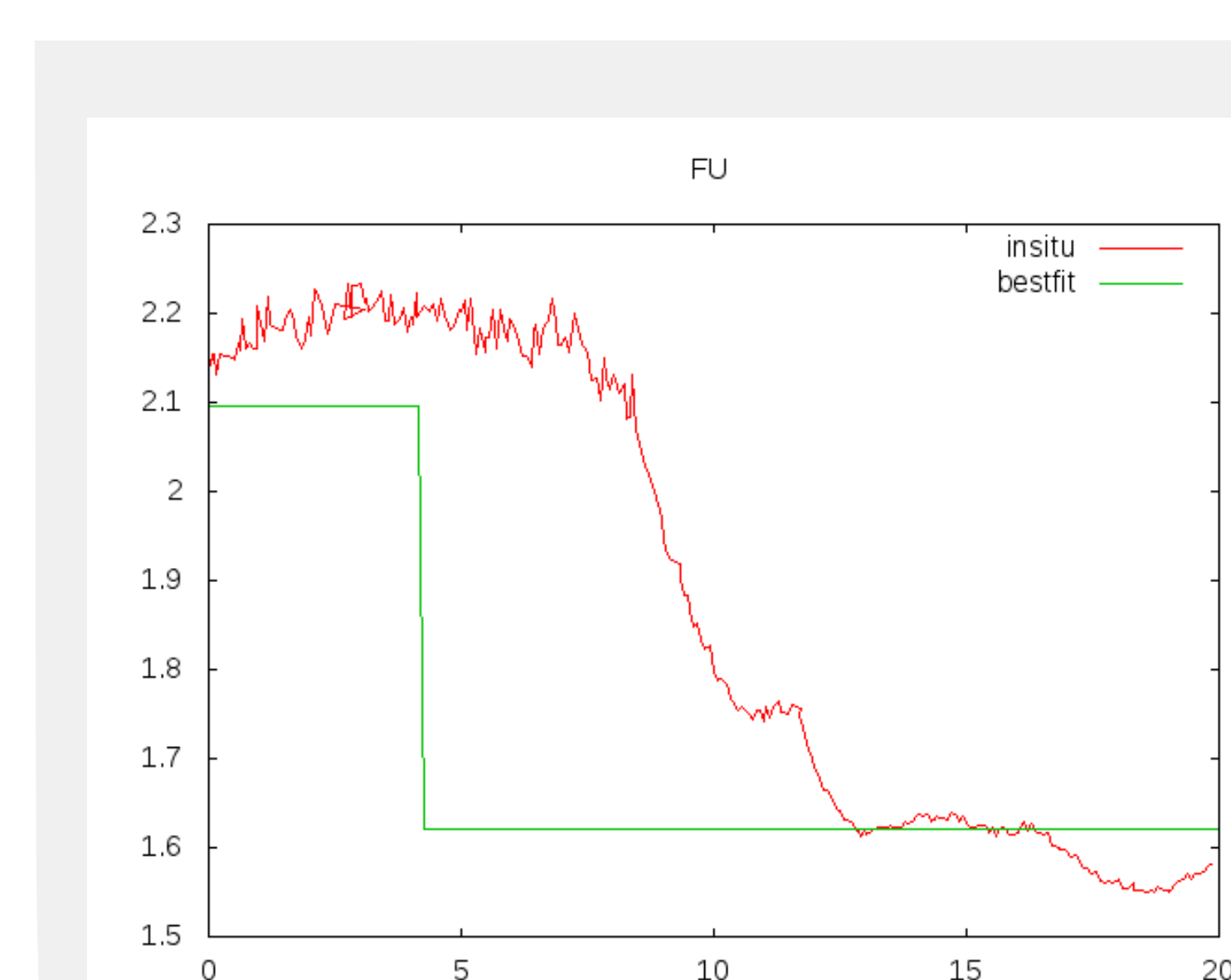(© Processing EOMAP, satellite data © Landsat 8/USGS)

Figure 2: Best fit of the two-layered approach for station Fischbach-Uttwil (FU) with satellite (green line) and in situ data (red line) measured on 2014-08-04
(© Processing EOMAP, in situ data © BOWIS of the International Commission for the Protection of Lake Constance (IGKB)

Stratification

The vertical gradients of water constituents and stratification in the water column due to density gradients and hydrodynamic processes are well known natural phenomena. They can be quite pronounced close to river inflows, shallow water areas with resuspension events or for phytoplankton distributions. Identifying and quantifying stratification effects support the understanding of past and future environmental processes and the distribution of important parameters affecting the water quality, including nutrients and oxygen.

REFERENCES

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