Global Lake Water Products within the Copernicus Global Land Service

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Copernicus Global Land Service

Providing bio-geophysical products of global land surface

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Vegetation
Energy
Water
Cryosphere
Hot Spots
Leaf Area Index (LAI)
Fraction of Absorbed PAR
Fraction of vegetation cover (FCOVER)
NDVI
Vegetation Condition Index (VCI)
Vegetation Productivity Index (VPI)
Dry Matter Productivity
Burnt Area
Land Cover
Soil Water Index
Surface Soil Moisture

Top-of-Canopy reflectance
Surface Albedo
Land Surface Temperature
Radiation Fluxes

Water Bodies
Lake and river water level
Lake surface water temperature
Lake surface reflectance
Lake turbidity
Lake trophic state
Water Level

Lake Ice Extent
Snow Cover Extent
Snow water equivalent
Product specification

- **Parameters**
  - Lake Surface Reflectance (all bands)
  - Lake turbidity
  - Trophic state (based on CHL concentration)
  - Lake Water Temperature
- **Spatial resolution**
  - 300m, 1km
  - 100m (in evolution)
- **Temporal aggregation**
  - 10days for water LSWT, TUR and TSI
  - Best spectrum within 10days for LSR
- **Time span**
  - 2002-2012 (MERIS + AATSR)
  - 2016-ongoing (OLCI + SLSTR)
- **Service**
  - NRT (3 days after last day of decade)
- **Status**
  - Publicly released in June 2018 (300m, 1km)

LSWT = Lake Surface Water Temperature
TUR = Turbidity
TSI = Trophic State Index
LSR = Lake Surface Reflectances
LWQ = Lake Water Quality
Global distribution of inland water bodies

Water Leaving Reflectances

Trophic State Index

Turbidity

Lake Surface Temperature

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Copernicus

Plymouth Marine Laboratory

University of Reading

HYGEOS

CLS
The Processing chains

Started with ESA project Diversity-II, completely reconstructed during Globolakes and finally working horse for operational Copernicus Global Land Service

Developments build on ARCLake project and ESA CCI SST, further evolution with Globolakes findings and developments and finally operational processing chain for the Copernicus Global Land Service
Quality control

- Operational processing monitoring
- Operational quality control of products

Global statistics of parameters

Global number of valid pixels
Validation Lake Water Quality

• Algorithm Validation in the scope of algorithm development
  – Globolakes: development of OWT based algorithm (MERIS)

• Quality control of input products

• Validation of output products
  – In-situ data from various sources

• Quality control of output products
  – Spatial and temporal consistency tests

Neil et al., in review, RSE; in-situ: LIMNADES

in-situ: US Data bases STORET (http://www3.epa.gov/storet/)
and WQP (http://waterqualitydata.us/portal/)
OLCI consistency based on MERIS

Lake Huron

2005/10/01 MERIS
2008/10/01 MERIS
2010/10/01 MERIS

OLCI
Lake Turkana – Use Case based on CGLOPS products

Long-term average situation

Archive Turbidity data over 10 years, seasonal trends

NRT Turbidity data
Lake Turkana – changes of seasonal patterns?

- Due to dam constructions along the Omo River
- Expectation to have a reduction of seasonality
- Tool for comparing seasonal patterns: Heatmaps derived from 12 years of data
Free and open product access
Anonymous query; data access after registration
Catalogue search & Subscription
Fast HTTP Access

Documentation
Each product comes with a set of documents:
- ATBD (Algorithm Baseline Document)
- PUM (Produce User Manual)
- QAR (Quality Assessment Report)
Products and Documents undergo a review cycle by external reviewers
Challenges, Gaps and Evolutions

- Transfer of scientific sound results into operational services
- Atmospheric correction among wide range of different water types
- Reduce artefacts due to merged products (time and space) as far as possible
- SNR of S-2 MSI data and consistency of sensors
- Availability of in-situ data for algorithm calibration and product validation (OLCI + MSI)
- Product evolution
  - 100m spatial resolution based on MSI products
  - TSI -> Chlorophyll conc. under discussion
  - Integration of OLCI-B, SLSTR-B
- Algorithm improvement
  - Generate turbidity parameters from reflectances & improve parameter retrieval for clear water types
  - Atmospheric correction for Sentinel-2 MSI and OLCI
  - Pixel classification: shoreline pixels, ice, cloud, cloud shadow
- Long-term concept
  - Global products of resolvable water bodies instead of selected (and isolated) lakes

Happy to welcome you at the poster for further discussions