NOAA Global Flood Product Quick Guide

Updated September, 2019

Quick Guide Overview

- The intention of this quick guide is to give a brief overview of the VIIRS, ABI and AHI Flood Mapping products for emergency response stakeholders and how to access and use them.

- This is **not** a technical document. Users who wish to have the specific scientific information, such as which bands are used, can refer to the last slide at the end of this presentation or contact the developers (information listed on slide 13).

- A set of useful links to access the products is also provided.

Flood Products Overview

- The VIIRS, ABI and AHI flood products provide flood areal extent and can be used for situational awareness.

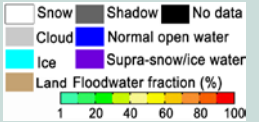
- The joint VIIRS/ABI or VIIRS/AHI flood products, whenever they are available, is always highly recommended for use because they are with both the most complete flood extent and the finer 375-m spatial resolution.

- Under clear-sky conditions in VIIRS and ABI/AHI images, VIIRS flood product is recommended for use because of its more accurate floodwater details.

- The ABI and AHI flood maps filter out clouds using a multiple composition process. This means that it may be able to provide flood extent in regions which are cloudy during the two daytime VIIRS overpasses. In this case, the ABI and AHI flood maps could take the role of providing flood maps at coarser spatial resolution.

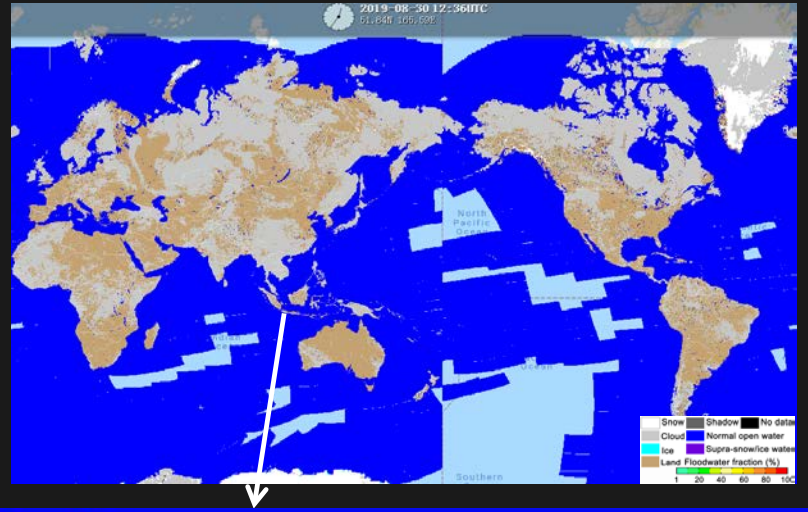
Lists of VIIRS/ABI/AHI Flood Products

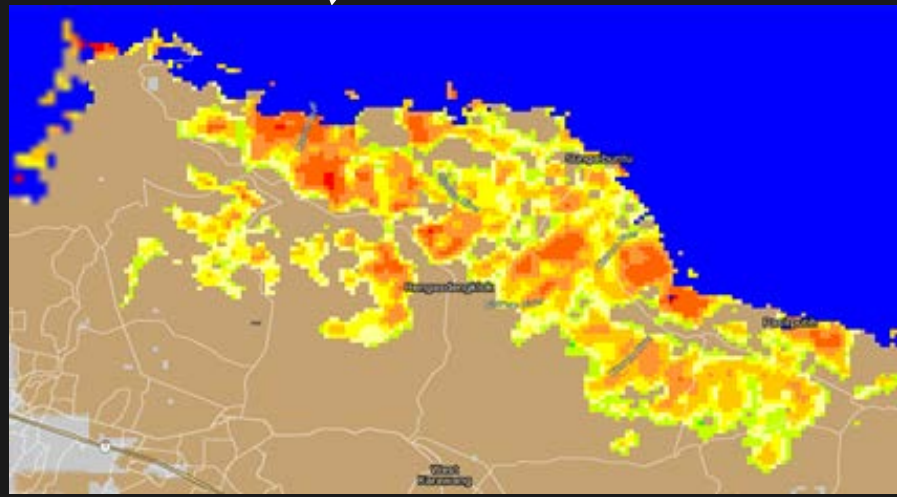
Products	Spatial resolution	Availability	Coverage	Production latency	Description
Suomi-NPP &NOAA-20/VIIRS near real-time flood product	375m	2-3 daytime passes for each satellite	Global land between 80° S and 80° N	Available 3 hours after pass	Daytime-only flood extent in water fractions (open water percentage in a satellite pixel)
Suomi-NPP &NOAA-20/VIIRS daily composited flood product	375m	Once per day	Global land between 60° S and 75° N	Available at 06Z	
Suomi-NPP &NOAA-20/VIIRS 5-day composited flood product	375m	Once per day	Global land between 60° S and 75° N	Available at 06Z	
GOES-16&17/ABI flood product	1-km	Every hour	Land in America (135° W ~ 17° W, 50.5° S ~ 50.5° N)	every hour	
Himawari-8&9/AHI flood product	1-km	Every hour	Land in East Asia and Oceania (90° E ~ 180° E, 47.5° S ~ 50.5° N)	every hour	
Joint VIIRS/ABI flood product	375m	Once per day	Land in America (135° W ~ 17° W, 50.5° S ~ 50.5° N)	Available at 00Z	
Joint VIIRS/AHI flood product	375m	Once per day	Land in East Asia and Oceania (90° E ~ 180° E, 47.5° S ~ 50.5° N)	Available at 12Z	



VIIRS NRT Flood Product

- The VIIRS 375-m Flood Product, is a near real-time product derived from daytime VIIRS imagery from Suomi-NPP and NOAA-20.
- The VIIRS Flood Map reflects the current flood status at the time of the overpass along with additional information on the weather and land conditions.
- Suomi-NPP and NOAA-20 are low earth orbiting satellites, which means only two daytime observations can be derived per day over a given Region of Interest (ROI) with a ~50 min interval.
- Observations are taken ~2-3pm local solar time. The latency of the product is about 3 hours after a pass is complete.





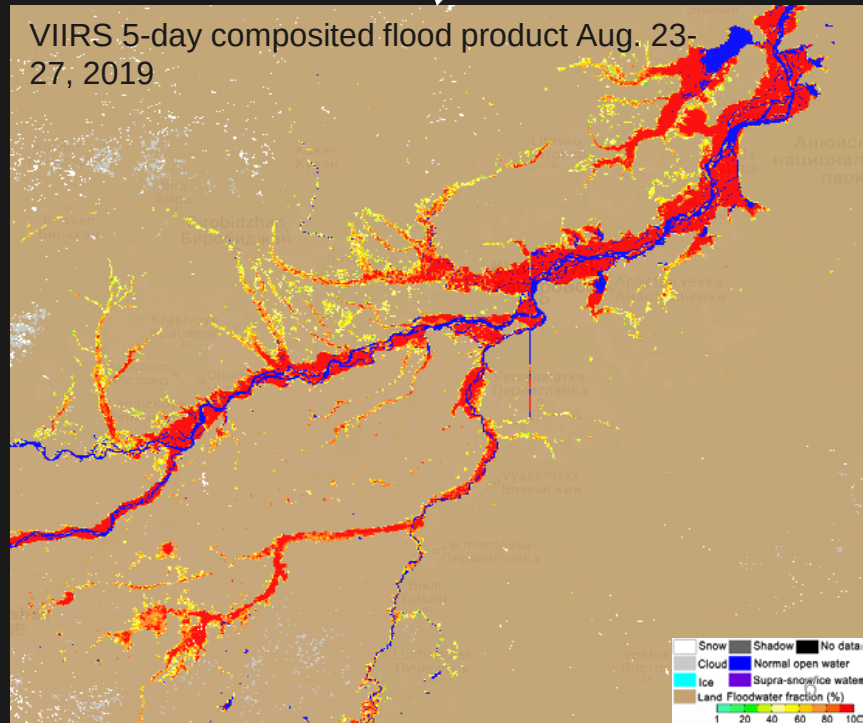
https://realearth.ssec.wisc.edu/?products=RIVER-FLDglobal

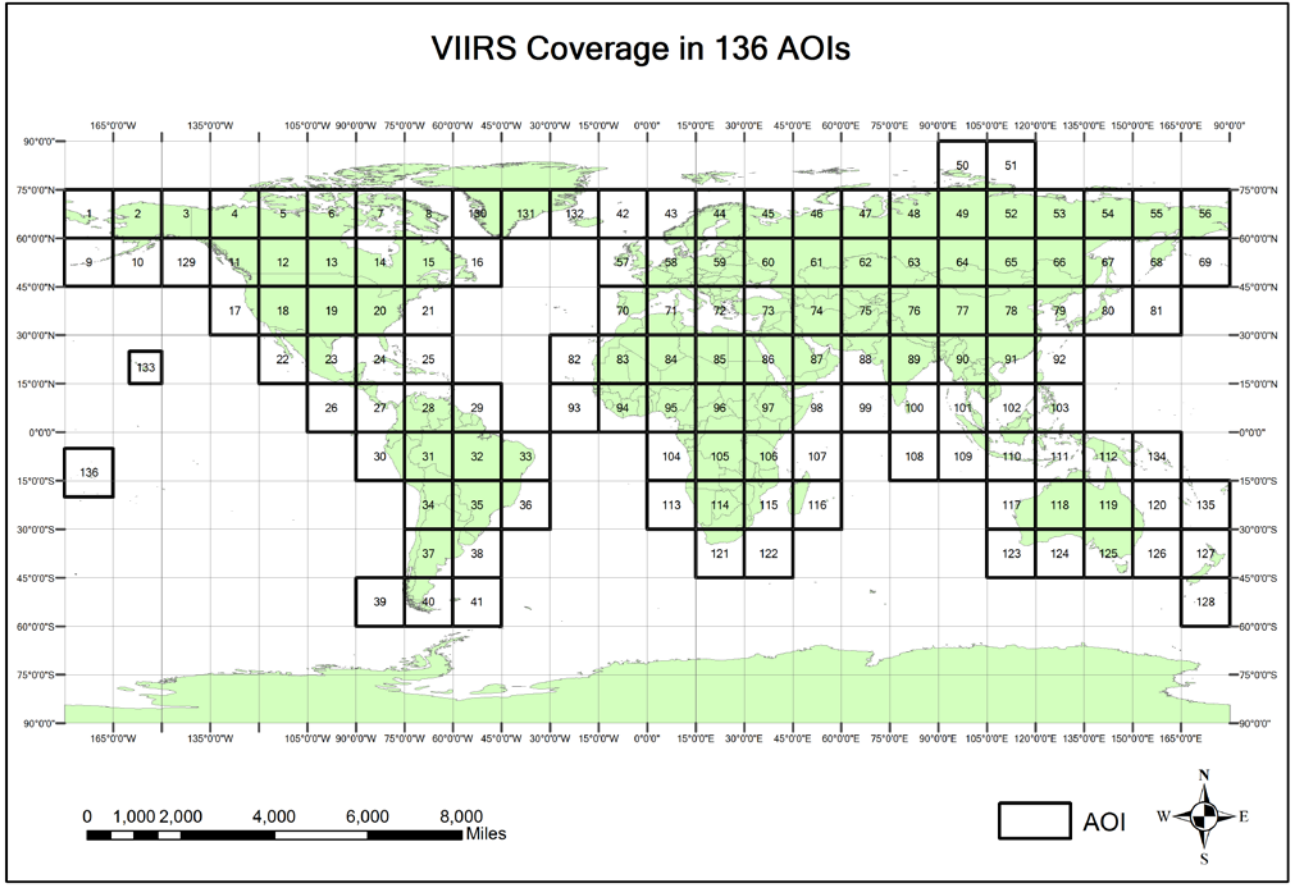
VIIRS Composited Flood Products

- The VIIRS Composited Flood Products are used to filter out cloud cover through a maximal water-fraction composition process and thus derive the maximal flood extent during a flood event from the VIIRS NRT flood maps of Suomi-NPP and NOAA-20.
- The routinely global VIIRS Composited Flood Products include daily composited flood product and 5-day composited flood product.

- The compostion process is done by dividing the global land into 136 AOIs.

Daily composite:
https://realearth.ssec.wisc.edu/?products=RIVER-FLDglobal-composite1
5-day composite:
http://realearth.ssec.wisc.edu/?products=RIVER-FLDglobal-composite





The global land is divided into 136 AOIs for the VIIRS composition process and data archive.

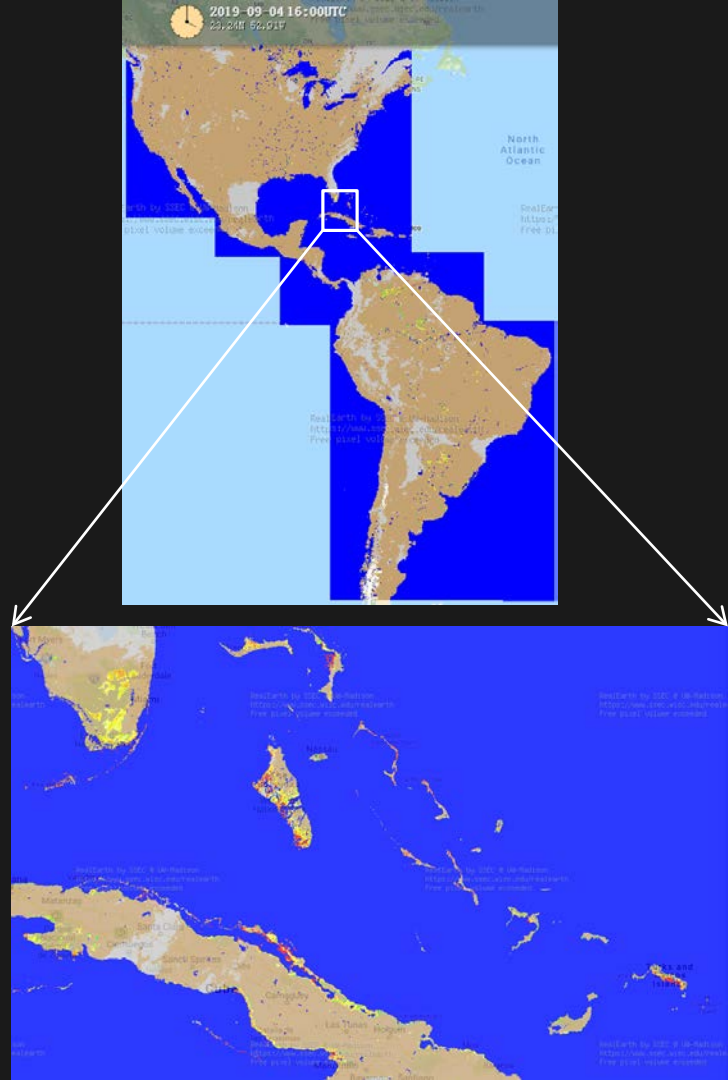
ABI Flood Product

- The ABI Flood Product is a rolling composited result based on the 10-minute ABI flood maps with hourly updates. Each hourly-updated flood map shows the average flood water fractions from the first 10-minute flood map to the latest one (example shown right).

- At the end of a day, the ABI Flood Map is the composited result of all the 10-minute ABI flood maps during daytime and thus shows the flood extent under the daily maximal clear-sky coverage.

- Data from ABI is acquired using the GOES Rebroadcast (GRB) downlink, which provides short latency in aquiring the ABI data.

Hourly composites:
http://realearth.ssec.wisc.edu/?products=River-Flood-ABI-hourly
Daily composites:
http://realearth.ssec.wisc.edu/?products=River-Flood-ABI



AHI Flood Product

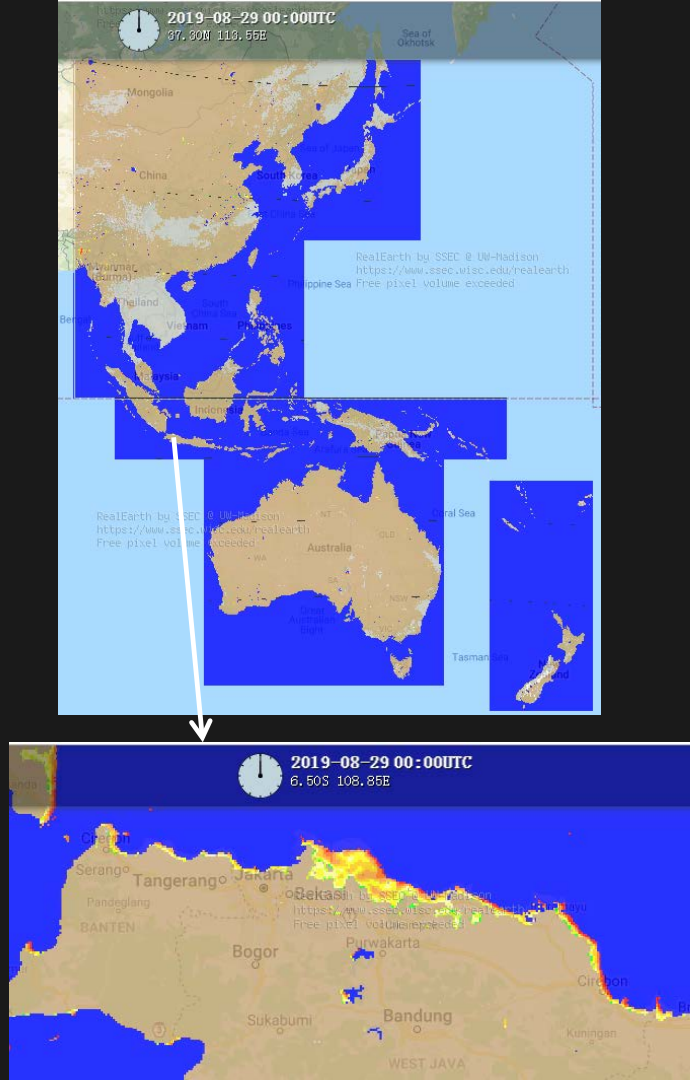
- The AHI Flood Product is a rolling composited result based on the 10-minute AHI flood maps with hourly updates. Each hourly-updated flood map shows the average flood water fractions from the first 10-minute flood map to the latest one.

- At the end of a day, the AHI Flood Map is a daily flood composite, and shows the flood extent under the daily maximal clear-sky coverage (example shown right).

- Data from AHI is acquired using the Himawari Cloud to STAR and then provided to CIMSS for processing.

- **IMPORTANT NOTE - The AHI Flood product is still experimental and has not been completely validated.**

https://realearth.ssec.wisc.edu/?products=RIVER-FLD-AHI



Joint VIIRS/ABI/AHI Flood Products

- The joint VIIRS/ABI or VIIRS/AHI Flood Products blend the daily flood detection results from VIIRS, ABI and AHI. It is based on the VIIRS 375-m daily composited flood maps, and uses the 1-km ABI or AHI daily clear-sky detection results to fill the gaps of clouds and cloud shadows in the VIIRS maps.

- Thus, it shows the flood extent under the maximal clear-sky coverage derived by the satellites during daytime, and keeps the finer VIIRS 375-m spatial resolution.

- **IMPORTANT NOTE - The current Joint VIIRS/ABI or VIIRS/AHI Flood products are experimental products using overlapping process. The 1-km ABI/AHI flood water fractions have not been fully fused with the VIIRS results.**

Joint VIIRS/ABI flood product:
http://realearth.ssec.wisc.edu/?products=RIVER-FLD-joint-ABI

Joint VIIRS/AHI flood product:
http://realearth.ssec.wisc.edu/?products=RIVER-FLD-joint-AHI

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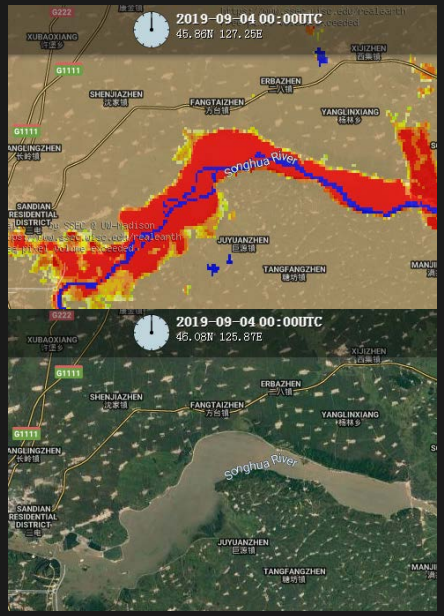
Example of how the products can be used during the day

- The ABI/AHI flood maps are available from the early morning to the late afternoon, and thus are recommended for use during the periods when VIIRS flood products are unavailable.
- Once the high resolution (**375 m**) flood product from VIIRS become available (3-4pm local solar time over a given region, assuming DB availability), assessments can be revised using finer and more accurate details of the flood extent, depending on cloud cover over ROI at time of S-NPP and NOAA-20 passes.
- When available, the Joint VIIRS/ABI or VIIRS/AHI Flood products are highly recommended for an initial evening assessment, since they provide the most complete and highest spatial resolution flood maps.
- When it is always partially cloudy during a period, the VIIRS daily or 5-day composited flood products are also recommended for use as they filter out the cloud cover through a maximal water-fraction composition process and can reflect the maximal flood extent during a day or the latest five days.
- Remember that the all of the flood products are produced during **daytime only**, thus the products will not be updated overnight

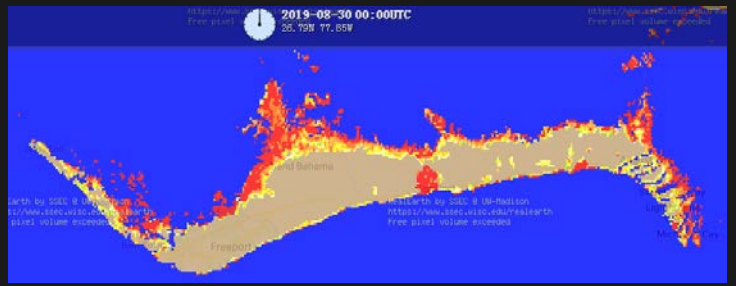
Potential Issues

- Water reference map: The current water reference map we use for global flood mapping is from MODIS global water mask (MOD44W), which was generated using the MODIS data 10 years ago. It might not reflect the new reservoirs and other hydraulic projects in the recent years, which may take some normal water as flooding water.

- Tides and Marsh lands: In some regions especially coastal areas, consistent flooding may be detected in the flood maps. These floods are mostly caused by the tides or occur over marsh lands, which do not pose any social impact.



Part of the flooding water in the top image along the Songhua River is actually a new reservoir built after 2010, which is shown in the bottom google image but not reflected in the MODIS water mask.



Flooding caused by the tides in Great Bahamas is a natural phenomenon.

Accessability and Contact information

- SSEC RealEarth
  - Online visualization page : https://www.ssec.wisc.edu/flood-map-demo/flood-products/
  - Links to the single flood products:
    - VIIRS real-time flood maps: http://realearth.ssec.wisc.edu/?products=RIVER-FLDglobal
    - VIIRS daily composites: https://realearth.ssec.wisc.edu/?products=RIVER-FLDglobal-composite1
    - VIIRS 5-day composites: http://realearth.ssec.wisc.edu/?products=RIVER-FLDglobal-composite
    - ABI Daily composites: http://realearth.ssec.wisc.edu/?products=River-Flood-ABI
    - AHI Daily composites: http://realearth.ssec.wisc.edu/?products=RIVER-FLD-AHI
    - Joint VIIRS/ABI: http://realearth.ssec.wisc.edu/?products=RIVER-FLD-joint-ABI
    - Joint VIIRS/AHI: http://realearth.ssec.wisc.edu/?products=RIVER-FLD-joint-AHI
  - Also available on RealEarth App (available for Android and Apple)

- The flood products via Web Mapping Service (via Real Earth) are available

- Note that these products are not supported 24/7 but do have a high reliability of uptime.

- Any questions can be referred to William Straka (wstraka@ssec.wisc.edu), Bill Sjoberg (bill.sjoberg@noaa.gov) and Mitch Goldberg (mitch.goldberg@noaa.gov)

- Any technical and scientific issues can be referred to Jay Hoffman (jay.hoffman@ssec.wisc.edu), Sanmei Li (slia@gmu.edu) and Donglian Sun (dsun@gmu.edu)

References

Sanmei Li, DonglianSun, Mitchell Goldberg, Bill Sjoberg, David Santek, Jay P. Hoffman, Mike DeWeese, Pedro Restrepo, Scott Lindsey, Eric Holloway (2017). Automatic near real-time flood detection using Suomi-NPP/VIIRS data, *Remote Sensing of Environment,* 204 (2018) 672–689

Sanmei Li, Donglian Sun, Mitchell Goldberg & Bill Sjoberg (2015). Object-based automatic terrain shadow removal from SNPP/VIIRS flood maps, International Journal of Remote Sensing, Vol. 36, No. 21, 5504–5522

Sanmei Li, Donglian Sun, Mitchell Goldberg & Antony Stefanidis (2013). Derivation of 30-m-resolution Water Maps from TERRA/MODIS and SRTM. Remote Sensing of Environment 134 (2013) 417–430

Sanmei Li, Donglian Sun, Yunyue Yu, Ivan Csiszar, Antony Stefanidis, & Mitch D. Goldberg (2012). A New Shortwave Infrared (SWIR) Method for Quantitative Water Fraction Derivation and Evaluation with EOS/MODIS and Landsat/TM data. IEEE Transactions on Geoscience and Remote Sensing, Vol. 51, Issue 3

Sanmei Li, Donglian Sun & Yunyue Yu (2013). Automatic cloud-shadow removal fromflood/standing water maps using MSG/SEVIRI imagery, International Journal of Remote Sensing, 34:15, 5487-5502

Donglian Sun, Yunyue Yu, Rui Zhang, Sanmei Li, and Mitchel D. Goldberg (2012). Towards Operational Automatic Flood Detection Using EOS/MODIS data. Photogrammetric Engineering & Remote Sensing, 78 (6)