Global satellite-based flood monitoring post-MODIS
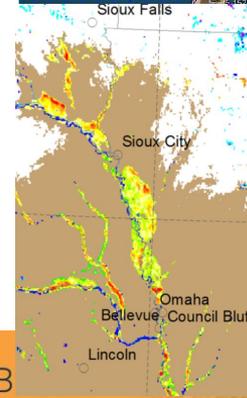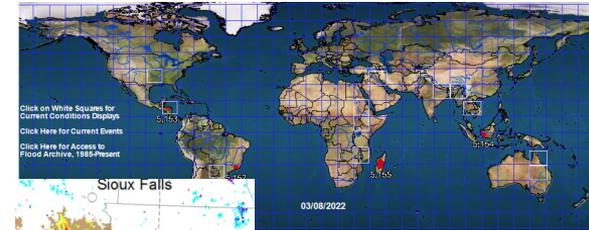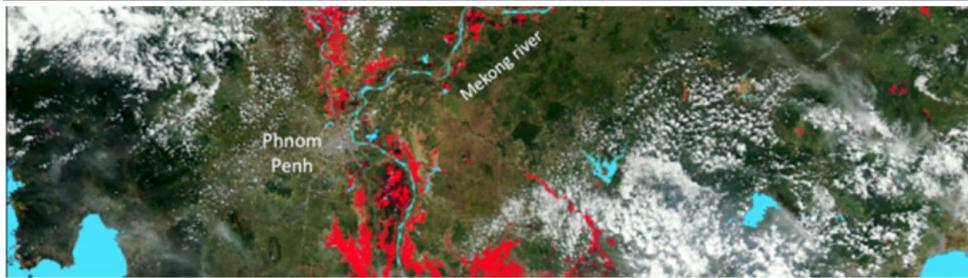
Guy Schumann (ImageCat Inc), in collaboration with Maggi Glascoe (MSFC), Bandana Kar (ORNL)
gs@imagecatinc.com

Yang et al.(2020) in *Water*
"Water body extraction from S-3…"

Users of MODIS/VIIRS Flood Maps

- Many NASA/NOAA projects use these maps or produce them
  - DFO, NOAA, A37, GEO
- End-users such as PDC, UN WFP, World Bank and many others rely on them for analytics and operations
- MODIS NRT and DFO: flood event detection and mapping
- VIIRS NRT flood maps: global water detection (not necessarily only floods)
- EC/JRC: Global Flood Monitoring (GFM) from S-1
- Need to think about MODIS follow on…
- Sentinel-3 can help by providing comparable resolutions, band frequencies, and complementary spatial coverage / revisit times
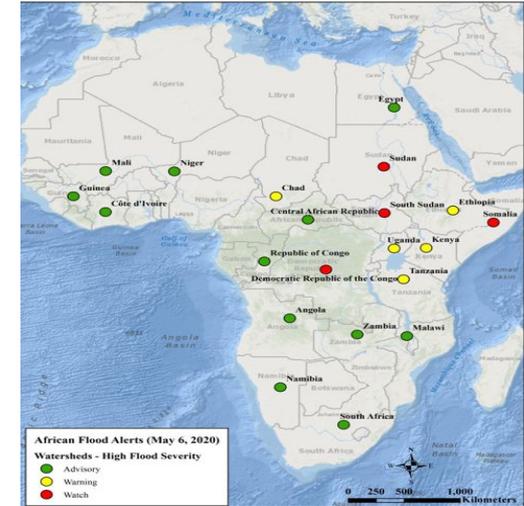
Value / Types of Usage

- Historical event archiving for better global risk assessment & trend analysis
- Extreme event flood maps
- Impact assessment
- Situational awareness assessment (A37)
- Validation of global/regional simulation models (A37)
- Defining flood hazard / risk areas
- ….

Watersheds that are experiencing watches (red), warnings (orange), or advisories (green) are converted into alerts (c) that will be delivered to DisasterAWARE®

Sentinel-3 OLCI

- OLCI (Ocean and Land Colour Instrument): 300 m (Full Resolution) and 21 bands in VIS/SWIR. Based on ENVISAT MERIS heritage
- Orbital passes complement VIIRS: (1) overpass time(s) e.g. morning (better) or afternoon (worse=more cloudy), and (2) data latency?
- The Sentinel-3 satellites have a mid-morning local overpass time (roughly 10 AM local time)
- Sentinel-3 OLCI Near Real Time (< 3 hours latency)
- Should be thought of as a possible MODIS replacement to complement VIIRS NRT water mapping

Table 1: Global coverage revisit times for OLCI optical measurements

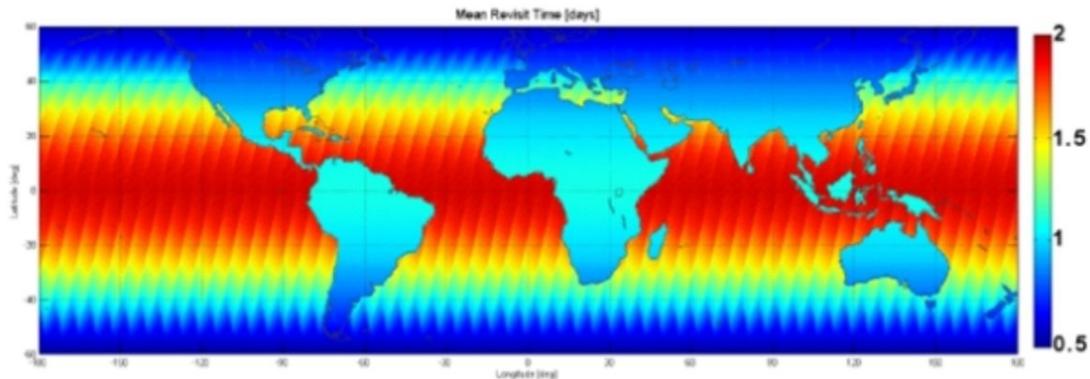|	Constellation configuration	Revisit at equator	Revisit for latitude > 30°	Specification
Ocean colour (sun-glint free, day only)	1 satellite	< 3.8 days	< 2.8 days	< 2 days
	2 satellites	< 1.9 days	< 1.4 days	
Land colour (day only)	1 satellite	< 2.2 days	< 1.8 days	< 2 days
	2 satellites	< 1.1 days	< 0.9 days	

Figure 2: OLCI mean revisit time with a two-satellite configuration, in red 2 days are required to have revisit at equator, in blue less than 0.5 days at high latitude.

Sentinel-3 SLSTR

- Sea and Land Surface Temperature Radiometer
- SLSTR: 500 m for VIS/IR reflectance
- SLSTR: 1 km for TIR

Table 1: Global coverage revisit times for SLSTR optical measurements

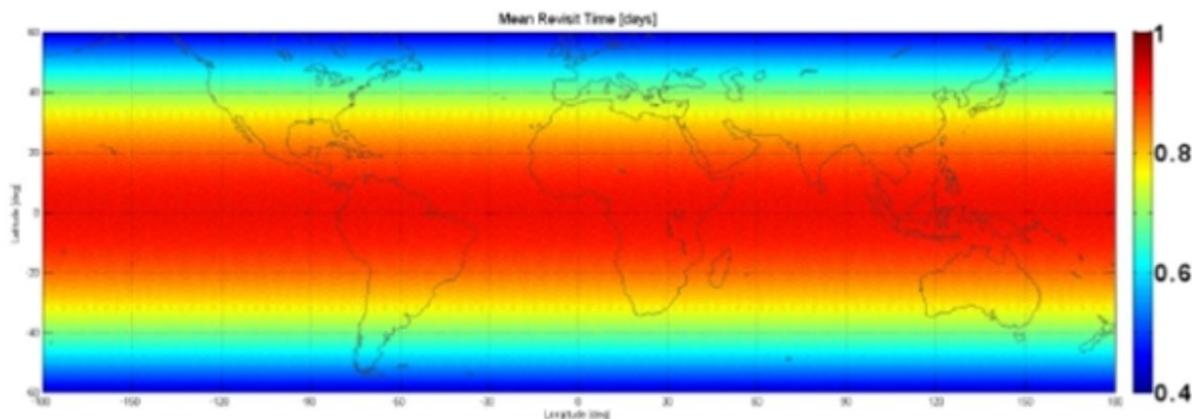|	Constellation configuration	Revisit at equator	Revisit for latitude > 30°	Specification
SLSTR dual view (day and night)	One satellite	< 1.8 days	< 1.5 days	< 4 days
	Two satellites	< 0.9 days	< 0.8 days	

Figure 2: SLSTR Mean Revisit Time with Two-Satellite Configuration