

EGM310: GIS and Remote Sensing

Week 12, Part 2: Applications – Water Resources

Remote sensing of water

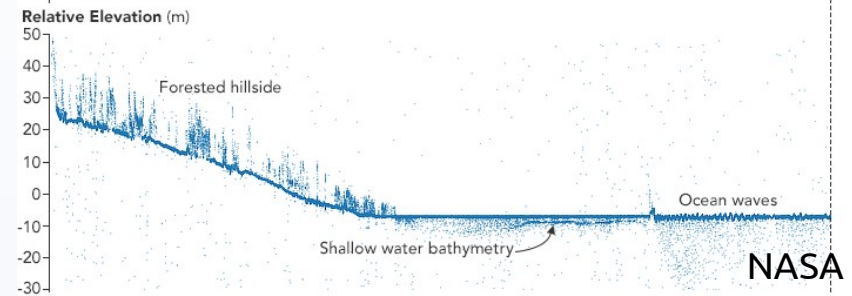
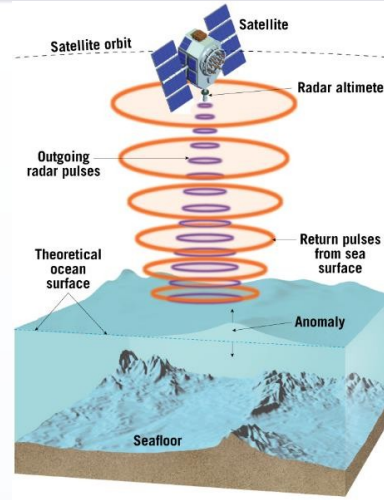
- Recall: most light absorbed within ~2m of surface
 - Infrared: < 0.5 m
 - Visible Blue/Green: up to 20 m in right conditions
- Sediments, chlorophyll
- Thermal wavelengths:
 - Water temperature (surface)
- Microwave wavelengths:
 - Surface roughness, composition
 - Soil moisture



- Indices:
 - Normalised Difference Water Index (NDWI)
 - Modified NDWI
 - Automated Water Extraction Index (AWEI)
- Choose threshold to classify water/not water

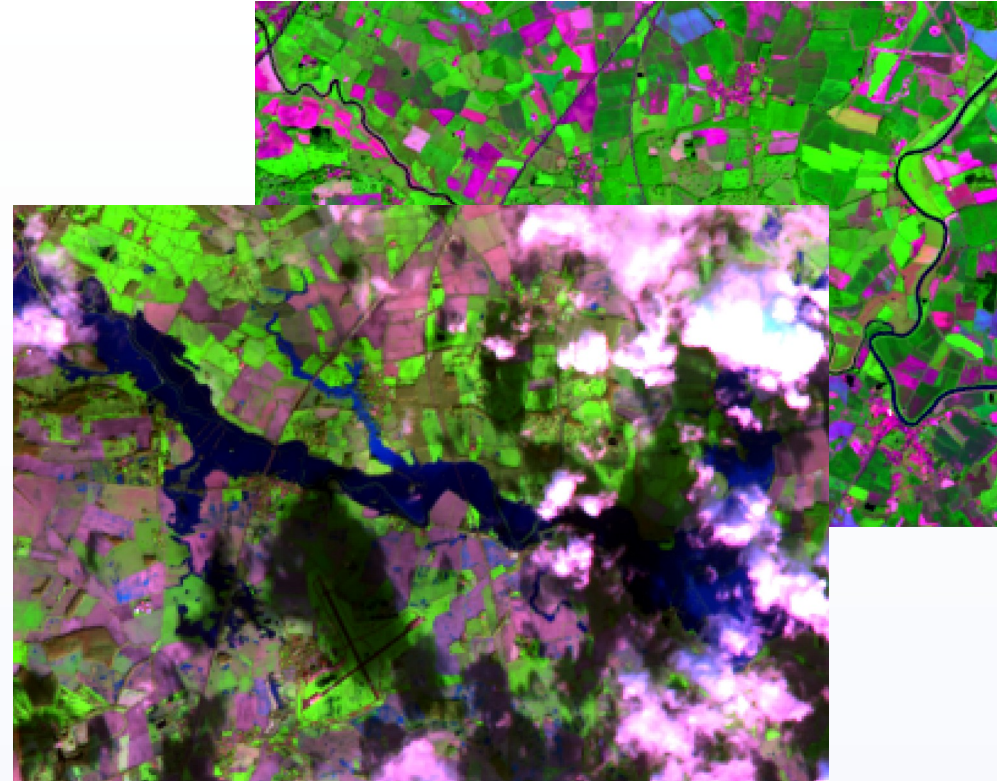


- Satellite altimeters
 - Radar
 - Laser/LiDAR
- With digital elevation model (DEM):
 - Flood depth, volume
 - Lake/reservoir volume

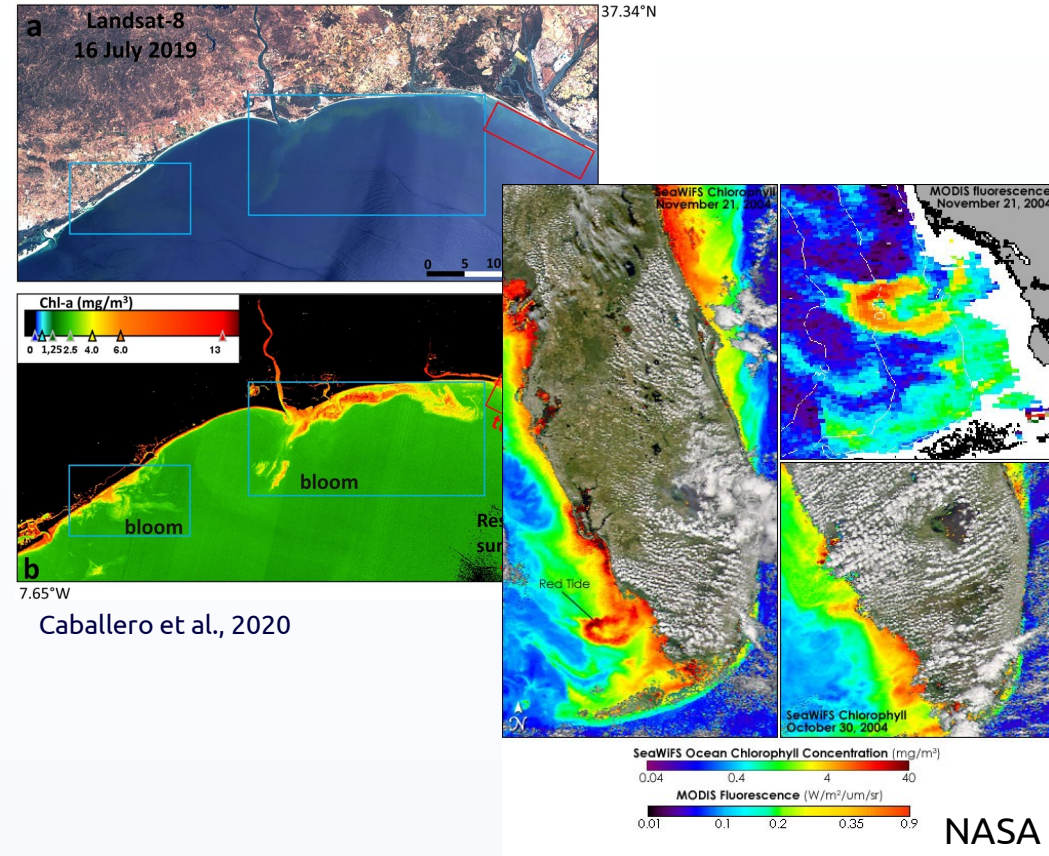


Example: Floods

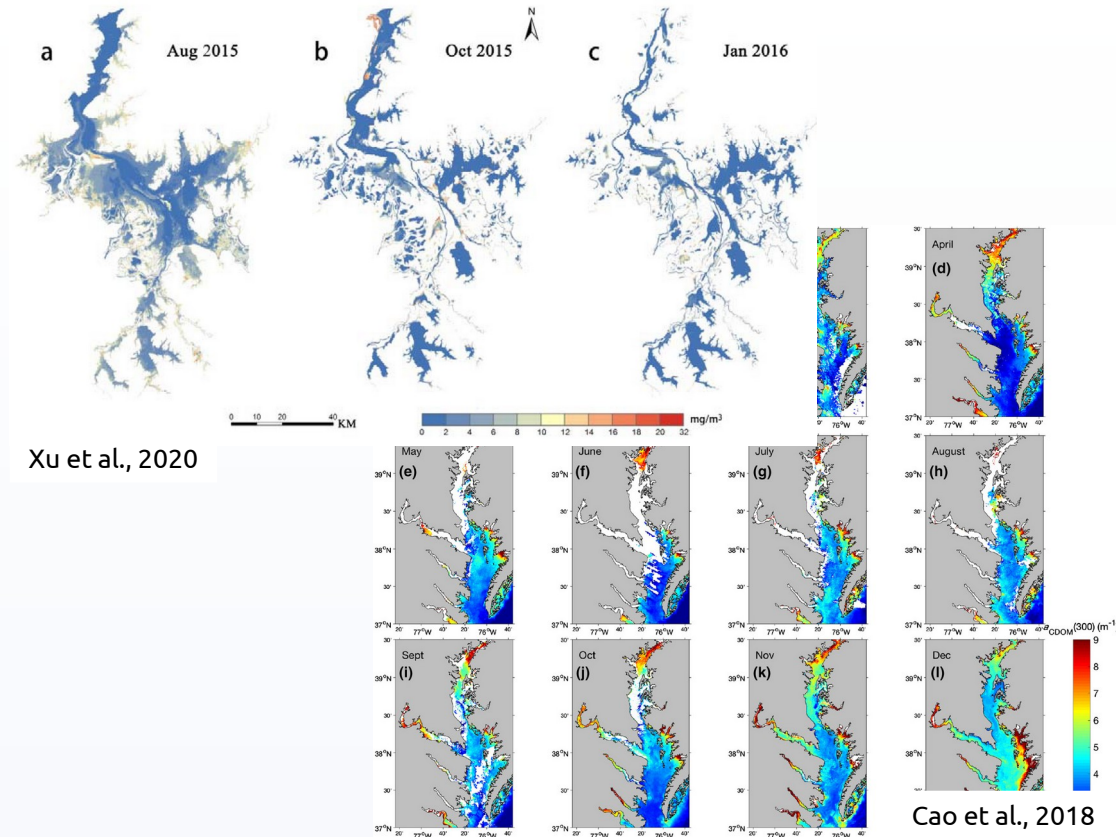
- February 2020, Storm Dennis
 - High winds, rainfall
 - Flooding across much of UK
- Optical sensors: weather-dependent
- SAR sensors: all-weather



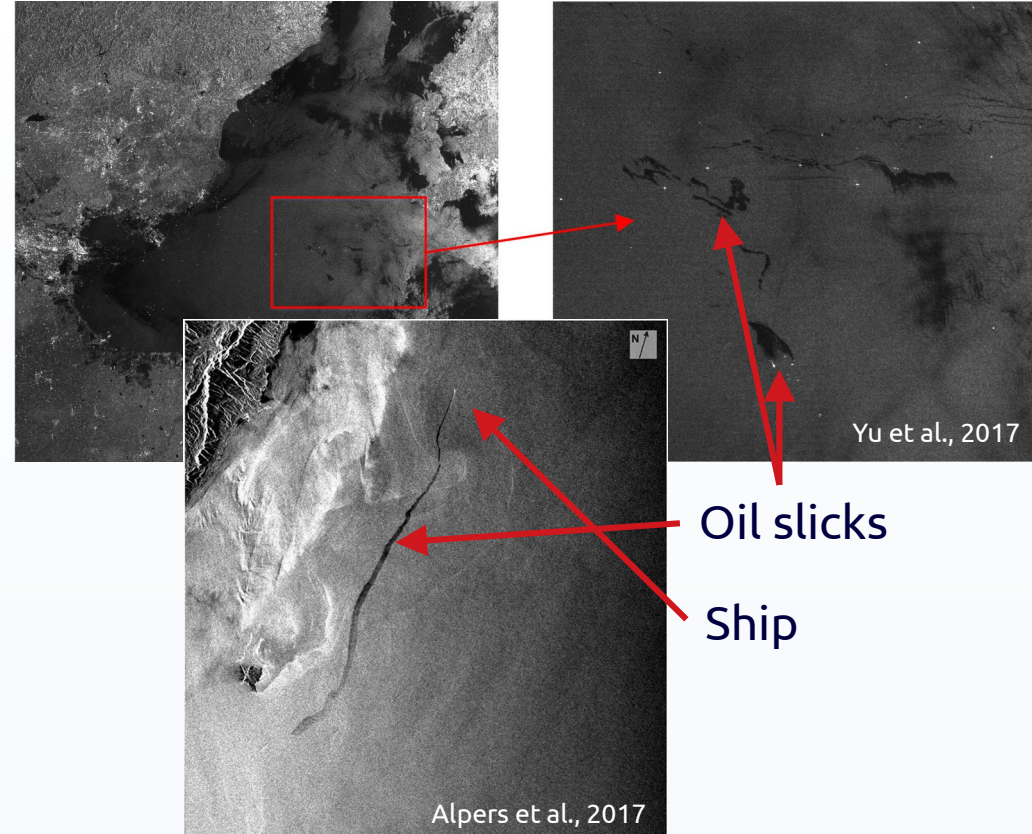
- Chlorophyll-a: map using difference in reflectance between blue, green λ
 - Used as a proxy for phytoplankton concentration
- Problem: may not be just chlorophyll
- Can also estimate fluorescence with certain sensors



- Colored Dissolved Organic Matter (CDOM)
 - Molecules leached from decaying organic matter
 - Related to Dissolved Organic Carbon (DOC), other nutrients
- Total Suspended Matter
- Normally estimated using empirical relationships derived from in-situ data



- Can use optical systems to detect slicks, sheens
 - Best results between 300-450 nm
- Thicker oil slicks can be detected with microwave sensors
 - Dampens waves, changes texture



- Remote sensing provides a powerful tool for water resource monitoring
- Visible & Infrared sensors:
 - Map extent
 - Monitor sediments, water quality
- Altimeters:
 - Can calculate water levels, volume
- Microwave sensors:
 - Detect & monitor floods
 - Detect & monitor oil spills, other pollution sources

- Lillesand, Kiefer & Chipman – Chapter 8.7
- Campbell & Wynne – Chapter 19
- Living Ocean – Remote Sensing [[NASA](#)]
- Eerie Blooms in Lake Erie [[NASA](#)]
- Sentinel-3: Ocean Colour [[EUMETSAT](#)]
- Satellites View Growing Gulf Oil Spill [[NASA](#)]