New Fields of Geospatial Applications

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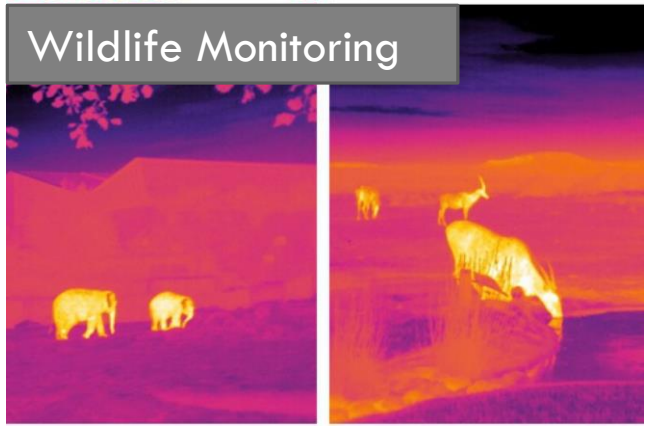
- New technologies
- New Sensors
- Availability of free satellite data
- Advances in data processing
- Advances in data sharing and visualization
- Applications

New Technology - Drone

Agriculture

Wildlife Monitoring

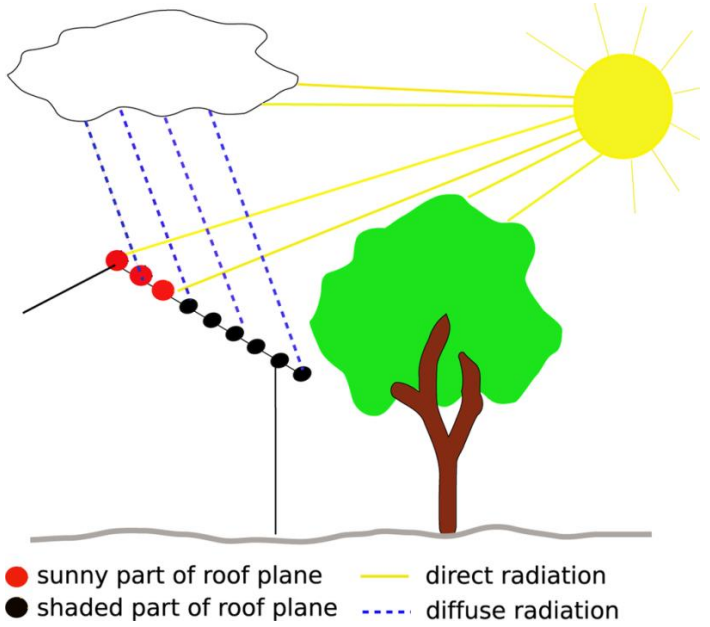


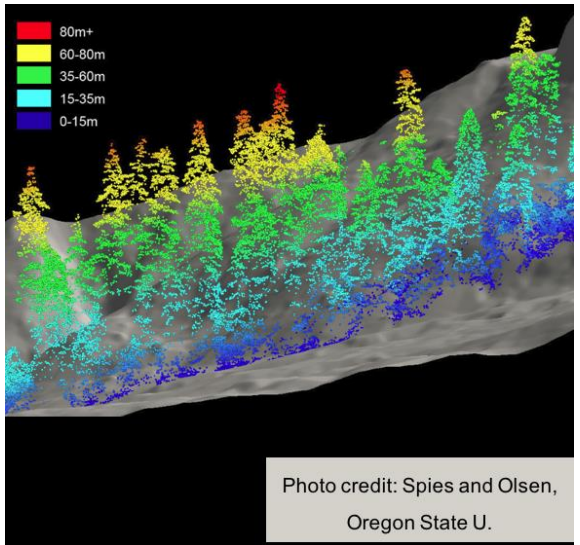
Flood Mapping

3-D Modelling

New Sensor - LiDAR

- Light Detection And Ranging (LIDAR) technology uses active sensors;
- Information obtained from lasers are - the three dimensional distribution of vegetation canopies as well as sub canopy topography;
- Tree/stand height, volume, biomass, etc. can be estimated from LiDAR data;





Source: Ussyskhin, 2011

Availability of Free Satellite Data – Sentinel 1

Sentinel-1 is a two satellite constellation (C band Microwave)

Observation Modes and Resolution

- Strip Map Mode: 5 x 5 m
- Interferometric Wide Swath: 5x20 m
- Extra-Wide Swath Mode: 25 x 100 m
- Wave-Mode: 5 x 20 m

Revisit Time: 12 Days for one satellite

Sentinel-2 mission is a land monitoring 2 satellite constellation

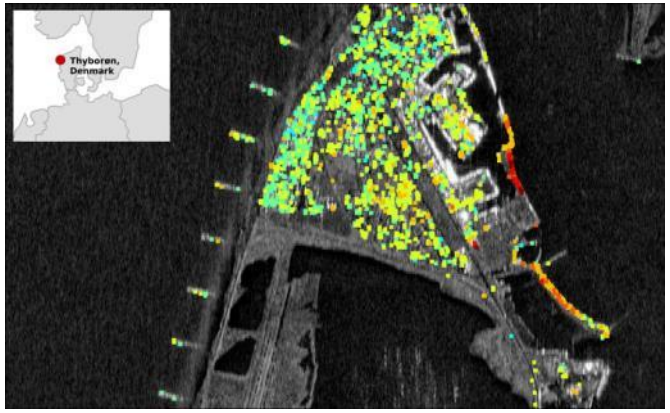
Spatial Resolution: Various Resolution for different bands (10 m, 20 m and 60 m spatial resolution)

Revisit Time: 10 days with one satellite and 5 days with 2 satellites

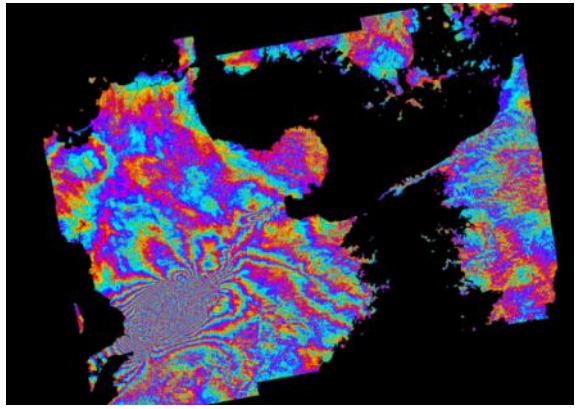
Applications of Sentinel 1 & Sentinel 2

Sentinel 1

Subsidence In Denmark (PS InSAR)



Surface Deformation from Kumamoto Earthquake (InSAR)

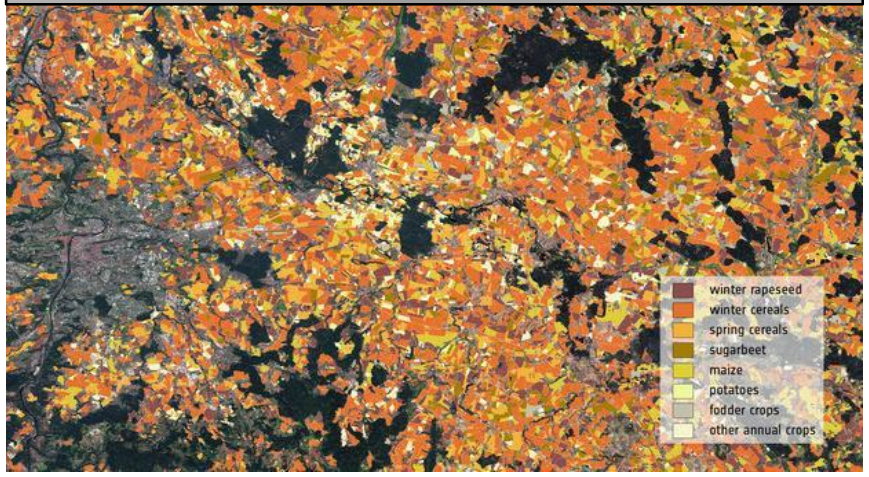


Flood in Bangladesh

Sentinel 2

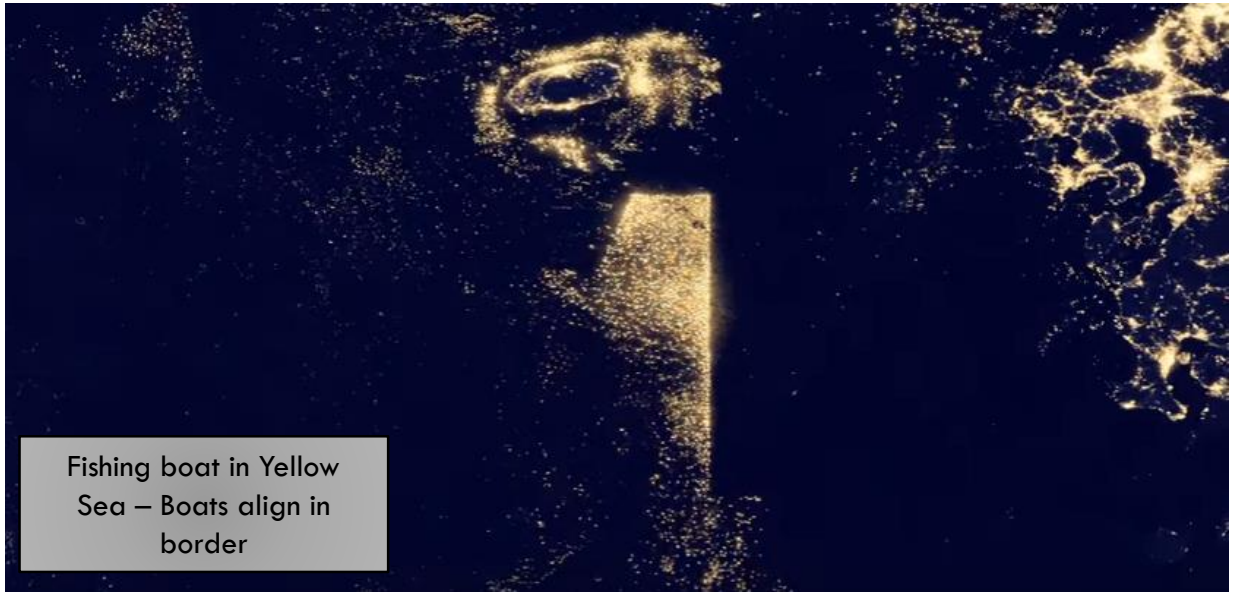
Leaf Area Index (LAI)

Land Cover classification



Source: http://www.esa.int/spaceinimages/Missions/Sentir

VIIRS Successor of MODIS Day and Night Observations



Source: https://www.nasa.gov/mission_pages/NPP/news/earth-at-night.html

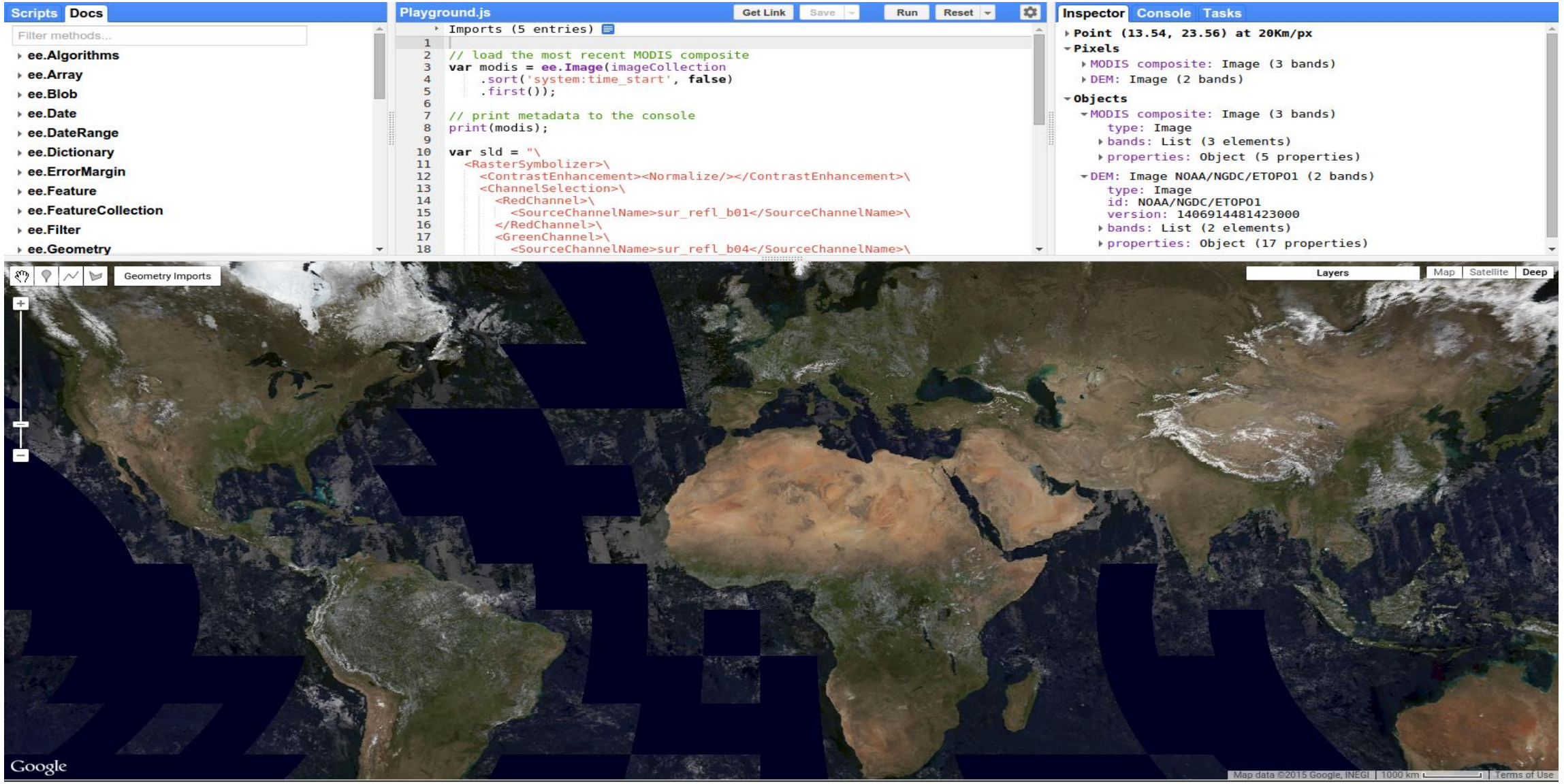
Advances in Data Processing - Cloud Computing

Advantages: Simplified access, quick analysis, improved decision making

Data hosts in the cloud and Quick analysis can be conducted in Cloud and only the results will be transferred to the client.

Another good example for free satellite data is **Google Earth Engine**

Cloud Computing - Google Earth Engine

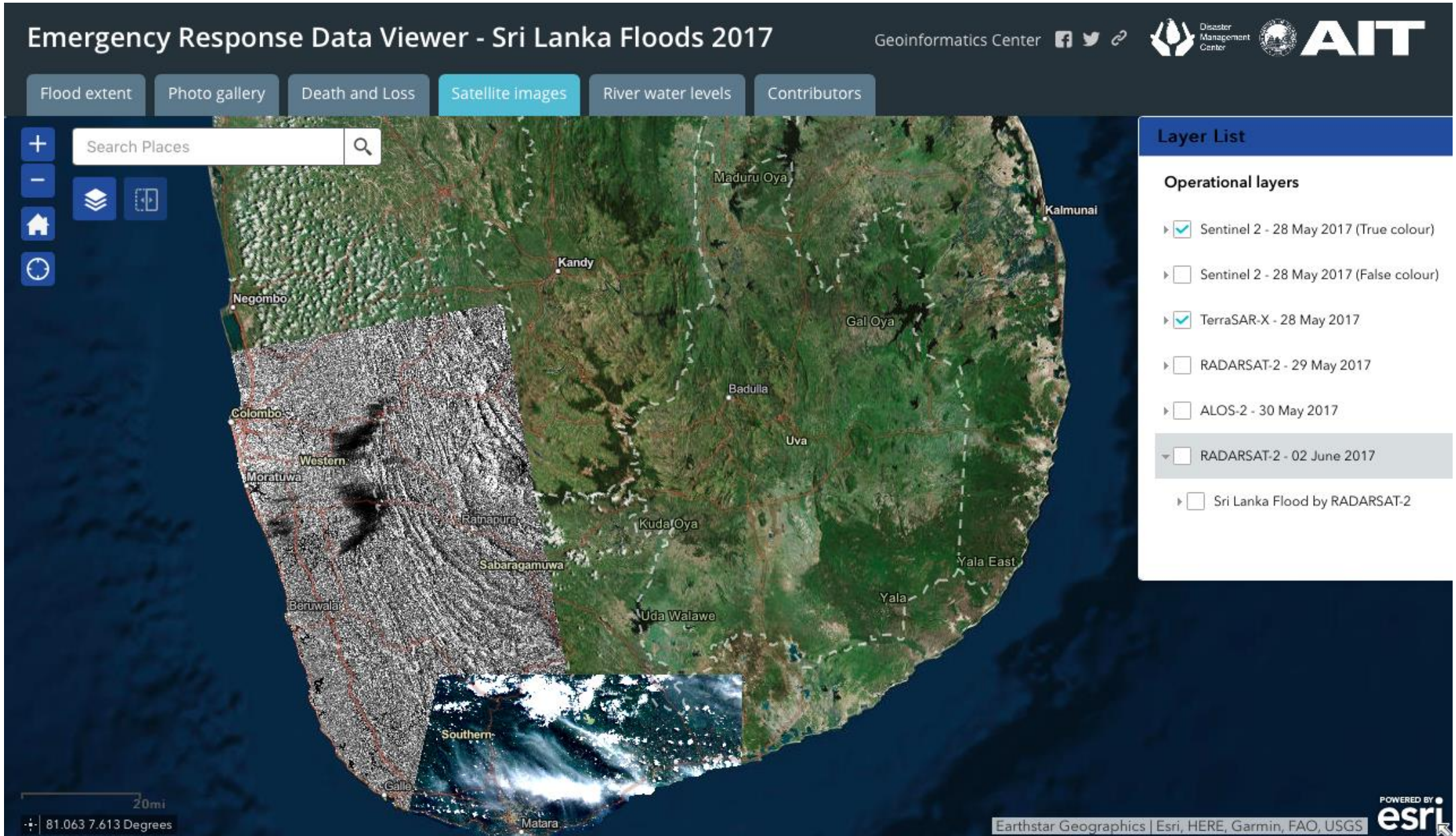


Advances in Data Processing - Artificial Intelligent

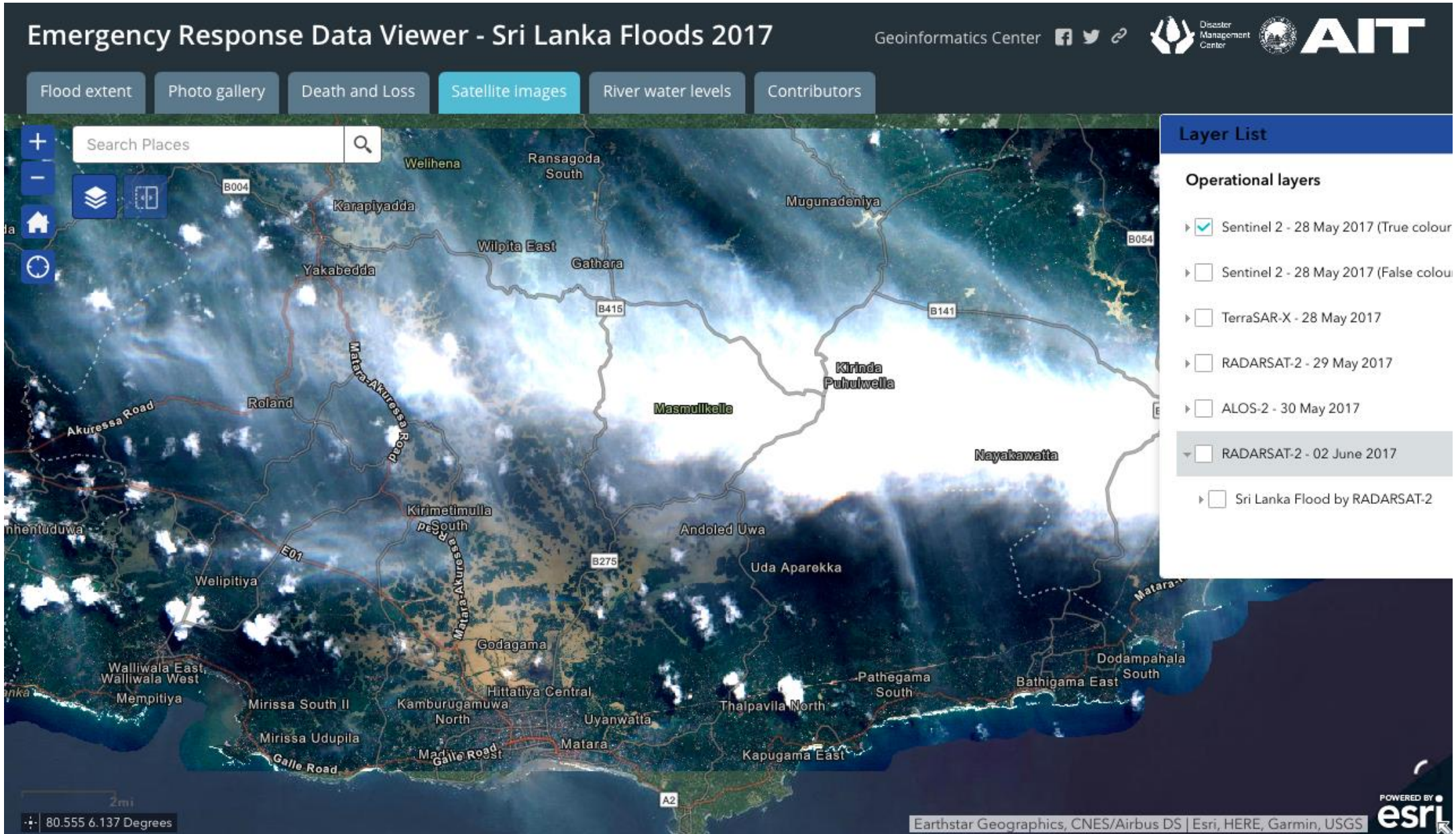
This advancement of deep learning allow scientist to detect various objects from high resolution satellite data successfully which was not possible from conventional classification algorithms

Source: https://medium.com/the-downlinq/you-only-look-twice-multi-scale-object-detection-in-satellite-imagery-with-convolutional-neural-34f72f659588

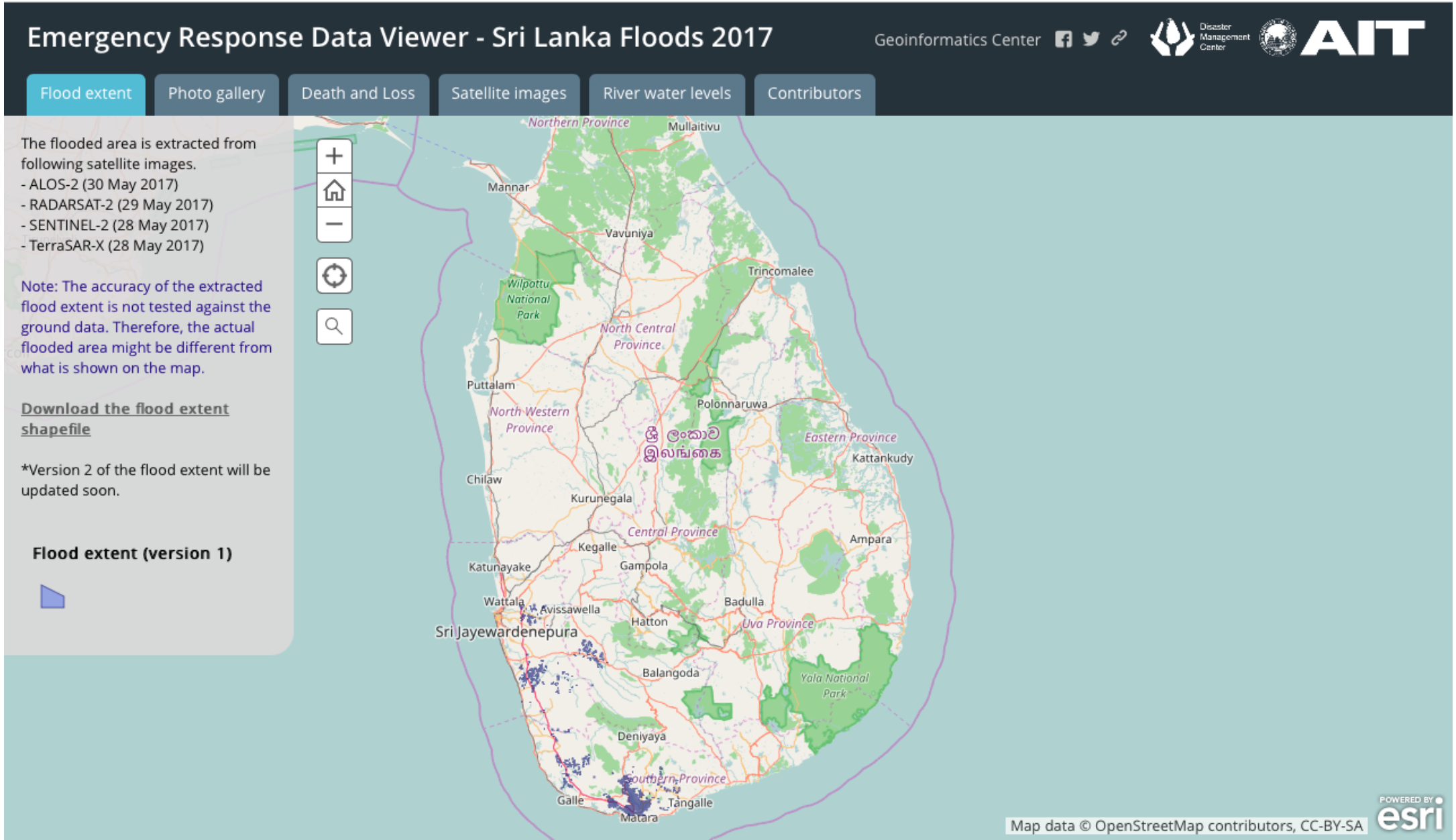
Advances in Data Sharing and Visualization - Web-GIS Platform



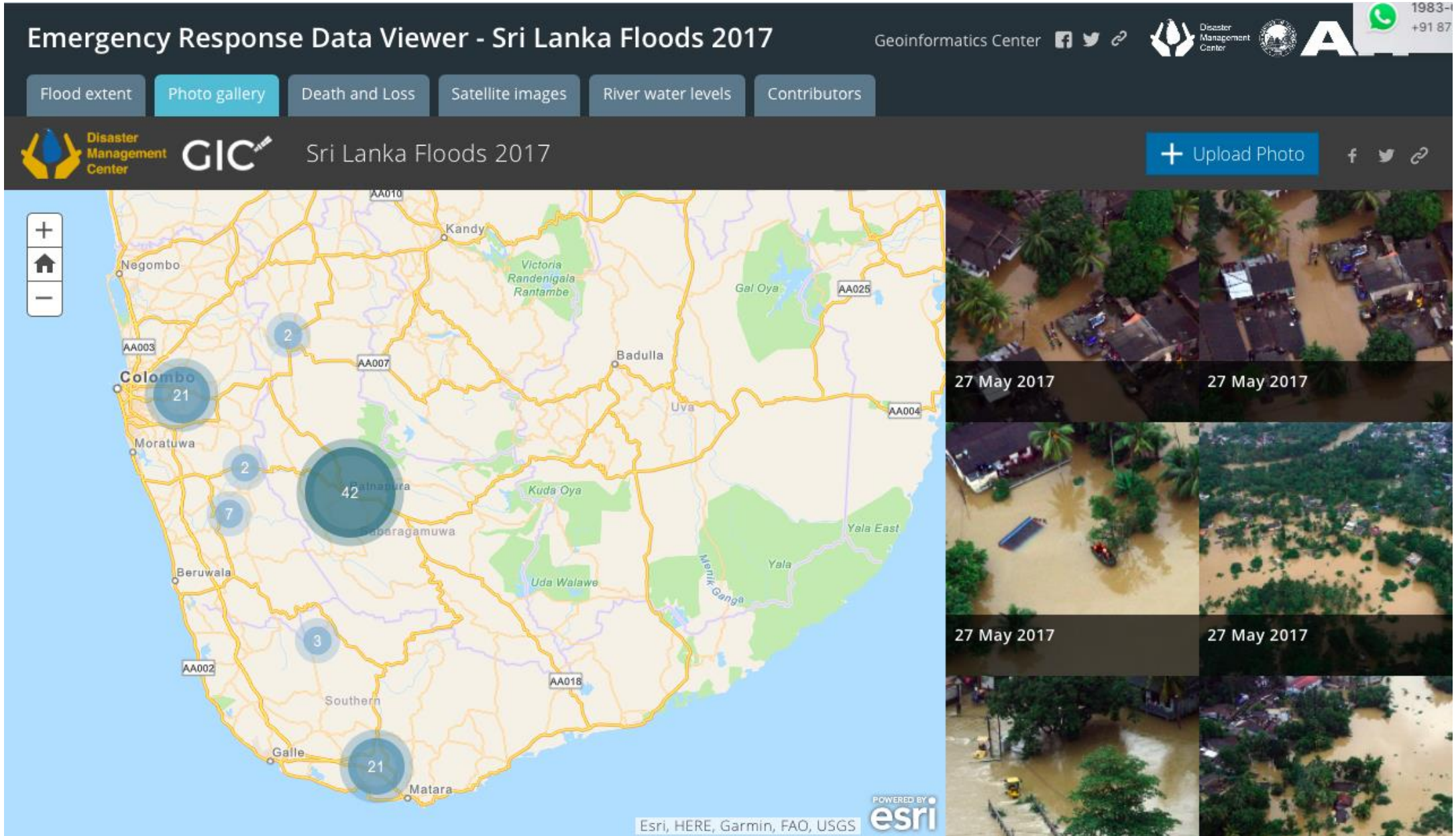
Sri Lanka Flood – Image from the Sentinel 2 (28 May 2017)



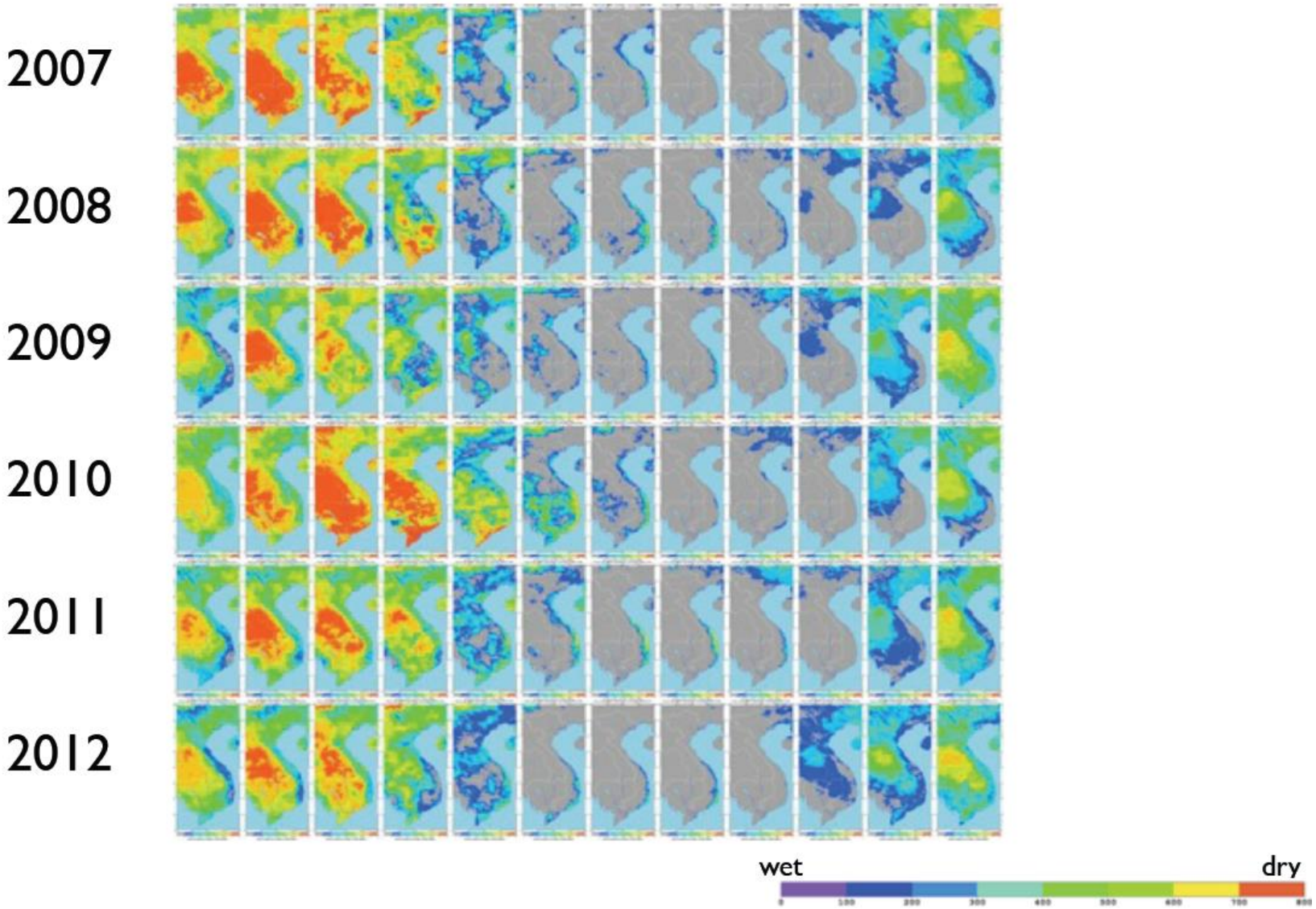
Extracted Flood Area from Satellite Images



Flood Photo Around Colombo City



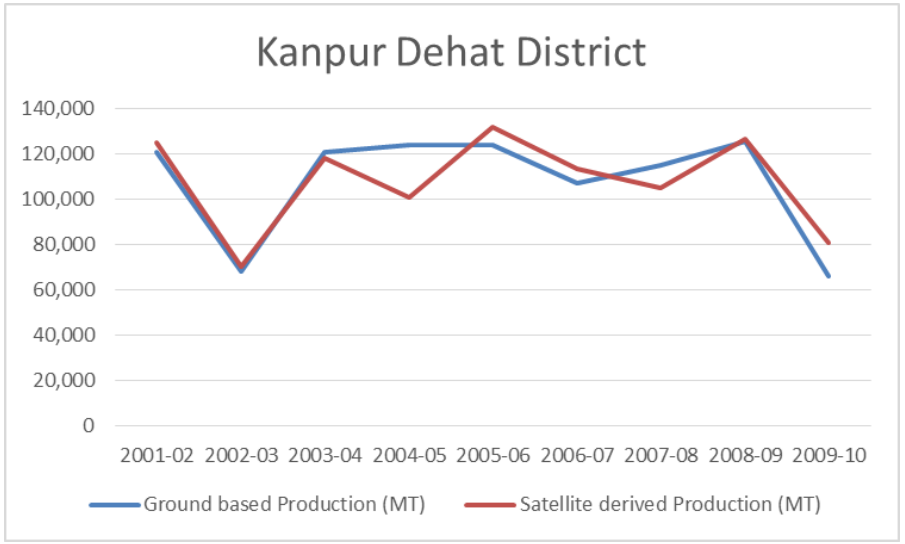
Applications - Drought Monitoring



Agriculture Crop Yield Forecasting

Rice

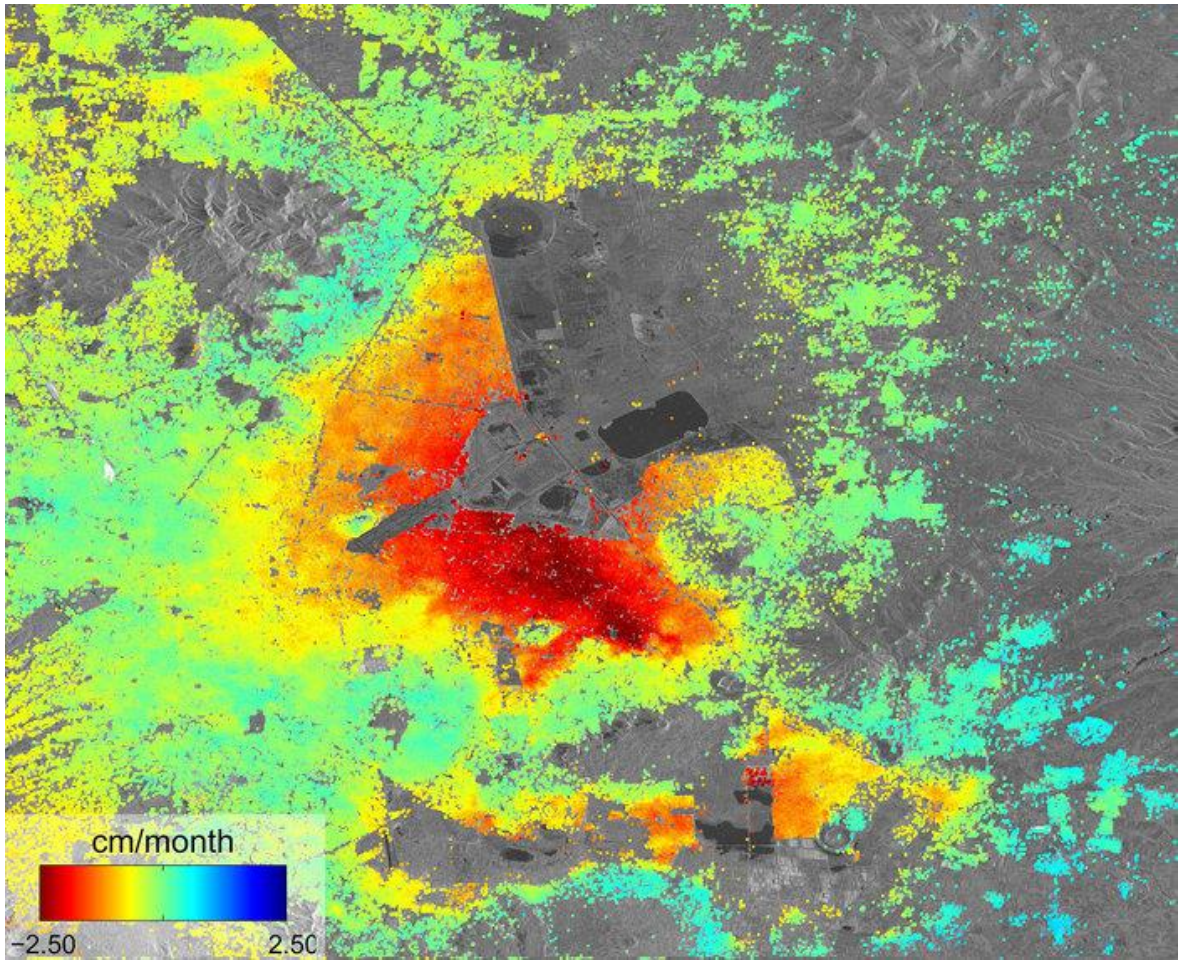
Year	Actual	Predicted	Remarks
2001-02	198,290	170,547	Drought year
2002-03	68,752	71,657	
2003-04	156,972	169,631	
2004-05	102,142	130,878	
2005-06	120,765	145,804	
2006-07	136,425	151,165	
2007-08	158,258	163,413	
2008-09	182,139	140,101	
2009-10	133,410	113,956	
2010-11	-	-	
2011-12	-	-	
2012-13	-	**155,625**	



Applications - Urban Area Monitoring

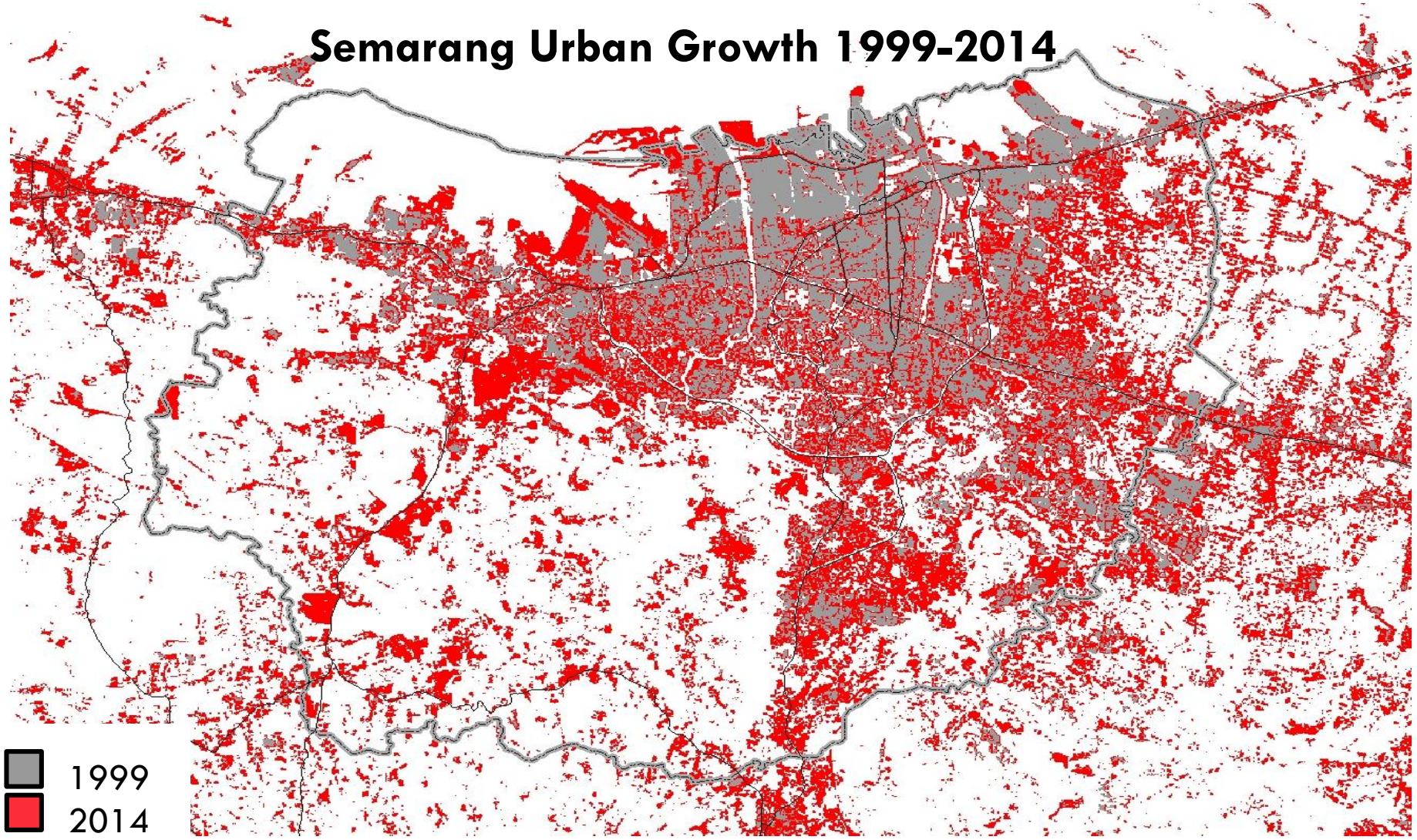
Mexico City subsidence

- Five Sentinel-1A radar scans acquired between 3 October and 2 December 2014 were combined to create this image of ground deformation in Mexico City.
- The deformation is caused by ground water extraction, with some areas of the city subsiding at up to 2.5 cm/month

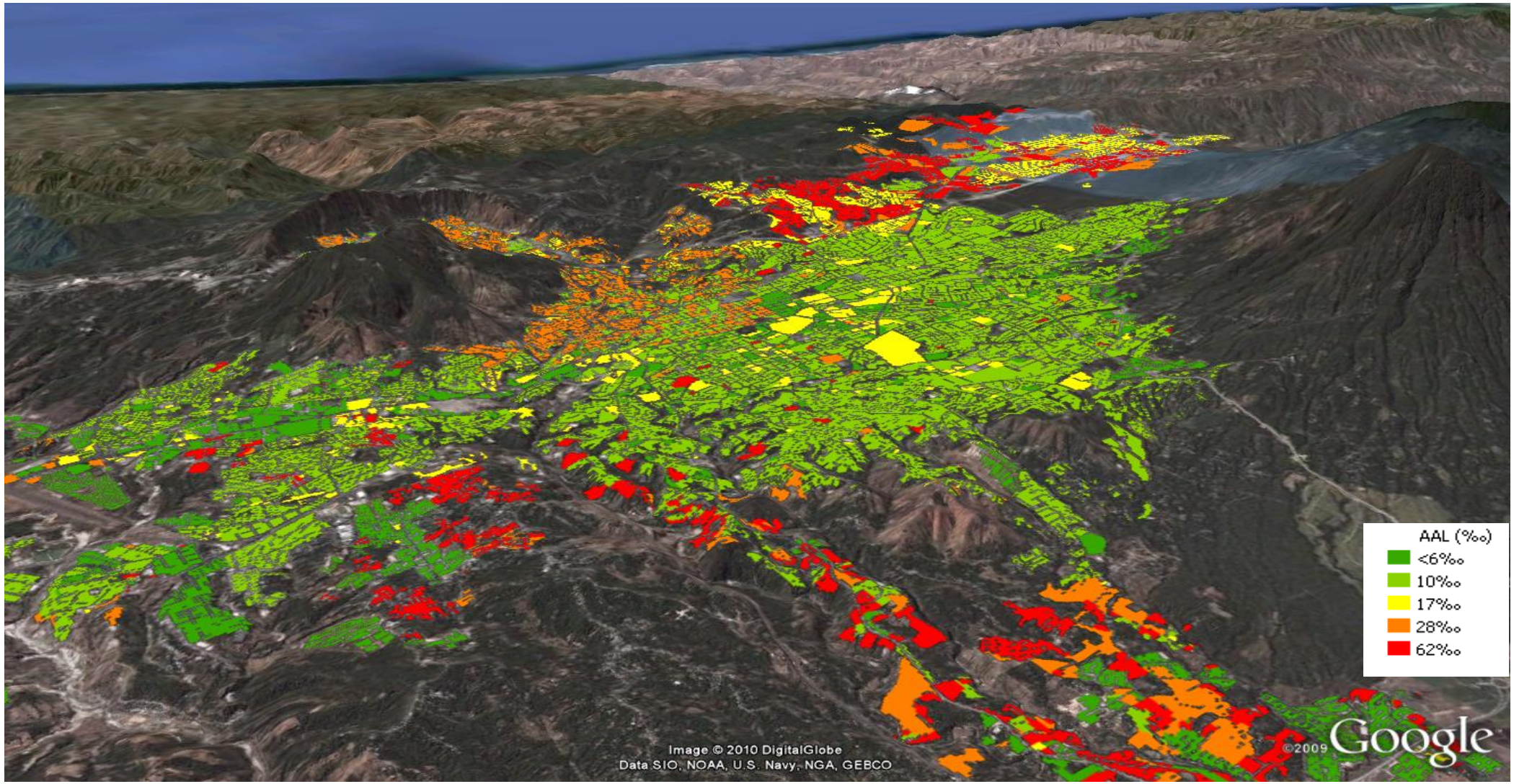


Source: https://www.esa.int/spaceinimages/Images/2014/12/Mexico_City_subsidence

Applications - Urban Growth Monitoring



Applications - Disaster Risk Assessment



Geospatial Skills Required

Degree: Bachelor Degree in Science and Engineering with RS and GIS/WebGIS skills

Master's/Ph.D. Degree in RS and GIS

Programming Skills: Python, JavaScript, HTML, CSS

Special Skill: SAR Data Processing, LiDAR Data Processing, Digital Photogrammetry

Specific Areas: Artificial Intelligence, Big Data

Selected Trainings We Offer

1) Mapping with Free Satellite Data and Open Source RS/GIS Tools
2) Introduction to Mapping with Drones
3) Applications of Drones in Agriculture
4) GIS for Disaster Risk Management
5) Global Navigation Satellite System (GNSS)

Thank you for your kind attention