EGU21-10295
https://doi.org/10.5194/egusphere-egu21-10295
EGU General Assembly 2021

Water monitoring with Very High Resolution satellite imagery

Freddie Kalaitzis[1], Gonzalo Mateo Garcia[2], and Giovanni Marchisio[3]
[1]University of Oxford (freddie.kalaitzis@cs.ox.ac.uk)
[2]University of Valencia (Gonzalo.Mateo-Garcia@uv.es)
[3]Planet (giovanni@planet.com)

The water volume on Earth's surface constantly varies with precipitation: an excess of water might lead to flooding, while its absence indicates upcoming droughts. We cannot afford in-situ monitoring devices on all rivers and streams worldwide, and free satellite imagery lacks the spatial and temporal resolution for continuous monitoring.

This talk will provide several examples of water monitoring using PlanetScope daily imagery. The global daily coverage of Planet's data presents new opportunities for developing robust models of flood hazard, providing timely mapping in support of relief operations, and applying near real time predictive models for river flow estimation based on simultaneous measurements over entire river basins.

First, we will describe how satellite data enable quantitative urban flood risk analysis by intersecting building segmentation maps with high risk flood zones. Rapid urbanization in developing countries is often unplanned and carries substantial risk for critical infrastructures. More frequent and severe flooding caused by climate change is exacerbating this. We capture rapid urbanization trends in African cities from high cadence imagery, and use flood risk data to quantify the humanitarian risk from flooding.

Second, we will show hurricane Harvey risk areas and demonstrate flood mapping. Flood mapping through high-cadence data provides vital information to first respondents on the ground on the damage of road networks and infrastructure.

Third, we will present Pix2Streams: a methodology to estimate water occurrence at the stream level developed in partnership with Frontier Development Lab and the USGS.

Pix2Streams is a pipeline that consists of

i) a water segmentation model that fuses several days of 3m PlanetScope imagery with 1m LiDAR data that is able to detect streams 5-7m wide,

ii) integration of the output of this model with a DEM-derived flow-line map to estimate water % coverage at the stream level.

Applying Pix2Streams across 2 years of daily PlanetScope imagery produces the first high-resolution dynamic map of stream flow frequency.

This is a new map that - if applied over entire watersheds - could fundamentally improve how we manage our water resources around the world, and may also evolve into an early warning system for floods or droughts. In particular, calibration and validation of measurements from space against USGS gage measurements downstream and the associated time lag could be a topic of future research.