

# DATA COLLECTION METHODS



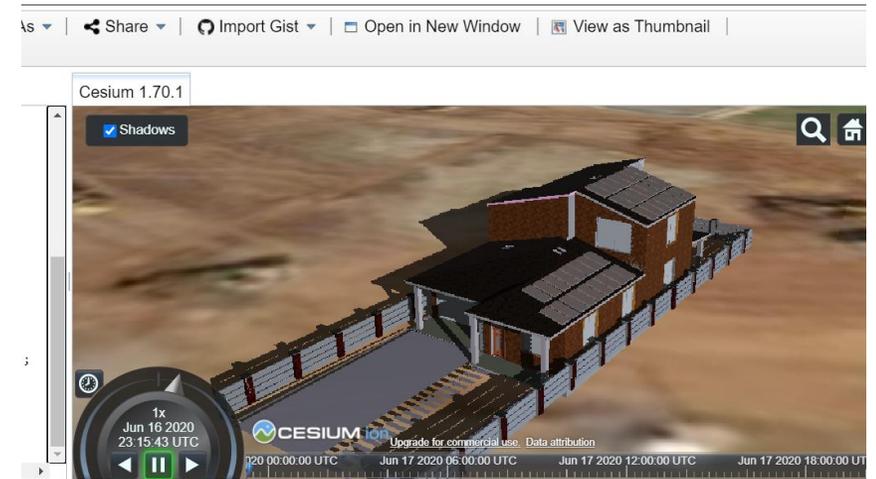
**DR. SARA SHIROWZHAN**

Lecturer/Co-Convenor,  
Smart Cities and Infrastructure Cluster,  
University of New South Wales School  
of Built Environment

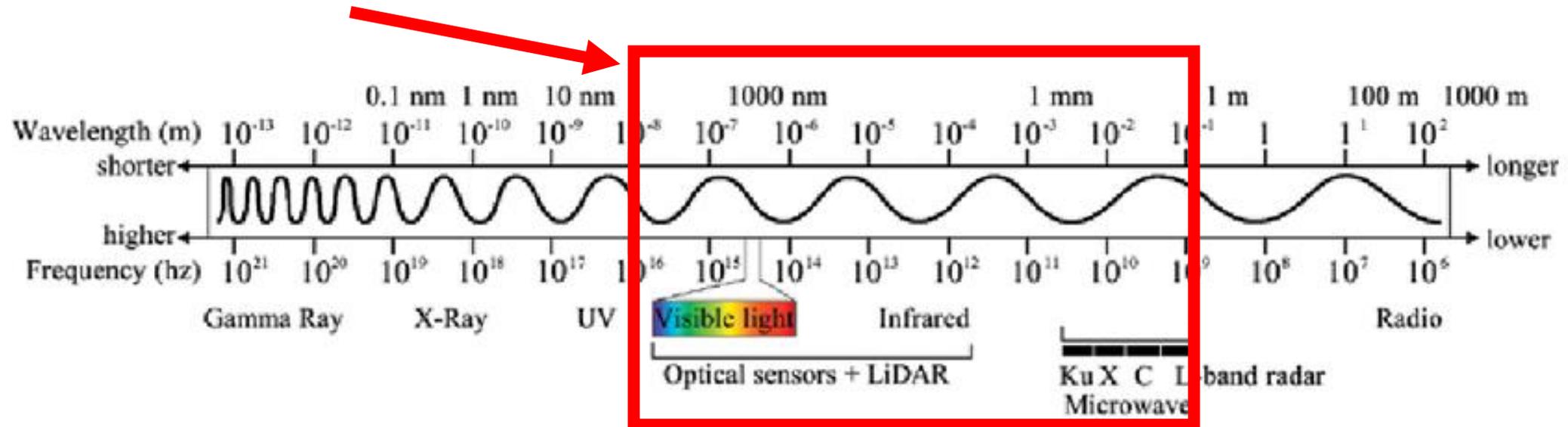


# Presentation outline

- Remote sensing data
- Street level data collection
- Mobile scanners and cameras
- Crowdsourcing data collection
- Web scraping



# Sensing technologies defined by Electromagnetic Spectrum



[https://www.researchgate.net/publication/274076283\\_Remote\\_sensing\\_of\\_snow\\_avalanches\\_Potential\\_and\\_limitation\\_for\\_operational\\_use/figures?lo=1](https://www.researchgate.net/publication/274076283_Remote_sensing_of_snow_avalanches_Potential_and_limitation_for_operational_use/figures?lo=1)

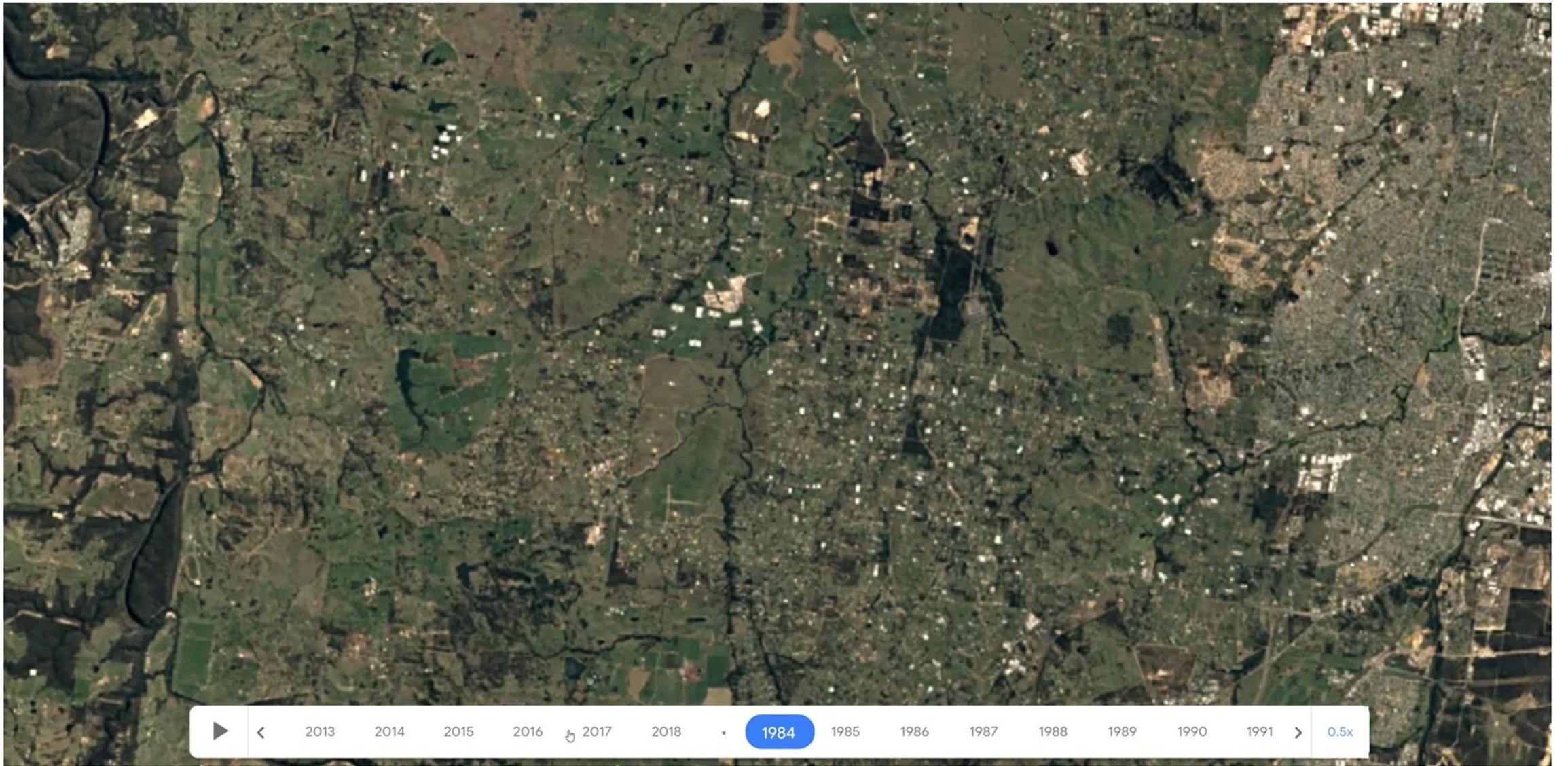


# Satellites

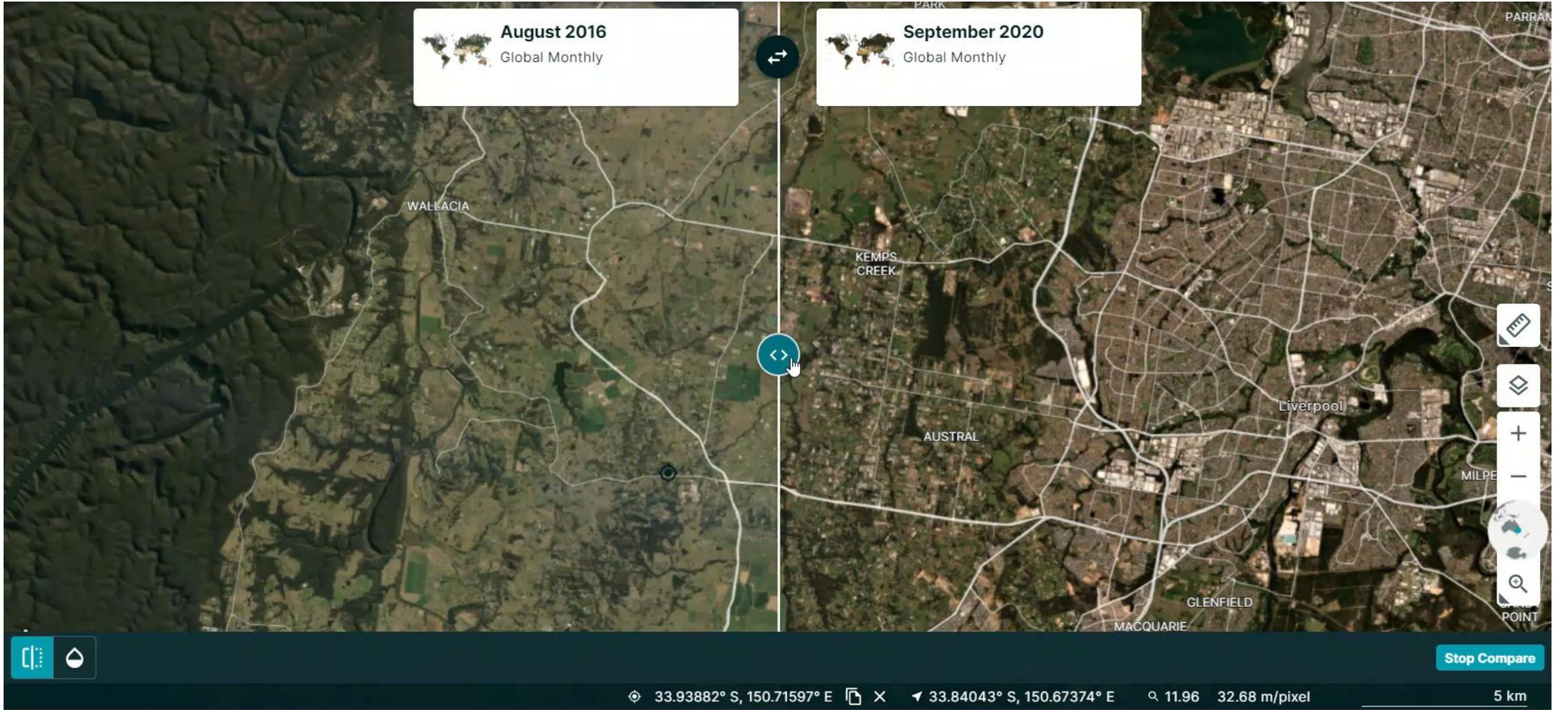
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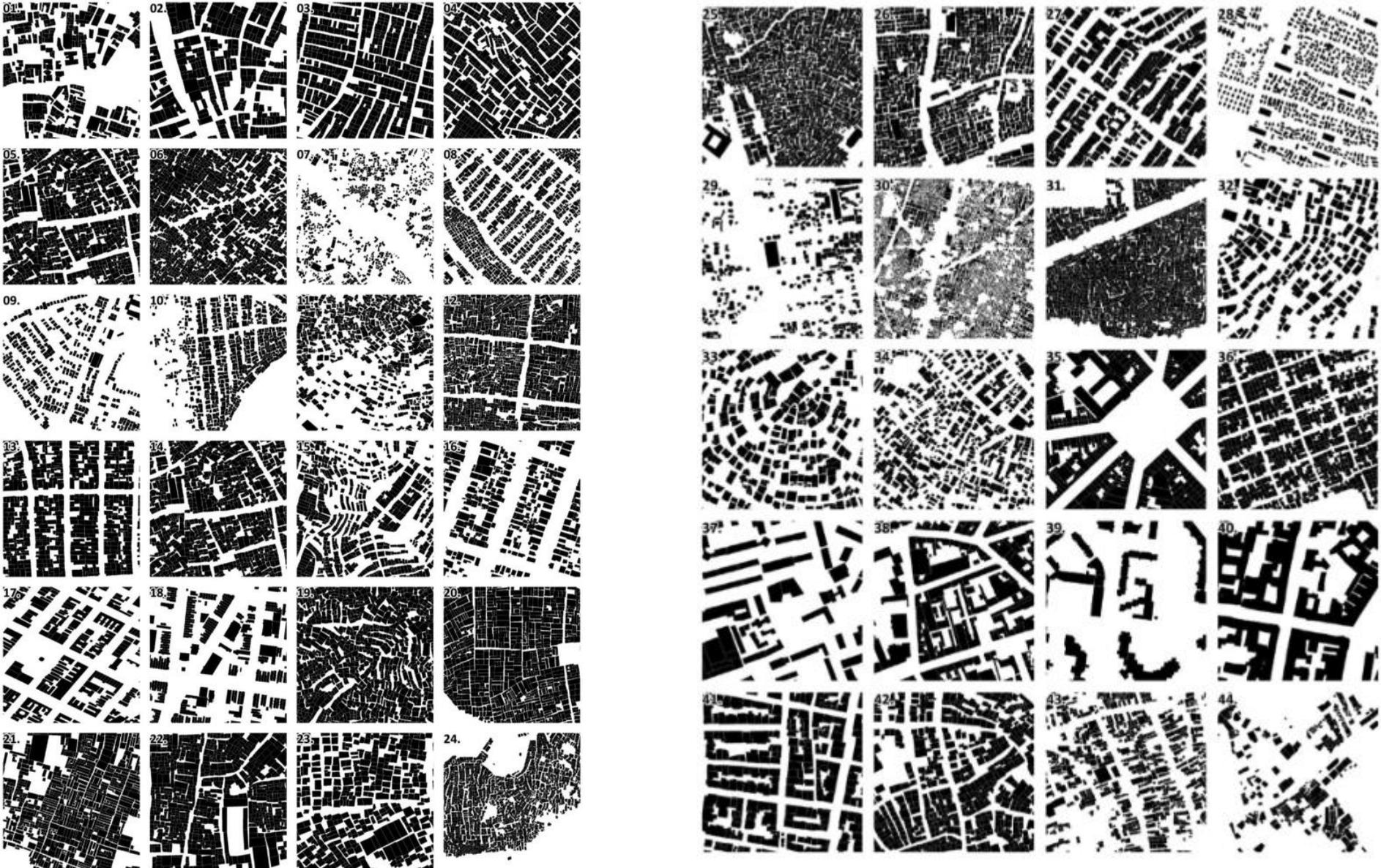




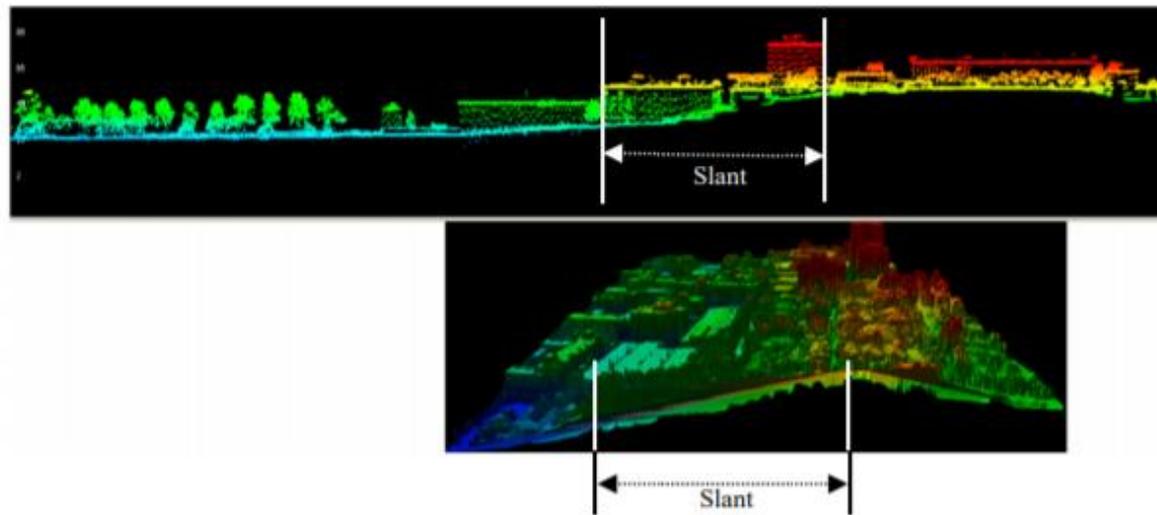
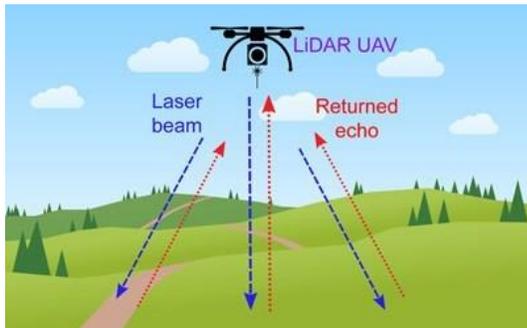
▶ < 2013 2014 2015 2016 2017 2018 • 1984 1985 1986 1987 1988 1989 1990 1991 > 0.5x



# Urban morphology using remote sensing



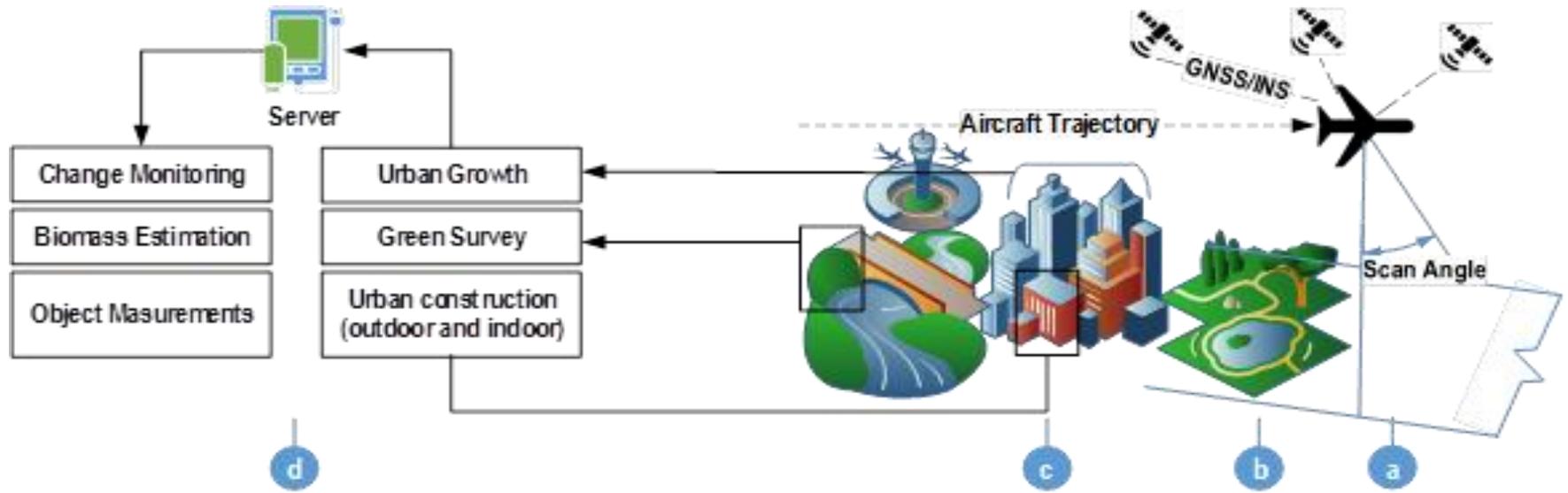
# Lidar



**Figure 3.** University of New South Wales (UNSW) airborne lidar data set and representation of slant area in a profile view and a 3D view.

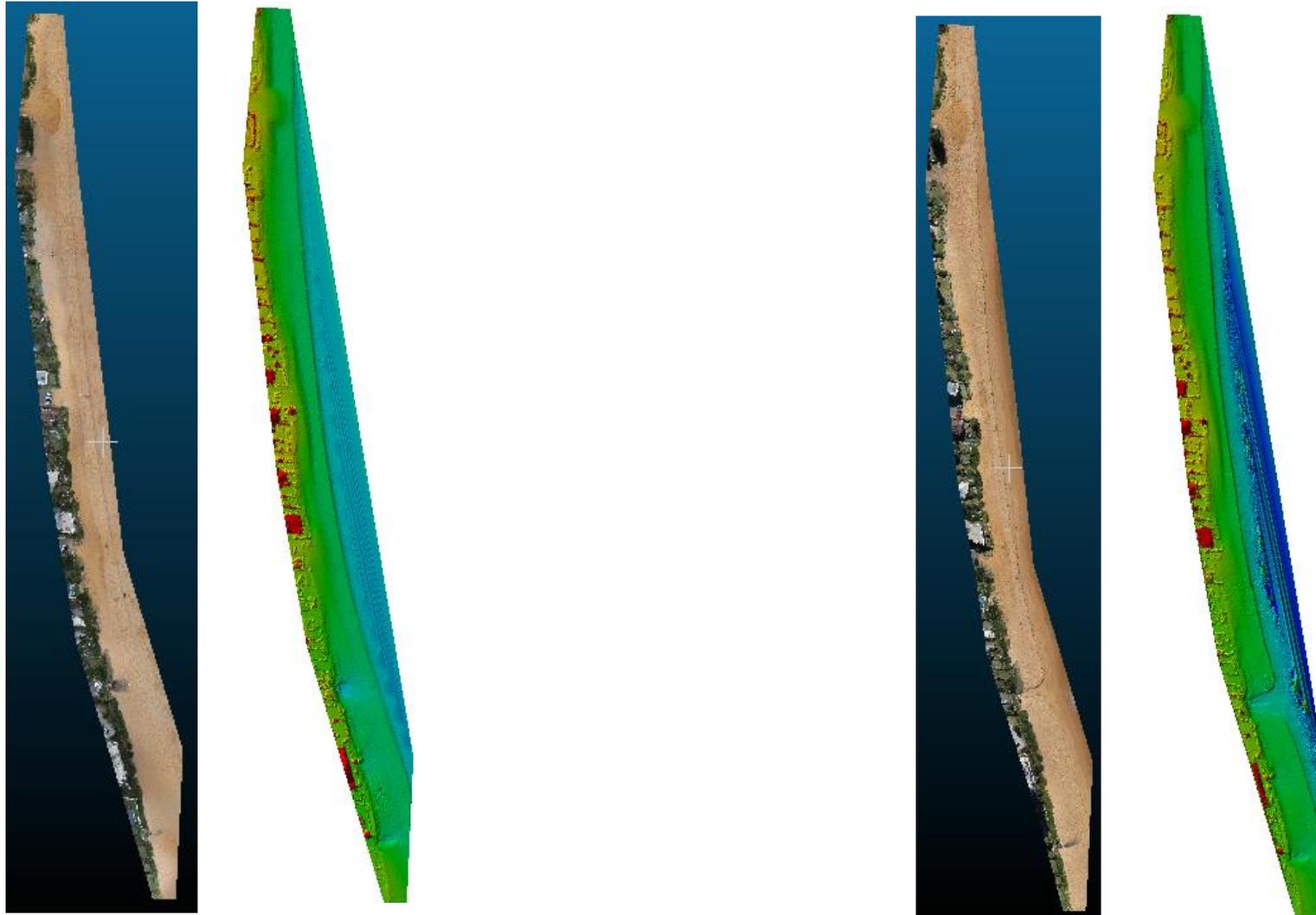


# Airborne lidar analysed for change measurements

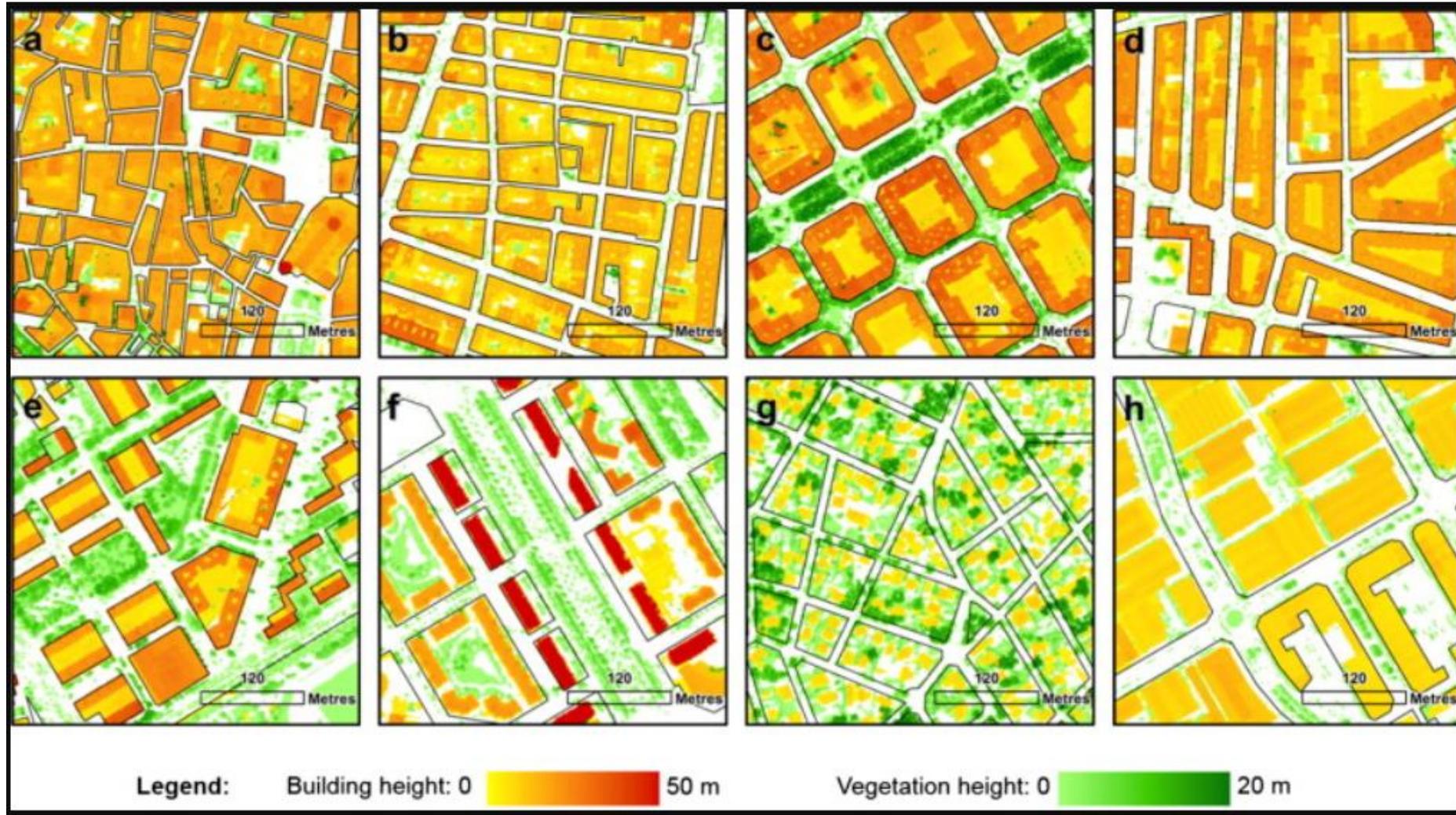


Ref. Shirowzhan et al. (2019)

Lidar data collected by drones: Before and after storm, Coastal area (Collaroy), where is the area of erosion?

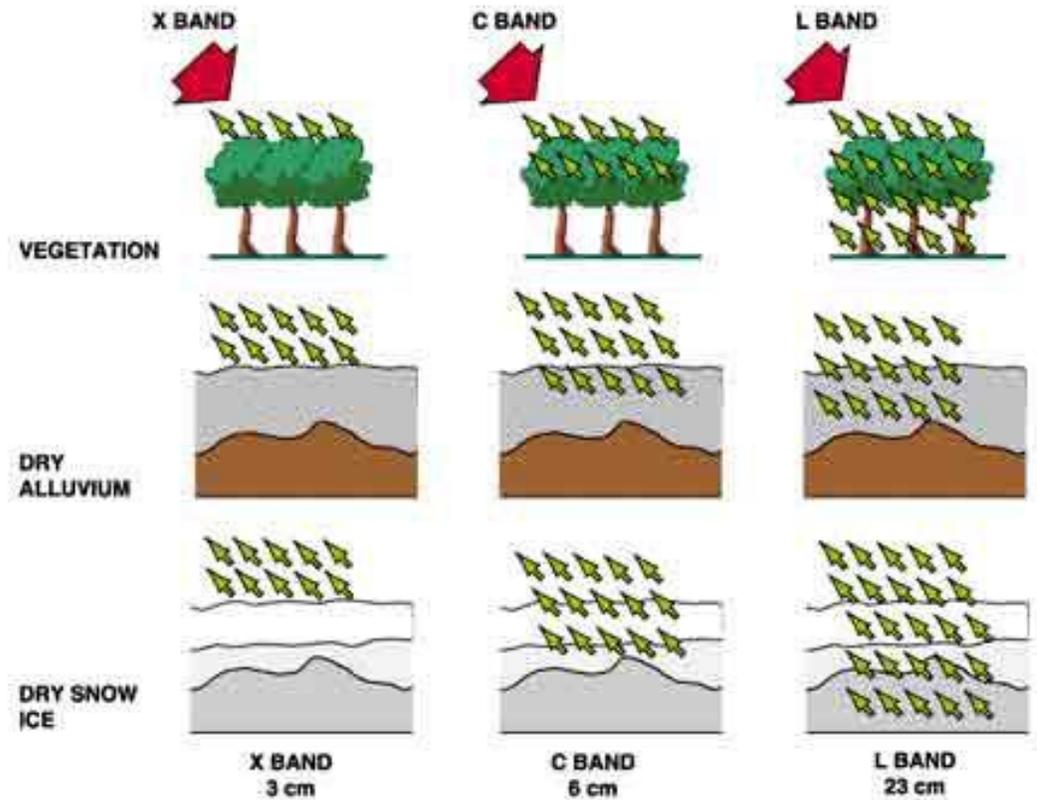


Lidar for characterizing urban morphology/typology, what is added to the previous literature?



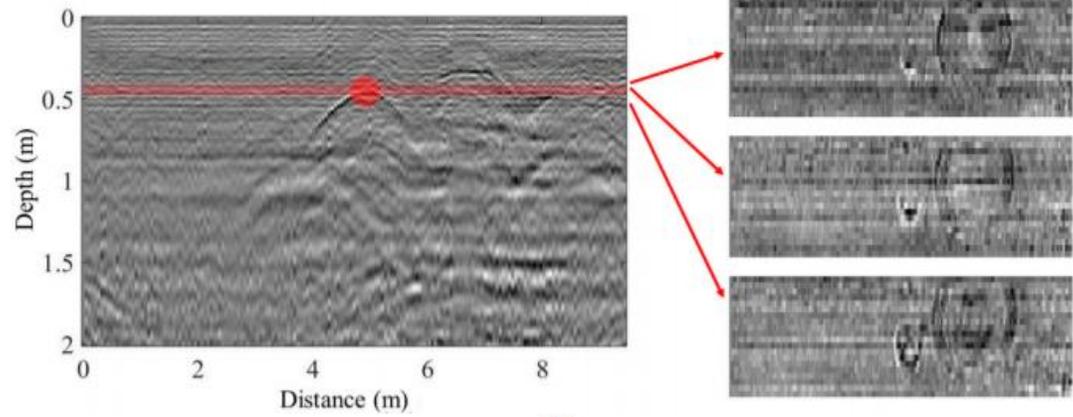
# Radar

Some radar bands can penetrate tree canopy and ground surface

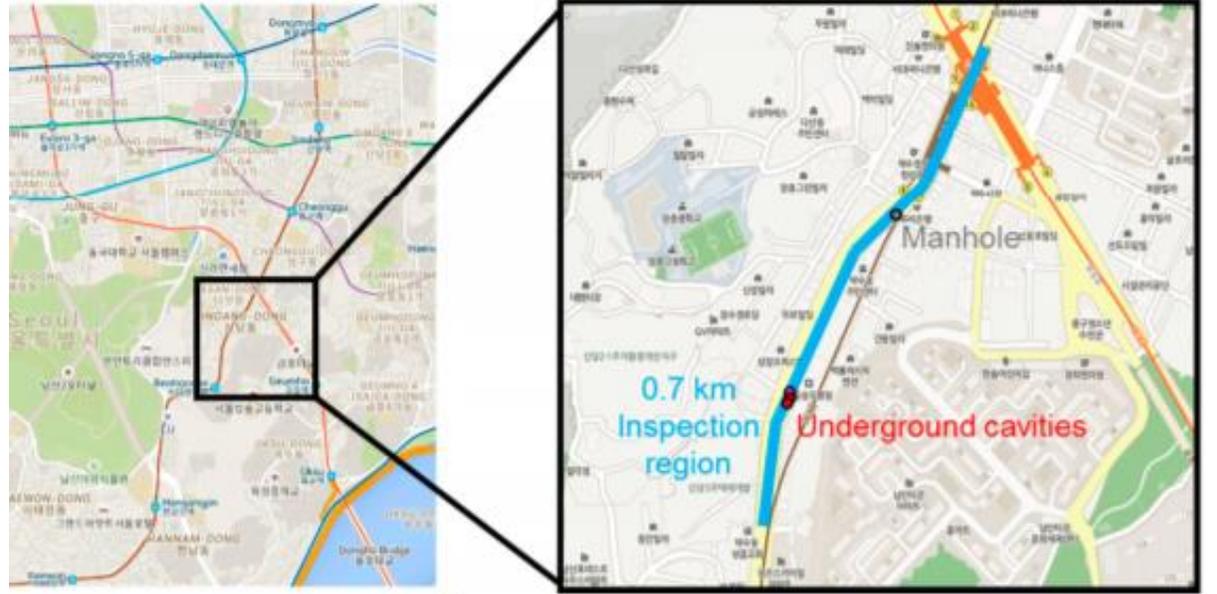
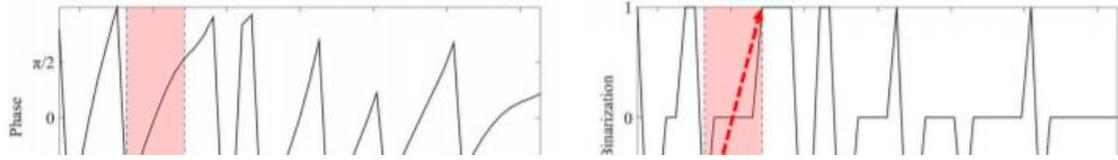


<https://earth.esa.int/eogateway/missions/ers/radar-courses/radar-course-2>





(b)



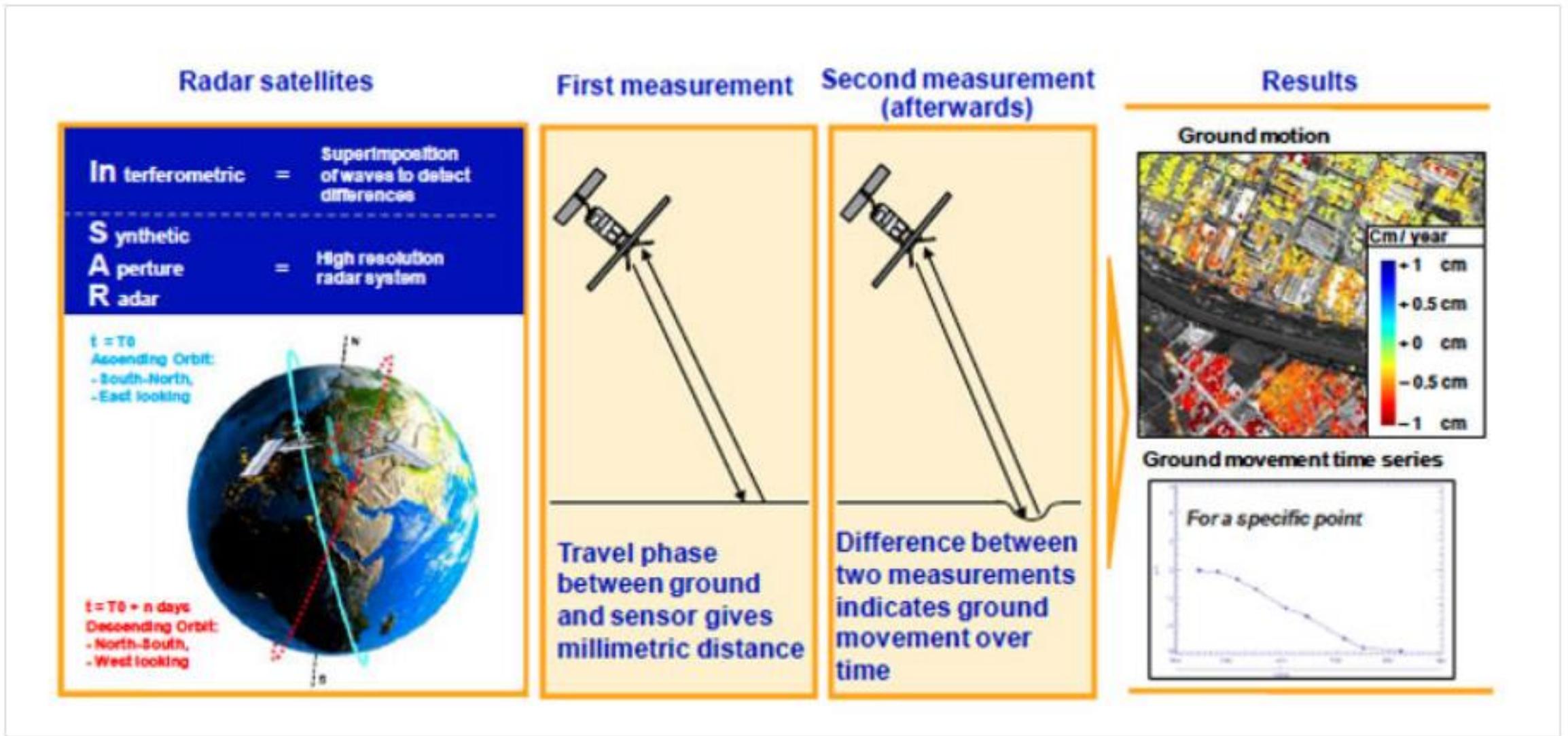
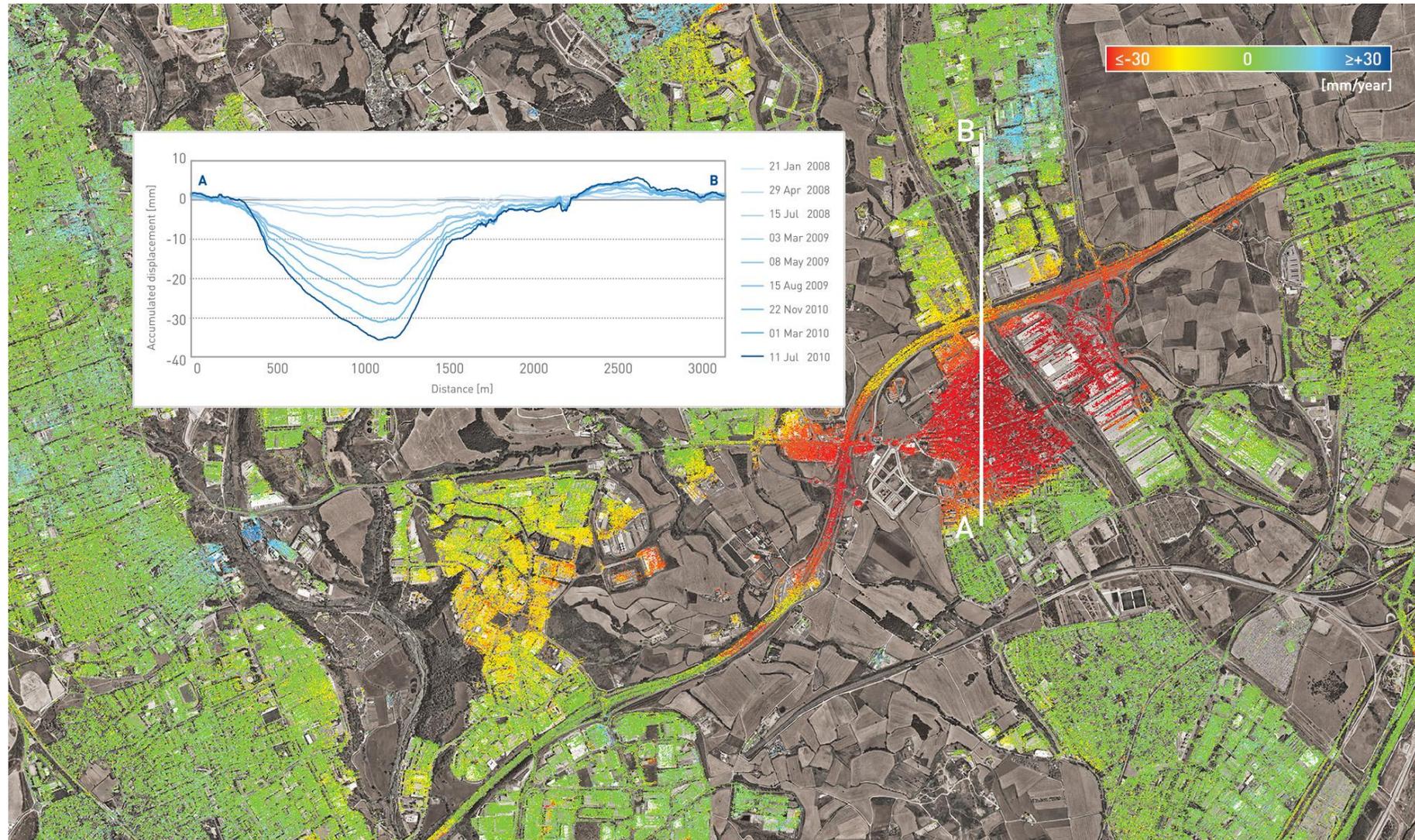
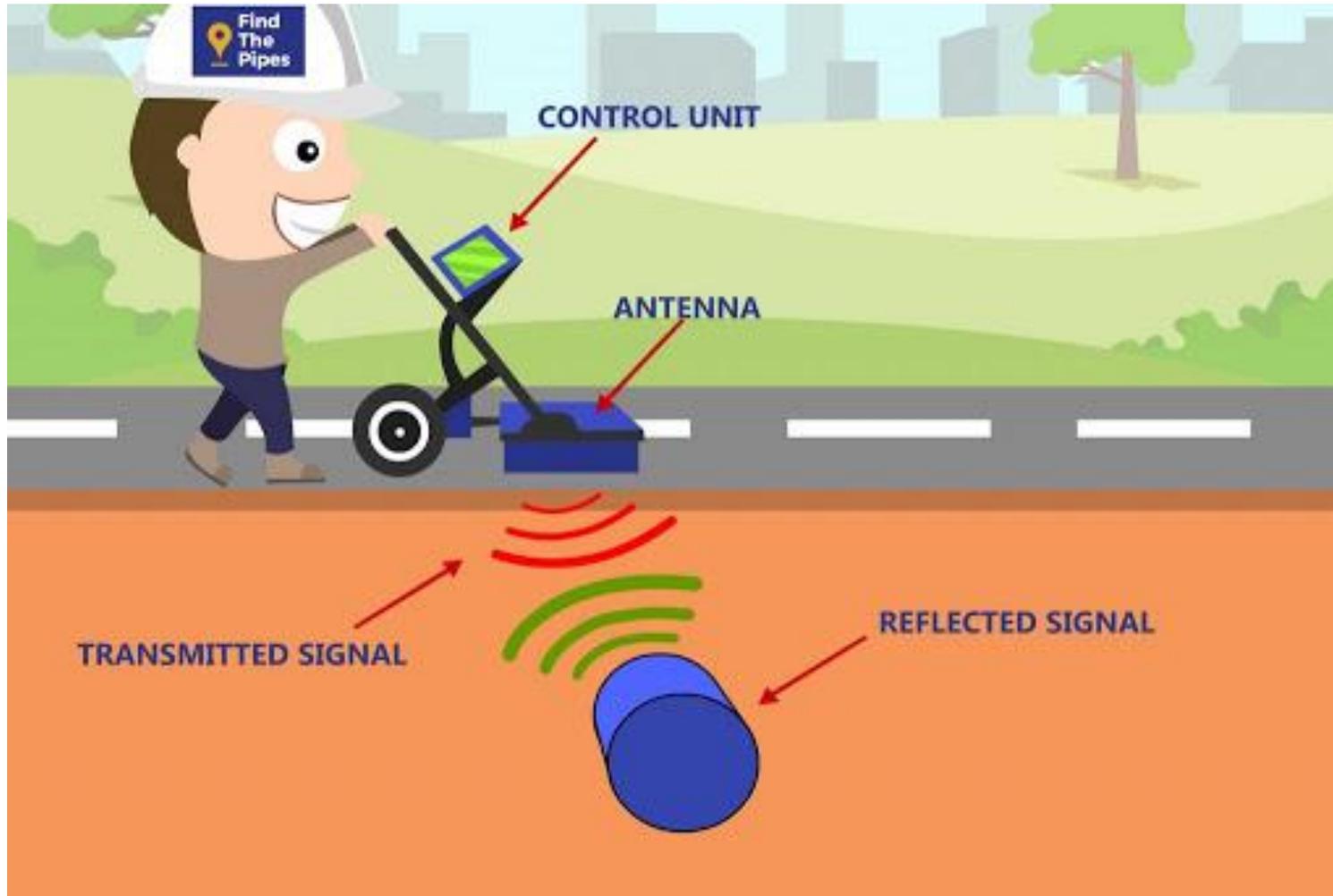


Fig 1. Principles of InSAR technology



Impact of water extraction on a highway. The ground motion map and cross section show the evolution and distribution of displacement over time. Satellite imagery: TerraSAR-X, Analysis period: 2008 – 2010, Background image: Cartographic and Geological Institute of Catalonia (ICGC).

<https://site.tre-altamira.com/industry/civil-engineering/>



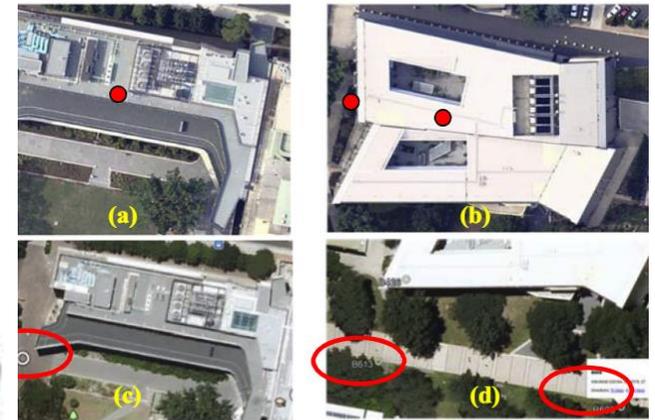
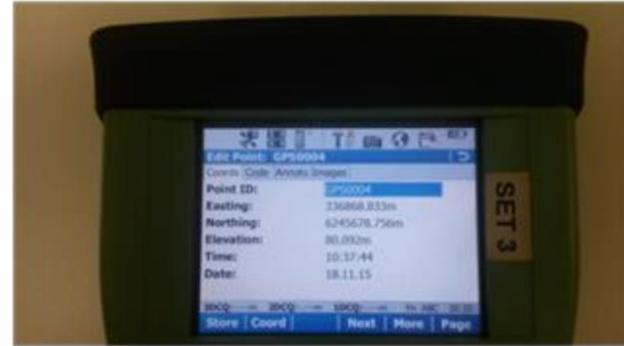
Examples of monitoring underground urban environment using radar

<http://www.findthepipes.com.au/guides/what-the-hell-is-ground-penetrating-radar/>



GROUND PENETRATING RADAR -UTILITY

# RTK GNSS



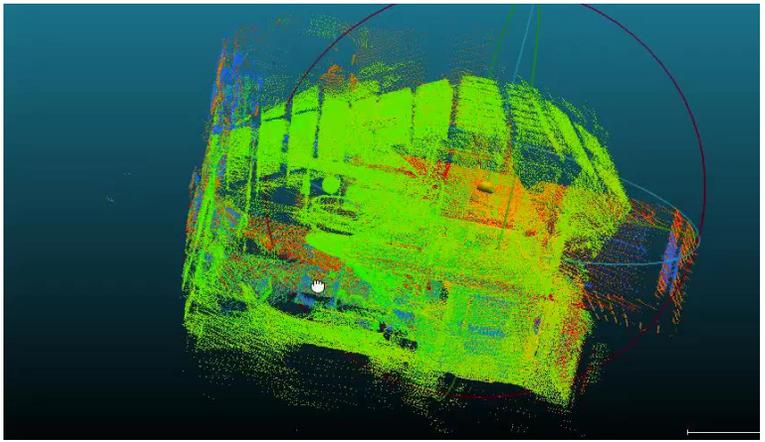
GNSS experimentations in the field work for validation of lidar analysis: (a) location of RTK in building C25 roof top for different heights; (c and d) survey ground marks.



# Measurement tools and updating BIM (As-built/Part-built)

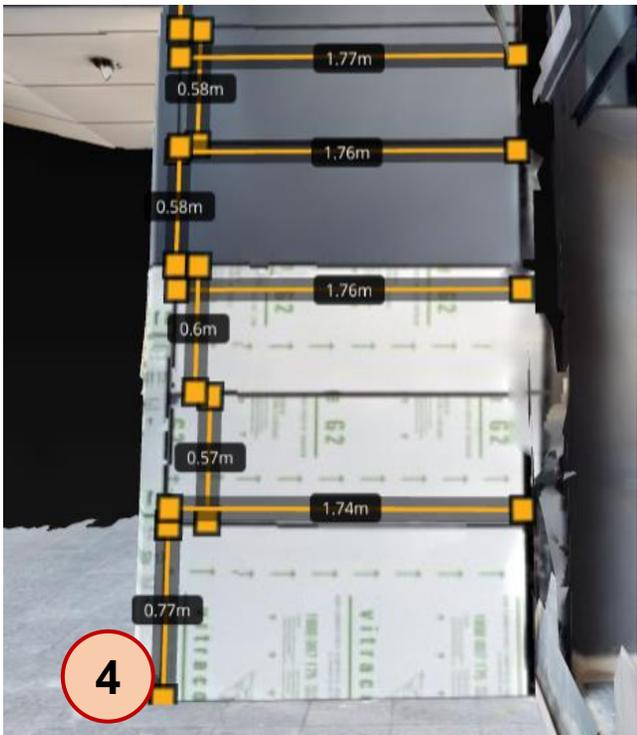


**3 ▲ Hand-held Mobile Scanner (HMS)**



**◀ Point clouds collected by HMS**

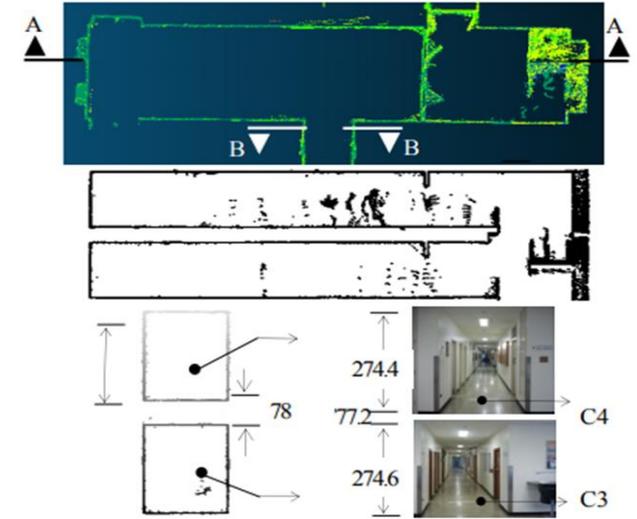
**Measurement ▶ by SPIKE Laser**



**4**

TLS

2



Scanner analysed for measurements ▲

◀ point cloud + photo

As-built

BIM updating

Terrestrial laser scanning (TLS)

Accuracy and efficiency





A close-up photograph of the back of a blue iPhone, showing the camera system. The camera system includes three large lenses arranged in a triangle, a smaller lens to the right, and a circular sensor below. The phone is resting on a wooden surface. The text "Have you heard about lidar data collection using iPhone?" is overlaid in white on the image.

Have you heard about lidar data collection using iPhone?

Other data  
collection  
methods at  
building or  
street level



Drones

Mobile mapping using photo or video cameras

# CCTVs live cameras

straya.io/new-south-wales/sydney-west/

Straya? Regions ▾ Providers ▾ My Account

# Crowdsourcing data collection apps

# Other methods for data collection in city scale

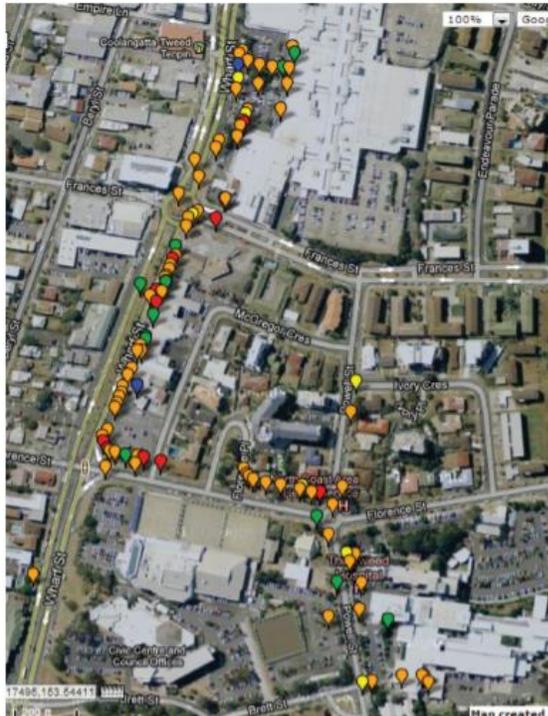


Fig. 4. Route of Tweed Heads Walk and Talk along with Results Visualisation

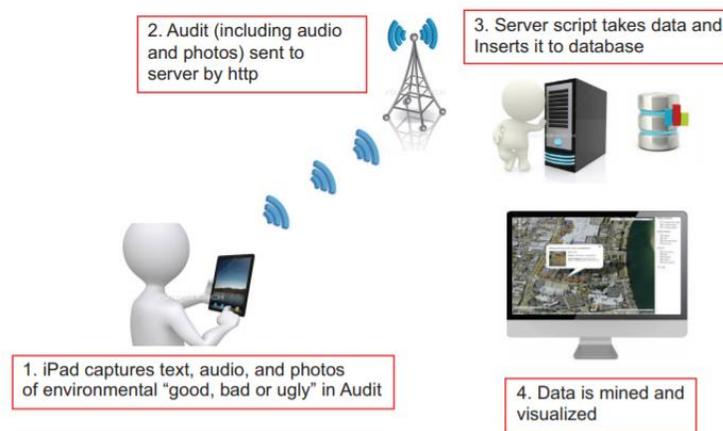


Fig. 1. Overall system architecture

## Mobile Crowdsourcing Older People's Opinions to Enhance Liveability in Regional City Centres

Jason Thorne <sup>#1</sup>, Aolly Li <sup>#2</sup>, Vijay Sivaraman <sup>#3</sup>, Catherine Bridge <sup>\*4</sup>

<sup>#</sup> Electrical Engineering and Telecommunications

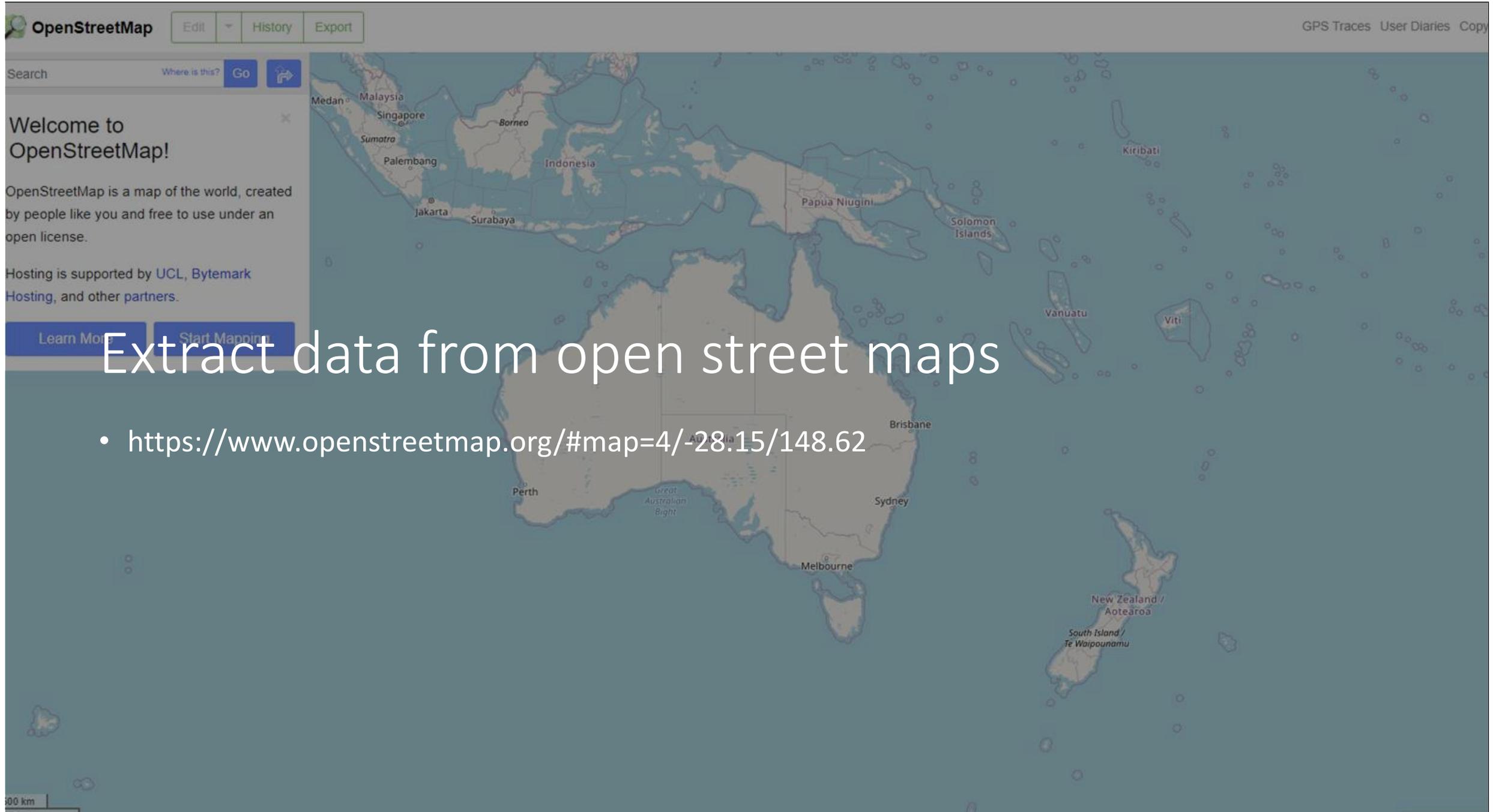
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- <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6827675>



# Extract data from open street maps

- <https://www.openstreetmap.org/#map=4/-28.15/148.62>

QuickOSM

Quick query Successful query, 2 layer(s) has been loaded.

Query

OSM File

Parameters

About

Help with key/value Reset

Key highway

Value motorway

In Sydney

All OSM objects with the key 'highway'=motorway in Sydney are going to be downloaded.

Advanced

Show query Run query

Successful query, 2 layer(s) has been loaded.

100%

Browser

Favorites

Spatial Bookmarks

Home

CA

D:\

F:\

H:\

I:\

J:\

P\

GeoPackage

SpatiaLite

PostGIS

MSSQL

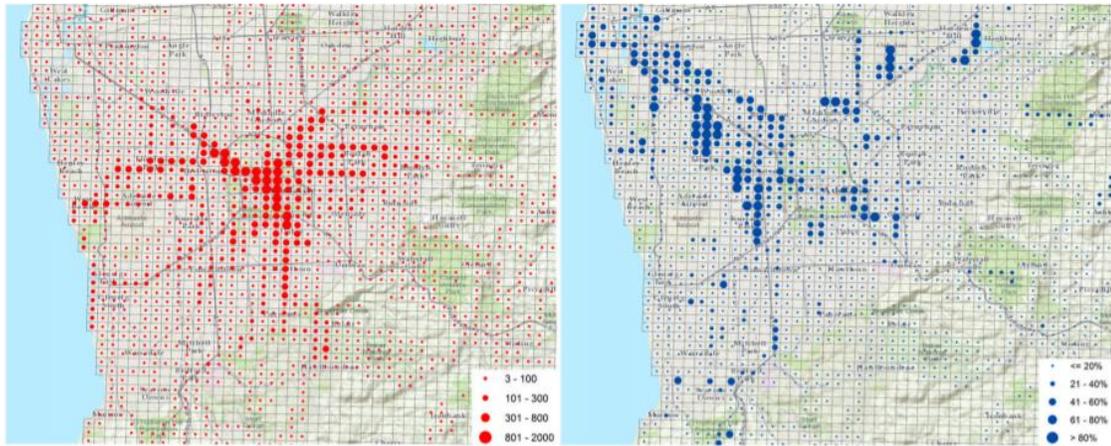
Oracle

Layers

highway\_motorway\_Sydney

highway\_motorway\_Sydney

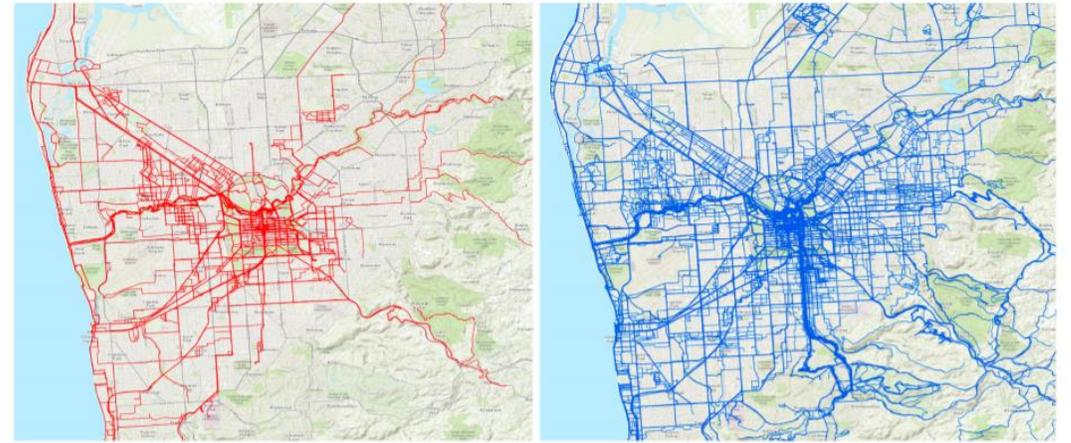
OpenStreetMap



(a) Total routes

(b) % of female riders

Figure 6. Anonymised RiderLog-Public data for Greater Adelaide, 2010–2014.



(a) Female rides

(b) Male rides

Figure 7. Anonymised RiderLog-Licensed data for Greater Adelaide, 2010–2014.

Article

# Building a National-Longitudinal Geospatial Bicycling Data Collection from Crowdsourcing

Simone Z. Leao<sup>1,\*</sup>, Scott N. Lieske<sup>2</sup>, Lindsey Conrow<sup>3</sup>, Jonathan Doig<sup>1</sup>, Vandana Mann<sup>1</sup> and Chris J. Pettit<sup>1</sup>

<sup>1</sup> City Futures Research Centre, University of New South Wales, Sydney NSW 2052, Australia; j.doig@unsw.edu.au (J.D.); v.mann@unsw.edu.au (V.M.); c.pettit@unsw.edu.au (C.J.P.)

<sup>2</sup> School of Earth and Environmental Sciences, University of Queensland, Brisbane QLD 4072, Australia; scott.lieske@uq.edu.au

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Received: 17 May 2017; Accepted: 26 June 2017; Published: 28 June 2017

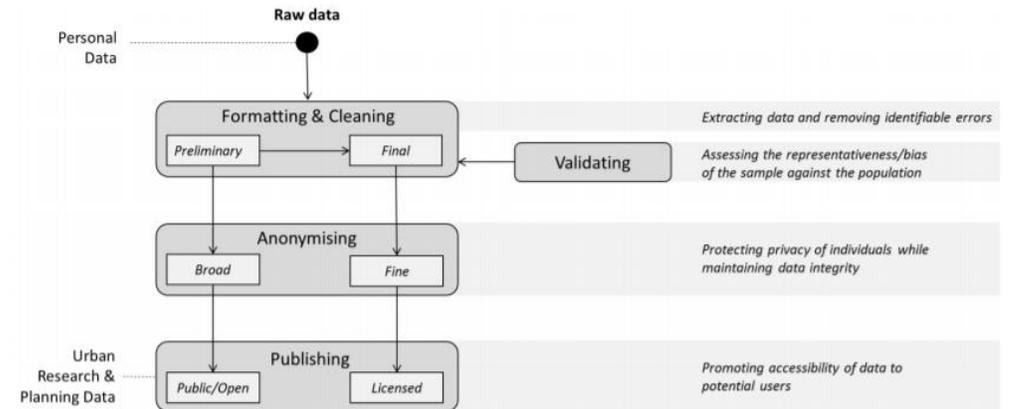


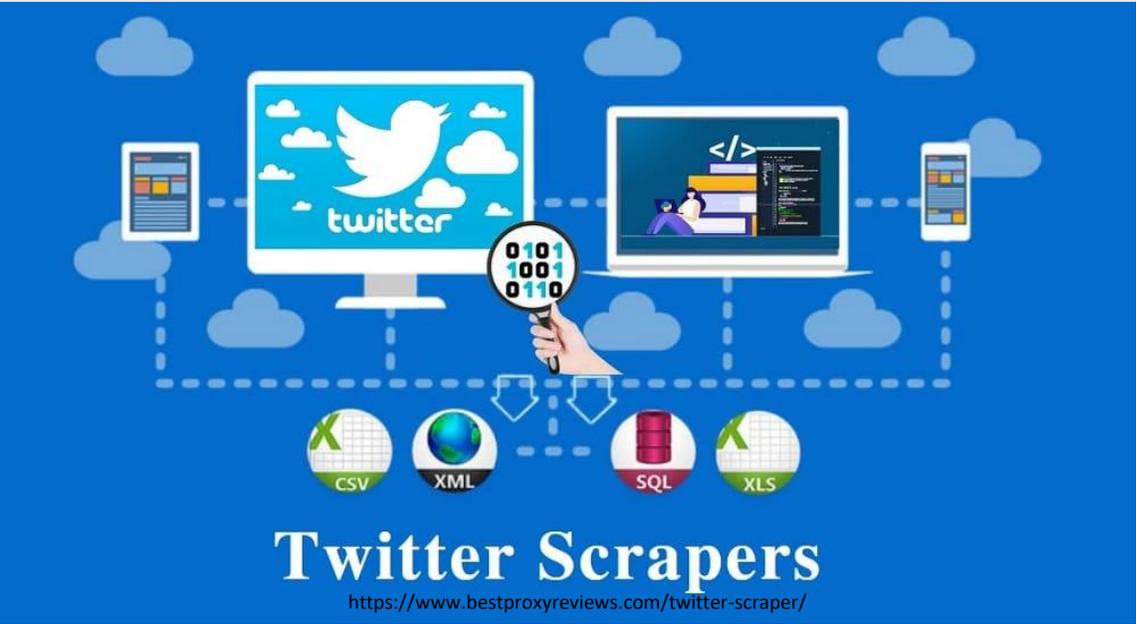
Figure 1. Crowdsourced data processing sequence to transform data from personal to urban research and planning purposes.

# Web scraping



<https://www.edureka.co/blog/web-scraping-with-python/>

# Twitter Scraping to collect location data



**Twitter Scrapers**  
<https://www.bestproxyreviews.com/twitter-scraper/>



Figure 2 - The Flow Chart of the Key Steps for Data Collection

A	B	C	D	E	F	G	H	I	J	K
source	target	user_id	name	user_created_at	tweet_text	tweet_created_at	user_location	longitude	latitude	language
1	macdonald_julia	ScottMorrisMP	Julia Macdonald	2021-12-09 00:14:30	AsocietyfromDamageControl@scottmorrismpExtremely	2021-04-01 00:17:24	Adelaide, South Australia	138.5999117	-34.9281805	en
2	reducovad_rikke	PeiterOrffoZ	Mike Neutbound	2025-05-31 00:45:06	@PeiterOrffoZ And is it a murder weapon	2021-04-01 10:28:48	Adelaide, South Australia	138.5999117	-34.9281805	en
3	longin2	VititChogger	Longin Otho	2020-06-20 10:25:04	@VititChogger hi! I am an idiot	2021-04-01 12:34:12	Adelaide, South Australia	138.5999117	-34.9281805	en
4	totalywayy	twisting	NetSociety	2014-06-12-21 05:45:18	@twisting @WageNews Worst! It be delicious if I aming an	2021-04-01 21:26:24	Adelaide	138.5999117	-34.9281805	en
5	AsastanidMarci	ScottMorrisMP	Anastasia (Tami) M.	2013-05-27 22:14:00	@hildickie @Beron_Botche @ScottMorrisMP is a #Pheze	2021-04-02 03:39:57	Adelaide Australia	138.5999117	-34.9281805	en

Figure 3 – Partially Collected Data

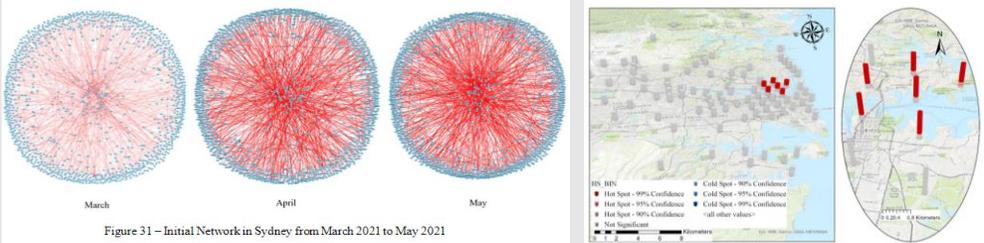


Figure 31 – Initial Network in Sydney from March 2021 to May 2021

Shirowzhan and Pettit, Routledge book at hand

# Conclusion(s)

Remote sensing technologies help to collect valuable information to be used for finding hidden patterns/trends on earth and over time.

Mobile and terrestrial laser scanning/photogrammetry technologies help to map cities in street/building level.

Crowdsourcing apps and web scraping are emerging methods of data collection at city scale.





# Thank you!

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