Unlocking Environmental Insights: LIDAR's Capacity in Monitoring Ecological and Urban Dynamics

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Abstract

LIDAR technology helps us measure distances and create detailed 3D data. With cities growing and changing, it's important to monitor urban redevelopment. In this study, we used LIDAR data for two key projects:

1.**Wolli Creek, Australia** – to track changes in urban areas and tree canopies over 7 years.
2.**Blenheim, New Zealand** – to find and analyze elevation changes.

The results show that LIDAR is a powerful tool for monitoring environmental changes caused by human activities and nature.

Introduction

While satellites like **Landsat** and **Sentinel** provide valuable data for large-scale environmental monitoring, their **low spatial resolution** limits their ability to capture detailed urban and tree canopy changes. In this work, we utilize LIDAR technology, which offers precise, high-resolution data, to detect minimal yet significant changes in urban environments and tree canopies. By leveraging LIDAR, we aim to address the finer aspects of environmental challenges that are often missed by conventional satellite imagery.
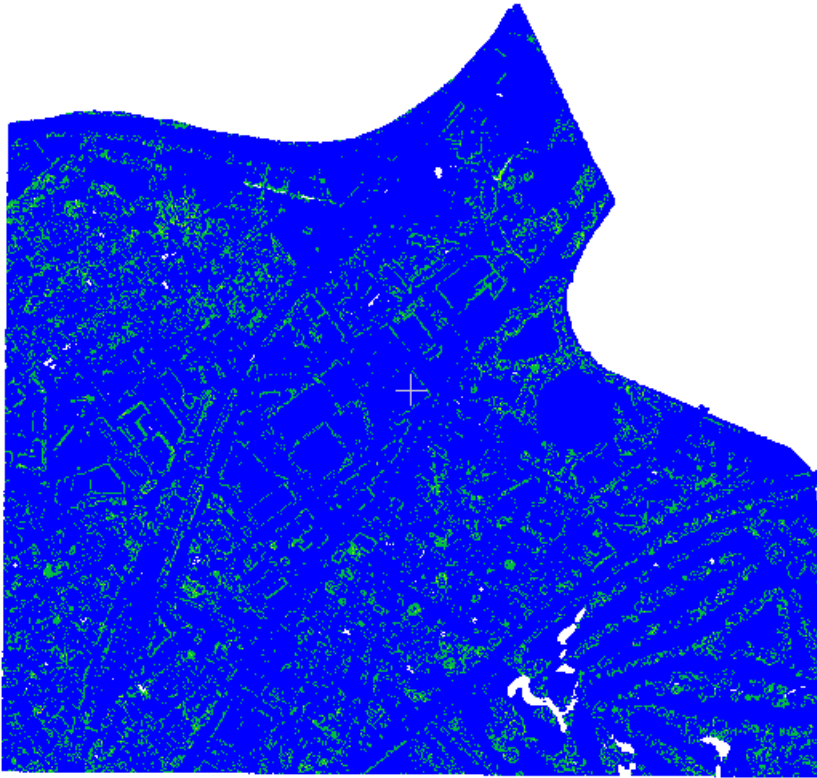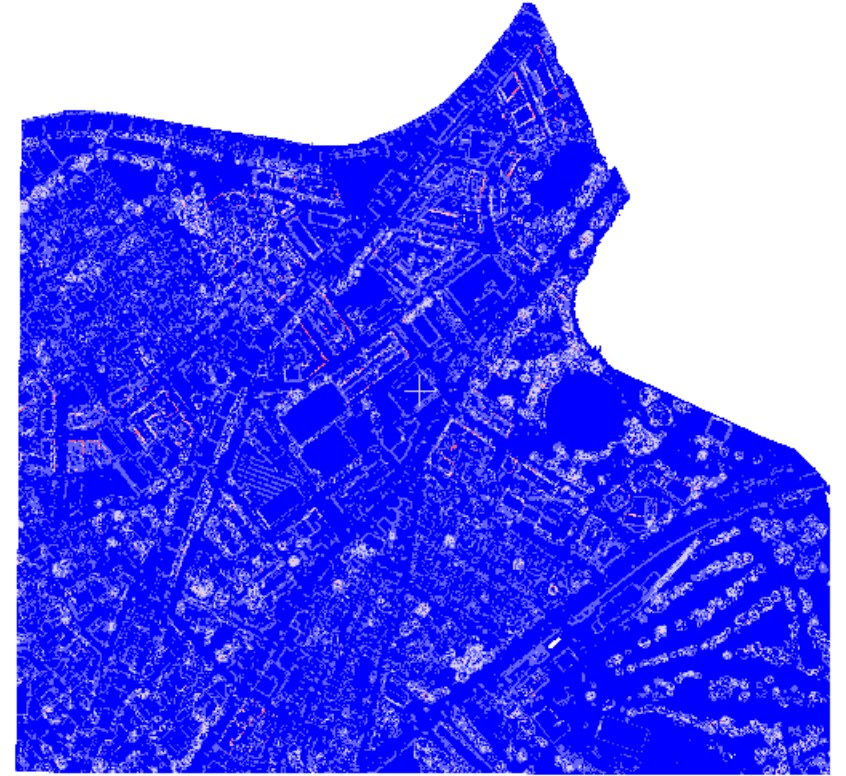
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Areas of Interest

Wolli Creek, Australia

Blenheim, New Zealand

Wolli Creek Australia 2013

Wolli Creek Australia 2020

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Figure 1 and 2
Point Cloud of Wolli Creek Australia 2013 & 2020
Source: Open Topography

Methodology

Reference Dataset

Compare Dataset

Stacking

Cloud to Cloud Distance Computation

Change Detection

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Methodology Flowchart
Cloud Distance Computation
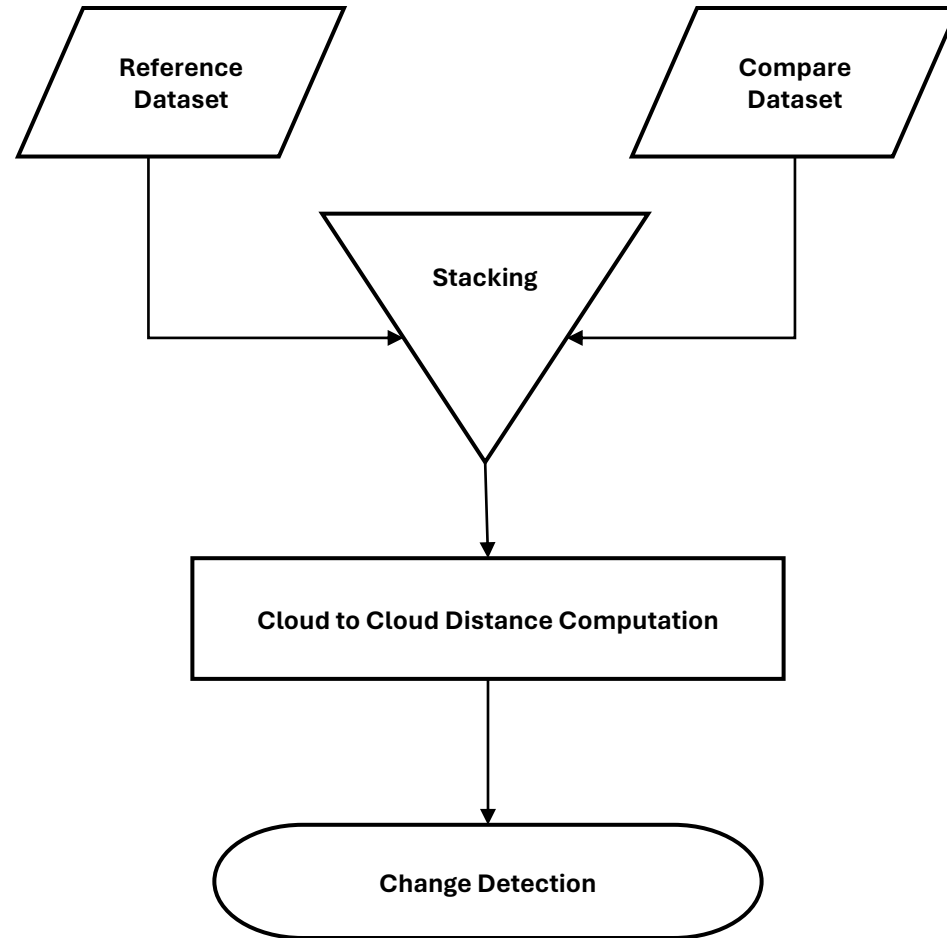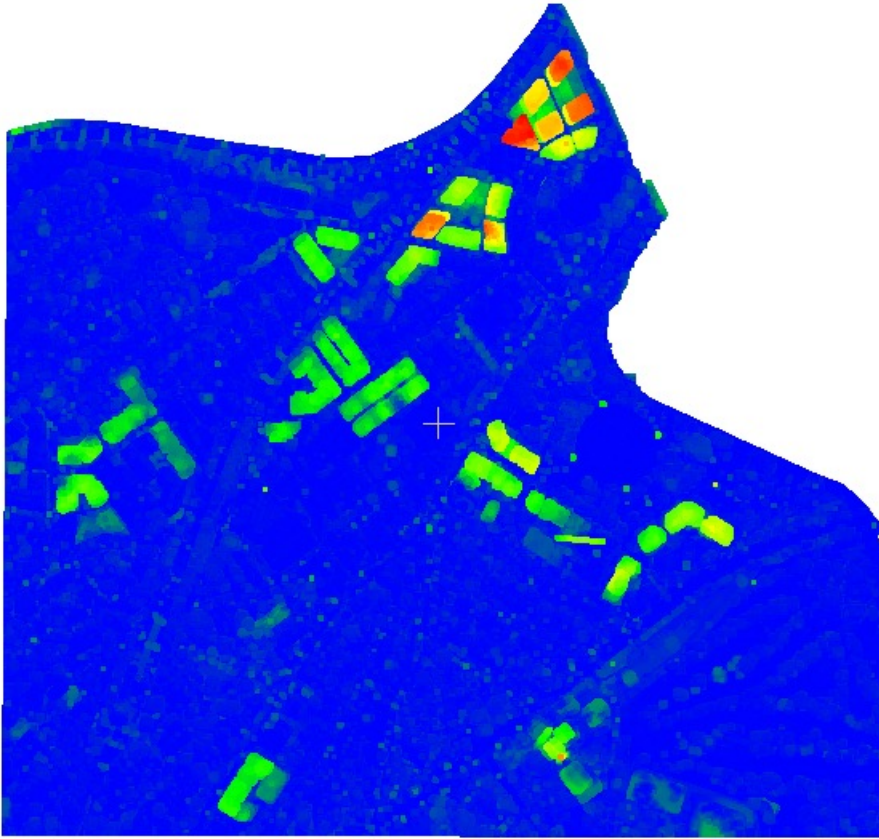
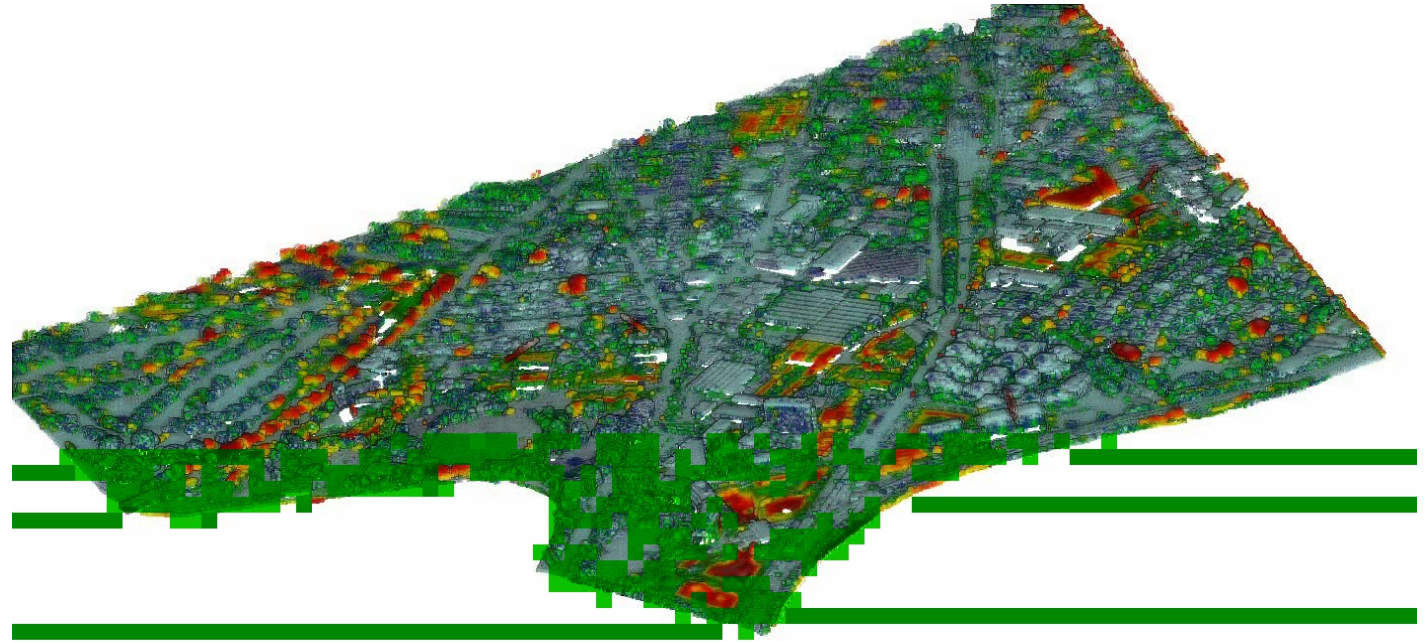# Results

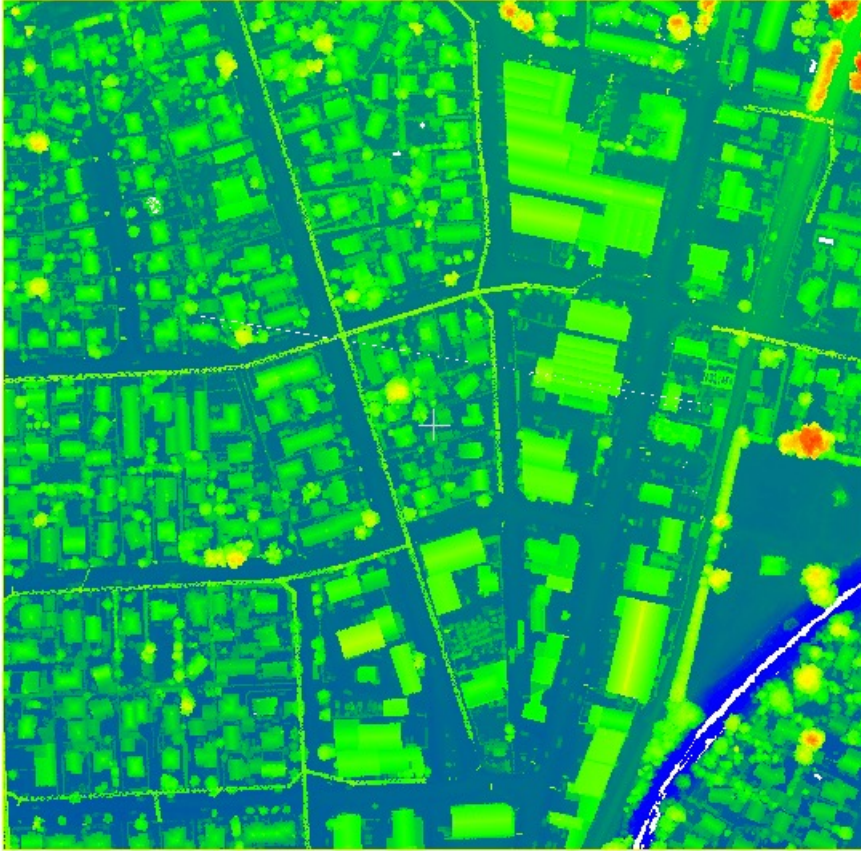

Change from 2013 to 2020
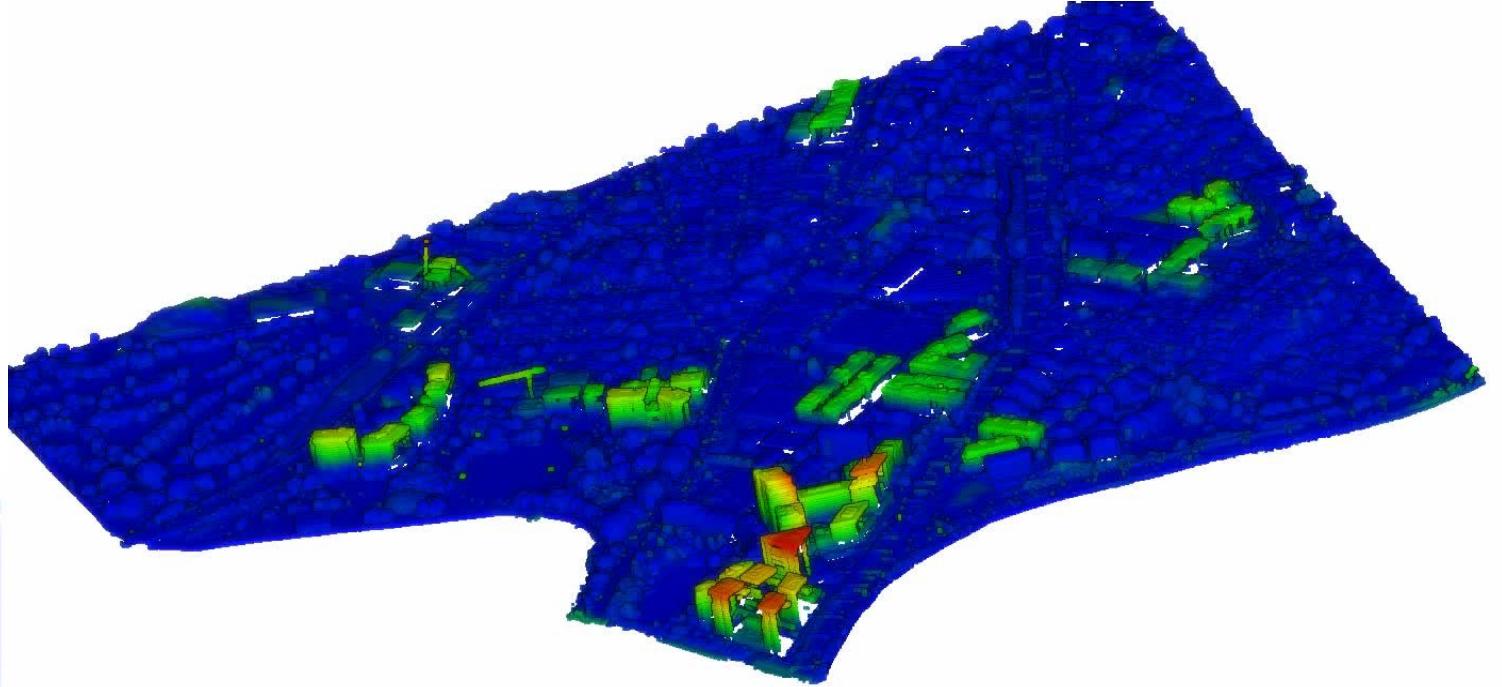
Urban Change Detected

Results

Canopy Change from 2013 to 2020

Deforestation

Height Profile Analysis
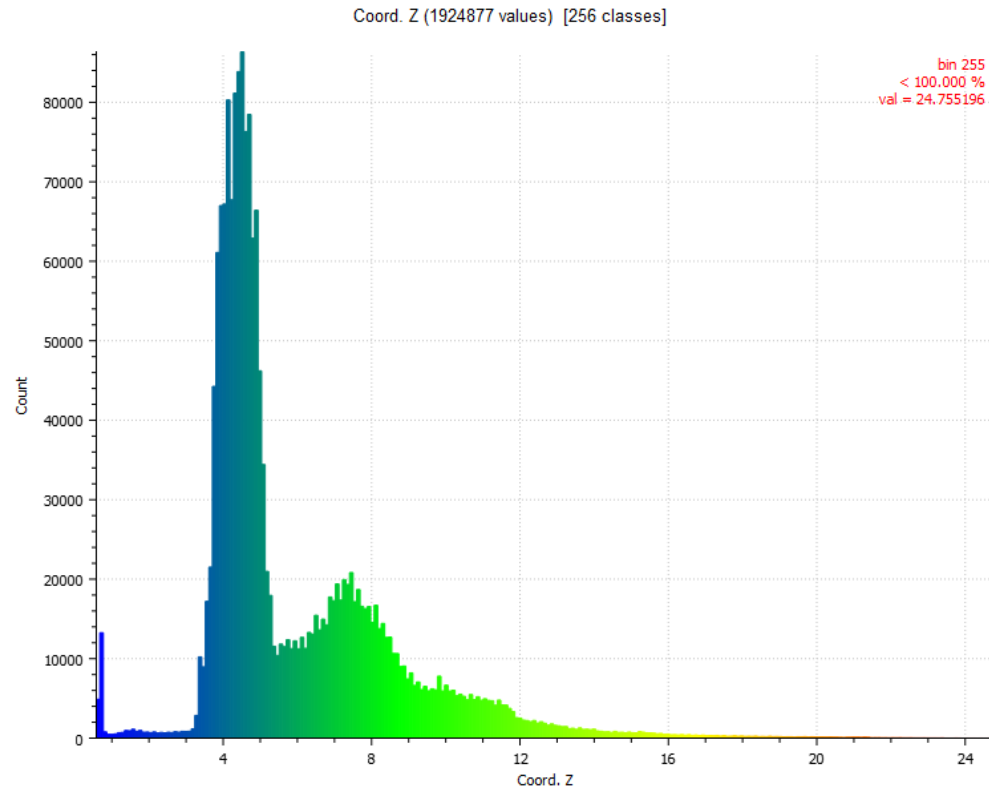

Blenheim 2014

Blenheim 2018
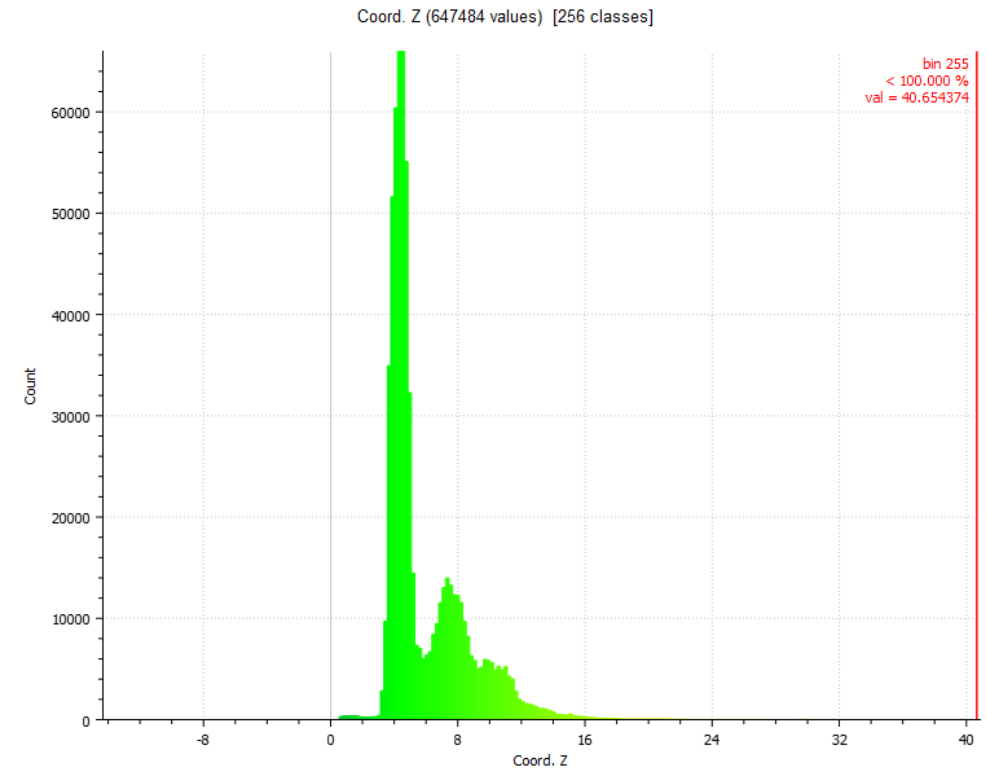
Source: Open Topography

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Point Cloud Scalar Field - Z

Coord. Z (1924877 values) [256 classes]

bin 255
< 100.000 %
val = 24.755196

Blenheim 2014

Coord. Z (647484 values) [256 classes]

bin 255
< 100.000 %
val = 40.654374

Blenheim 2018

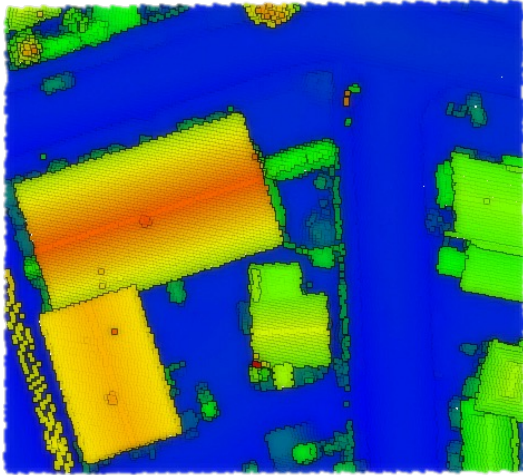GEOMUNDUS
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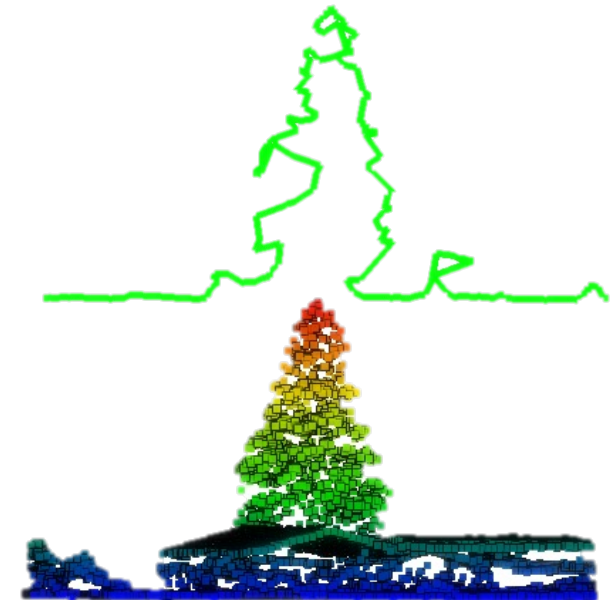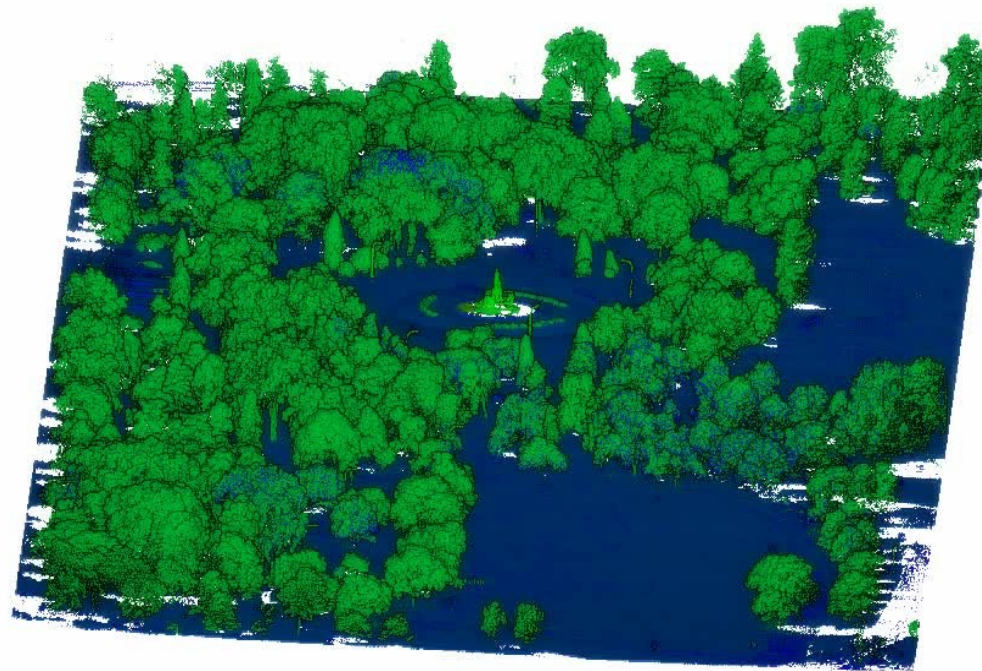2024

Result
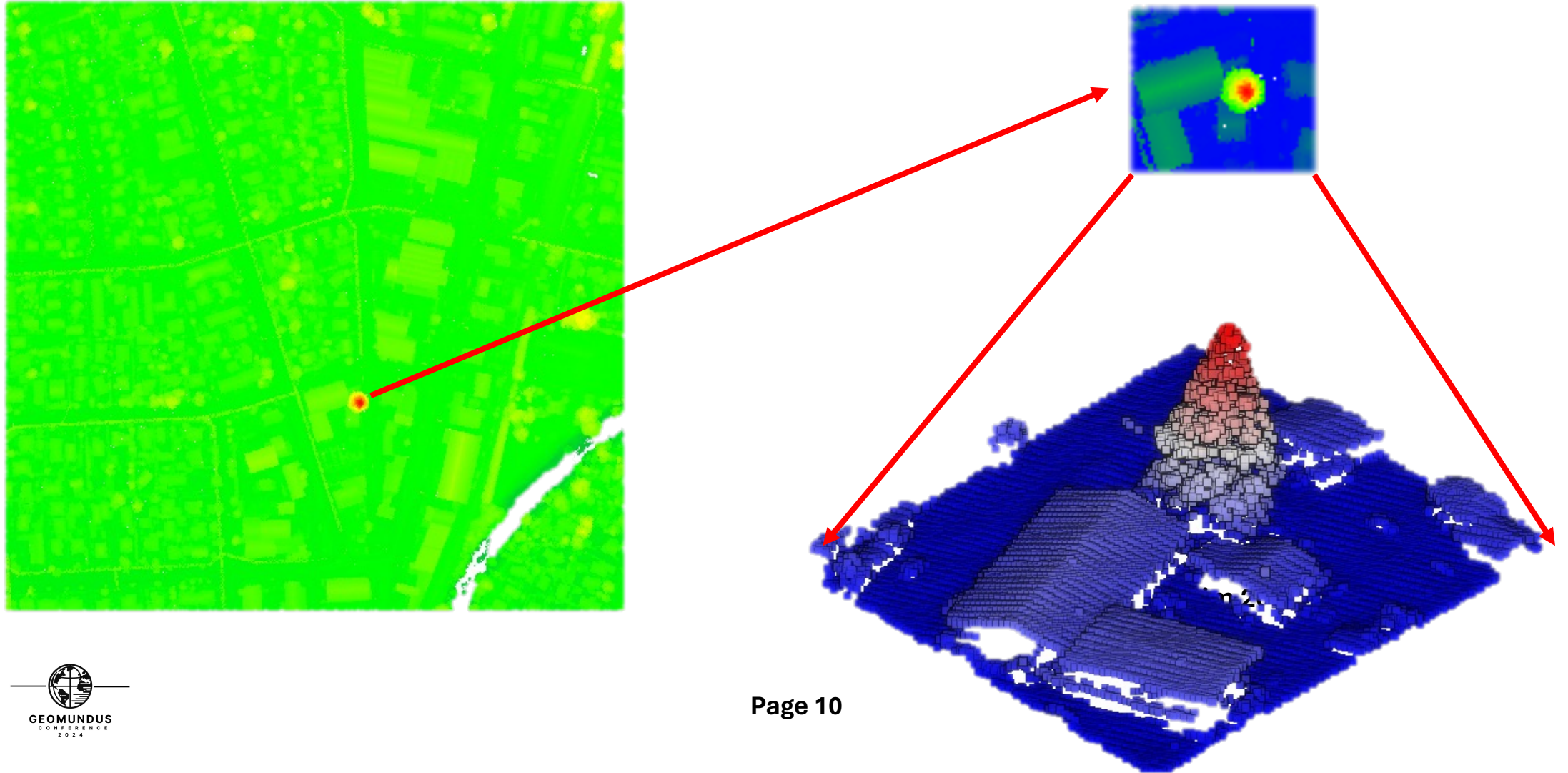
Profile Section
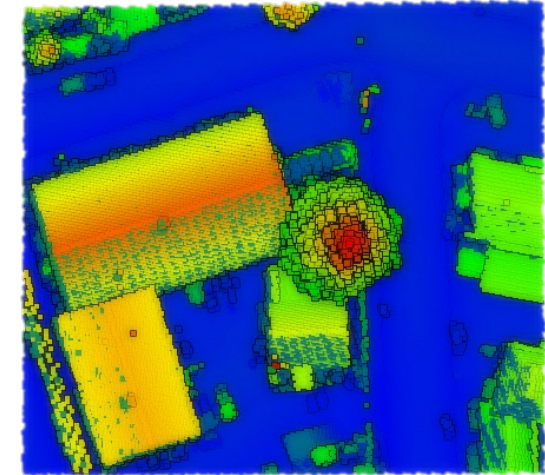
Blenheim 2014

Blenheim 2018

Classification

Conclusion and Future Directions

Through **LIDAR data analysis**, we can generate highly accurate reference models that help identify and rectify errors in classification processes. Its precision in **height profiling** allows us to compare these results with post-event analyses from other datasets, such as **SAR data**. By integrating multiple datasets, LiDAR stands out as a crucial tool for improving accuracy and reliability in environmental monitoring, providing a solid foundation for cross-validation and more comprehensive analyses.

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Thank You

Questions

Let's Connect !!!

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