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CNEP Centre des Nouvelles Etudes sur le Pacifique

Perspective



## Using UAV and very high resolution photogrammetry to assess shoreline evolution. Example in Ouvea, Loyalty Islands, New Caledonia.


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- Beach profiles are cross-shore graphical descriptions of elevation changes along an axis perpendicular to the shoreline (in this example, data was collected with a frame).
- DEM are precise elevation contour maps showing variation in elevation on the ground. They are interpolated from data (in this example, data was measured with a GNSS).
- DSM are precise elevation contour maps showing variation in elevation of all objects (buildings, vegetation).

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1954  
1976  
1982  
2002  
2012

The top-left image is a map showing the coastline of Ouvea, NC, with colored lines representing the shoreline at different years: 1954 (red), 1976 (green), 1982 (yellow), 2002 (orange), and 2012 (dark red). The map shows a significant retreat of the shoreline over time. The top-right image shows a person standing on a sandy beach, holding a surveying instrument on a tripod. The bottom-left image shows a person operating a surveying instrument on a tripod. The bottom-right image shows a close-up of a surveying instrument on a tripod.

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- Study site:
  - ✓ Beach of St-Joseph, in the north part of Ouvea, a low-lying atoll, Loyalty Islands, New-Caledonia.
  - ✓ Suffers from coastal erosion.
  - ✓ Monitored in the field for one year using beach profiles and DEM.
- A research funded by:
  - ✓ French Overseas Ministry (MOM project)
  - ✓ European Union (INTEGRE project)
- Objectives
  - ✓ Build very precise maps of the beach.
  - ✓ Compare the maps to assess mild changes.
  - ✓ Determine the impacts of collapsed infrastructures on sediment transport.
  - ✓ Estimate how precise and reliable the result of the photogrammetry are.

The bottom-right image is a screenshot of Google Earth Pro showing an aerial view of a beach area. A red dashed box highlights a specific section of the beach. The interface includes a search bar, a toolbar, and a status bar at the bottom showing coordinates and altitude.



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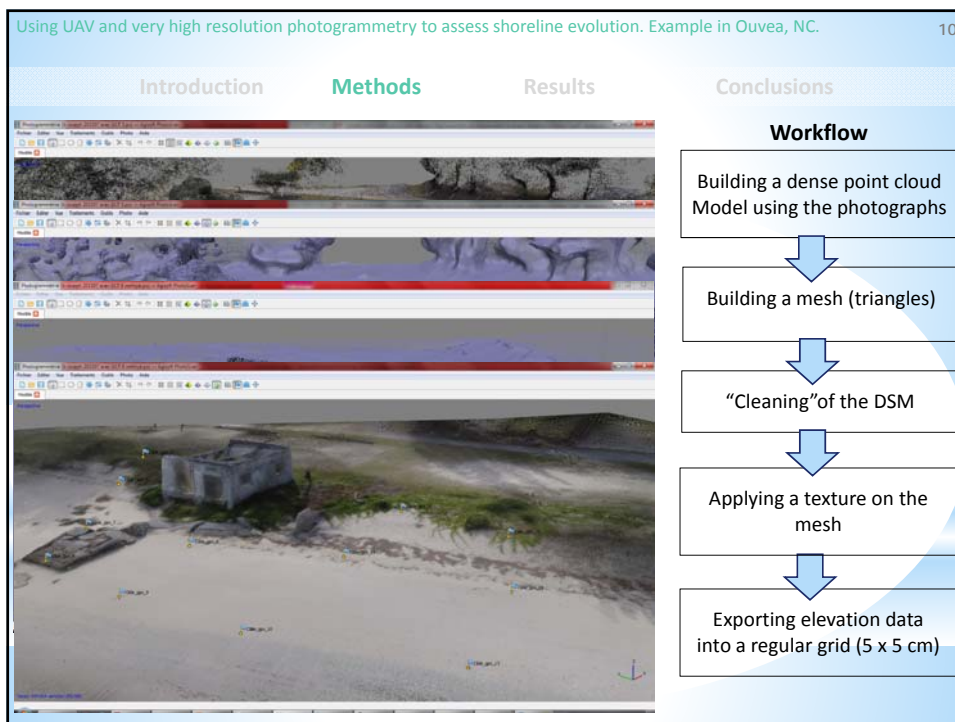
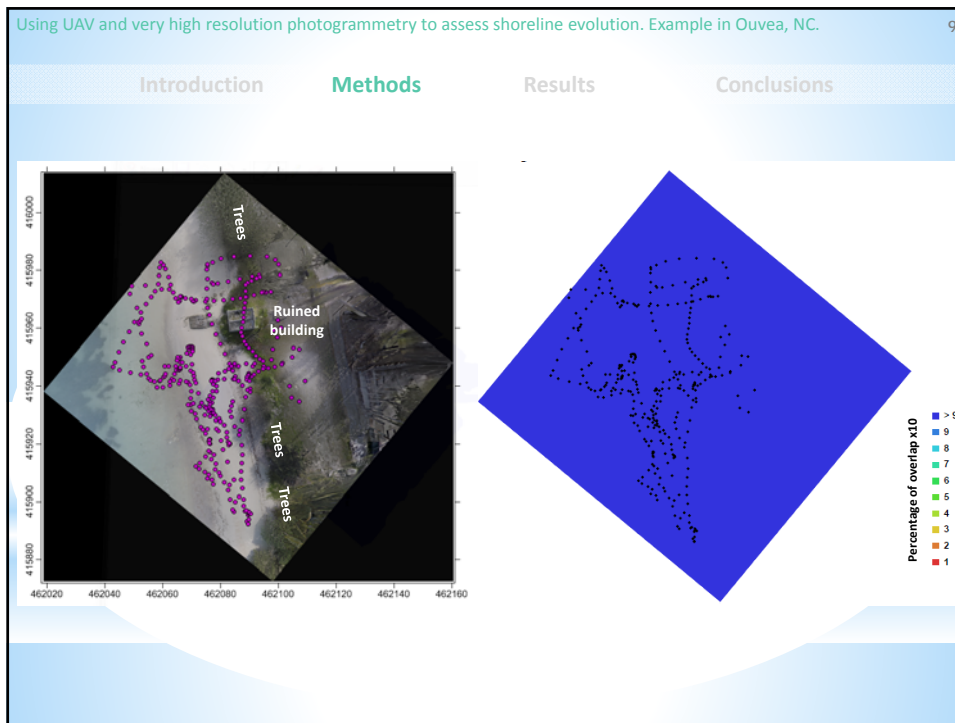
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Targets (GCP)

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The image displays two screenshots of the QGIS 2.8.1 software interface. Both screenshots show a 3D terrain model of a shoreline area. The left screenshot shows a wider view of the terrain with a yellow/orange contour line. The right screenshot shows a closer view of a specific area with a red box highlighting a feature. The software interface includes a menu bar, a toolbar, and a status bar at the bottom.

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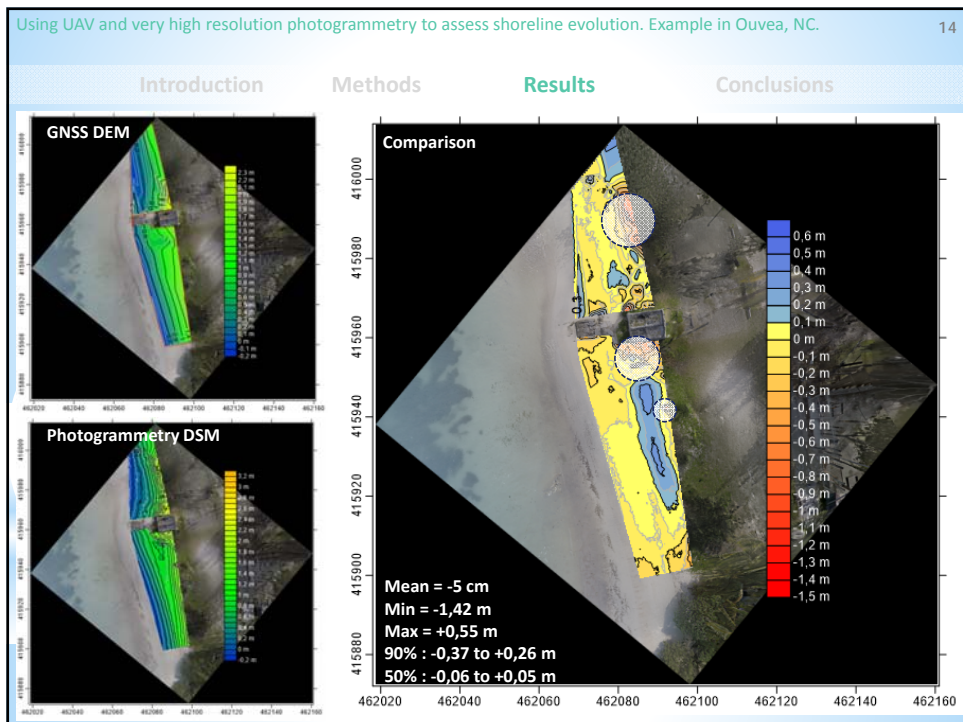
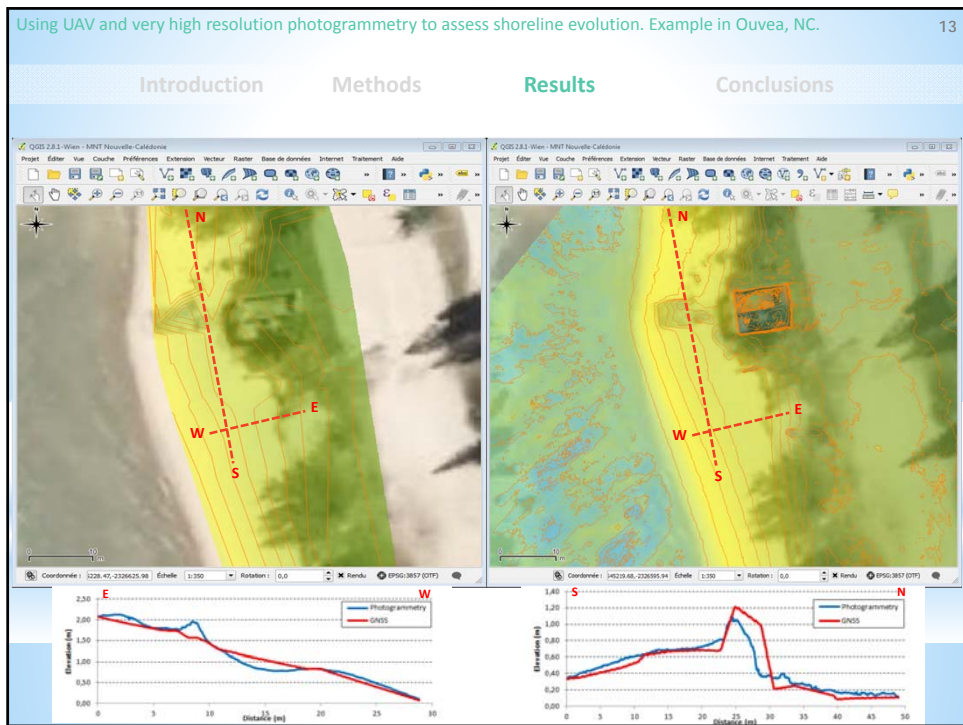
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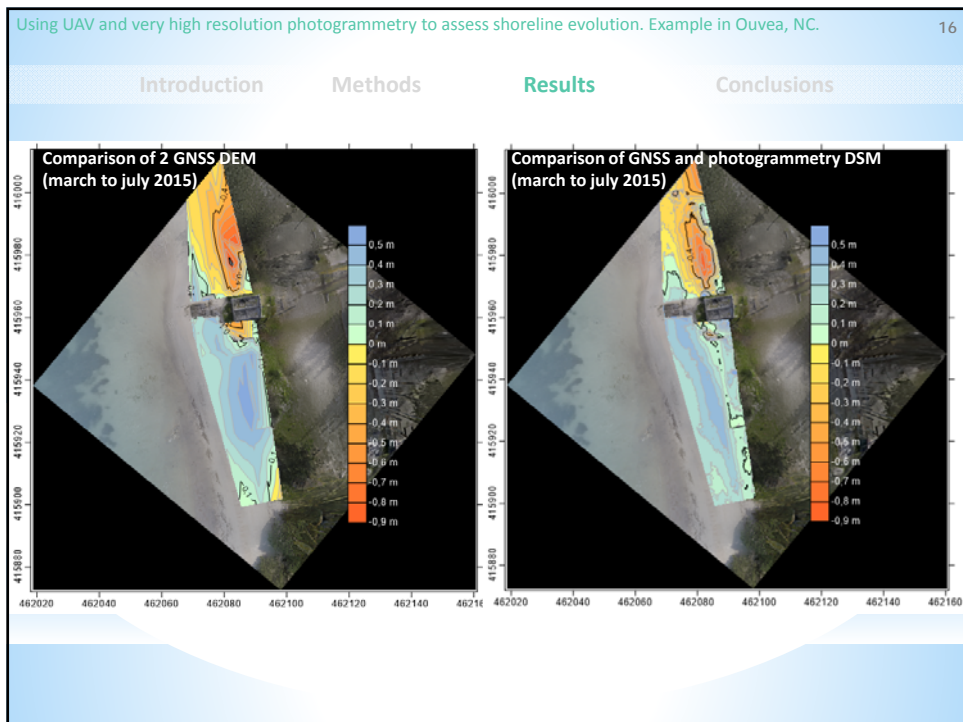
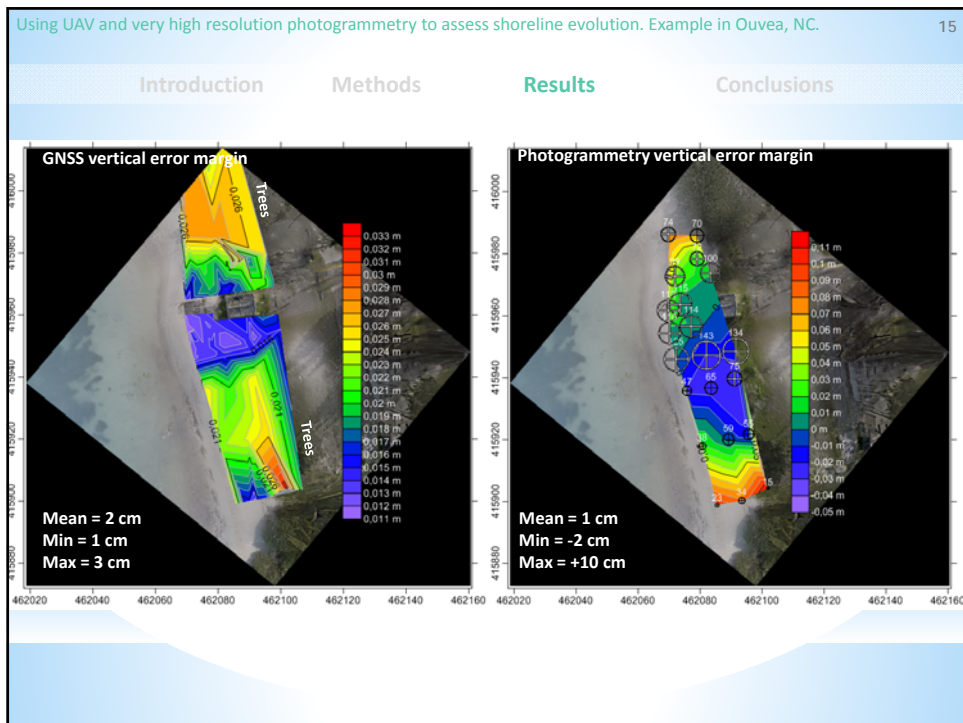
The image displays two line graphs and a QGIS screenshot. The top graph shows an elevation profile from East (E) to West (W) with a distance of 0 to 30 meters. The bottom graph shows an elevation profile from South (S) to North (N) with a distance of 0 to 50 meters, highlighting a peak labeled 'Concrete blocks'. The QGIS screenshot on the right shows the terrain model with red dashed lines indicating the cross-sections for the two graphs.

Distance (m)	Elevation (m)
0	2.00
5	1.80
10	1.50
15	1.00
20	0.80
25	0.60
30	0.40

Distance (m)	Elevation (m)
0	0.40
5	0.60
10	0.70
15	0.80
20	0.90
25	1.10
30	0.40
35	0.20
40	0.15
45	0.10
50	0.05









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Benefits	Inconveniences
<ul style="list-style-type: none"> <li>✓ Affordable</li> <li>✓ Easy and quick to operate</li> <li>✓ A great density of measurements</li> <li>✓ A high level of details</li> <li>✓ Beautiful maps and pictures</li> <li>✓ 3D model with texture that displays features invisible on GNSS survey (sand/vegetation limit)</li> <li>✓ Textured models are convenient tools for scientific communication</li> </ul>	<ul style="list-style-type: none"> <li>✓ Sensitive to meteorological conditions (wind)</li> <li>✓ A short time of flight (battery life = 20 minutes) and a short flight range</li> <li>✓ Heavy photogrammetric processing. A long time of computation that needs a work station</li> <li>✓ Needs GCP measured with a GNSS</li> <li>✓ Vegetation have to be removed from the DSM</li> <li>✓ More and more restrictive laws.</li> </ul>

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Figure 1 : DSM aux quatre dates de levé

Figure 3 : DSM différentiels

- Perspectives:
  - ✓ Use a better camera to make point detection and photogrammetric processing more accurate.
  - ✓ Use a UAV carrying a high accuracy GNSS => the GCP should not be necessary.
  - ✓ Go on testing the method and now compare several photogrammetry DSM, compute volume changes (sediment budget) and detect beach fine morphological evolution.

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Thank you for your attention.

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