



A laser scanning application for volumetric changes of the beach and dune analyses

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Materials and Methods

At the paper authors presents initial results of the first application of laser scanning registration of Polish coastal zone. An investigation was provided at the southern Baltic coast near the Swinoujście town and cover about 3,5 km of the coastal zone.

The first laser scanning registration of this area was done at 29.04.2007 using Hawk Eye laser dedicated for the coastal zone registration (red, green&IR). The second registration was done at 31.08.2008 by topographic laser scanner LMS Q560i Riegl (red).

On a base of two registered points cloud, using QT Modeler application, the DTM's of the investigated area, taken in 2007 and in 2008, were created. The whole data were converted to the same coordinate system. Two DTM's for 2007 and 2008 were subtracted for calculating dune and beach volumetric changes.

As a result of project authors present a map of beach and dune elevation differences.

Results and Conclusions

Comparison of two 3D models on the basis of the years 2007 and 2008 laser scanning data, was used for defining the volumetric changes in the area of beach and dunes, and their spatial distribution.

On the whole surface area of 136 thousand m² the average accumulation per 1 m² was + 0.197 m³, the average erosion - 0.011 m³, the balance of deposits was + 0.185 m³ and the active volume of sand 0.208 m³.

From the spatial distribution of volumetric changes it is visible that between 04.2007 and 08.2008 greatest accumulations occurred in the area of seaward slope of dunes and as a result of widening the beach. In contrast, mainly the upper beach up to the foot of dunes was eroded.

The most stable area, with the smallest changes in accumulation and erosion there is in the area D.

The greatest erosion was observed in the area of E. This is an area where natural morphodynamic processes are modified as a result of the breakwater jetty existence. It cerate significant activity of the area (0.413 m³/m²) and also accumulation (0.389 m³/m²).

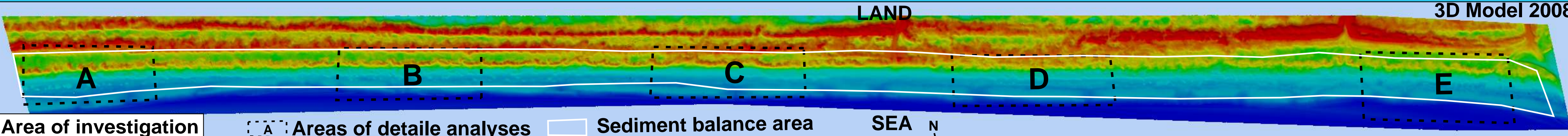
Towards the east of the area D the size of accumulation increases systematically, and increases the activity of the analyzed areas.

Average value of accumulation, erosion, sediment balance and active area per 1 m²

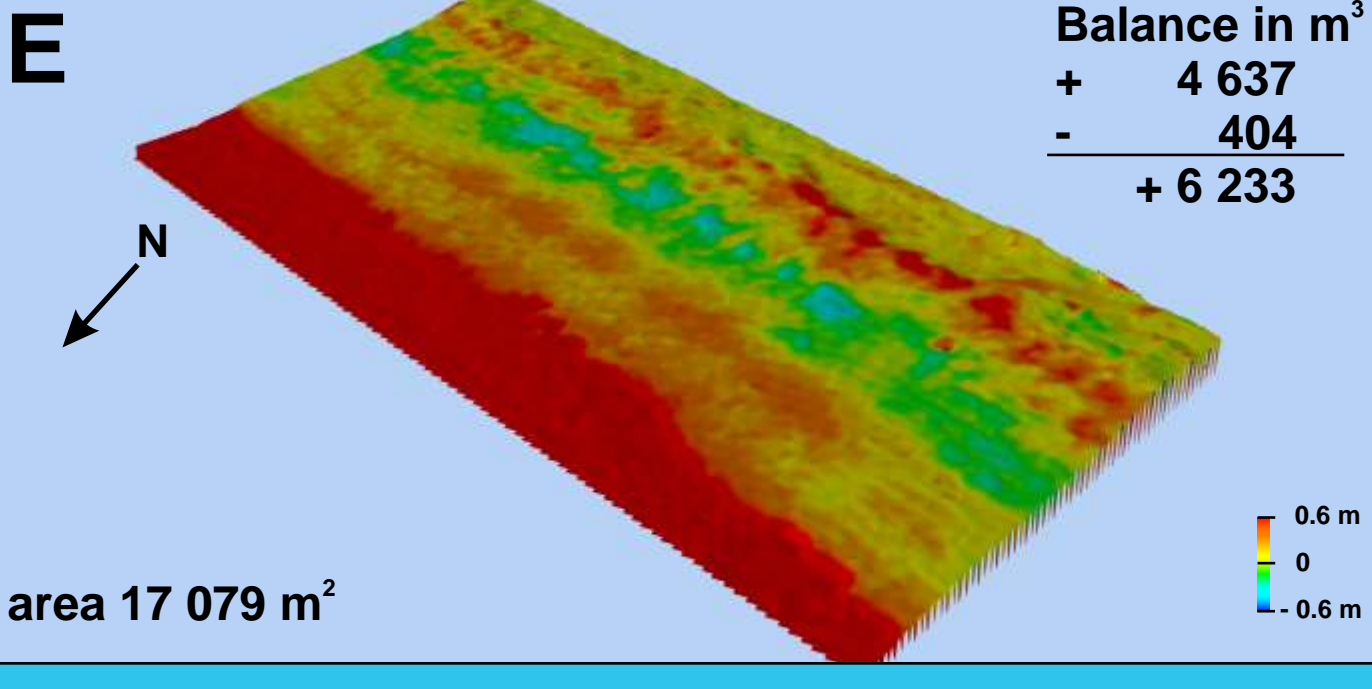
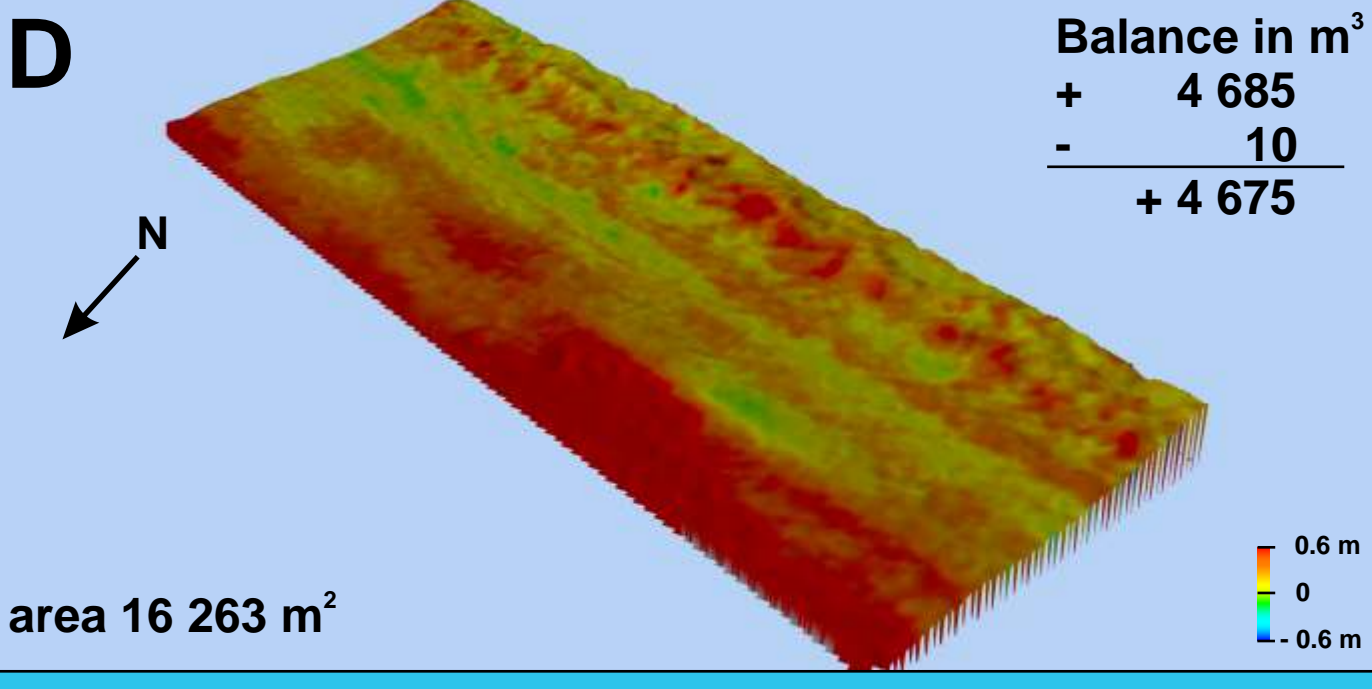
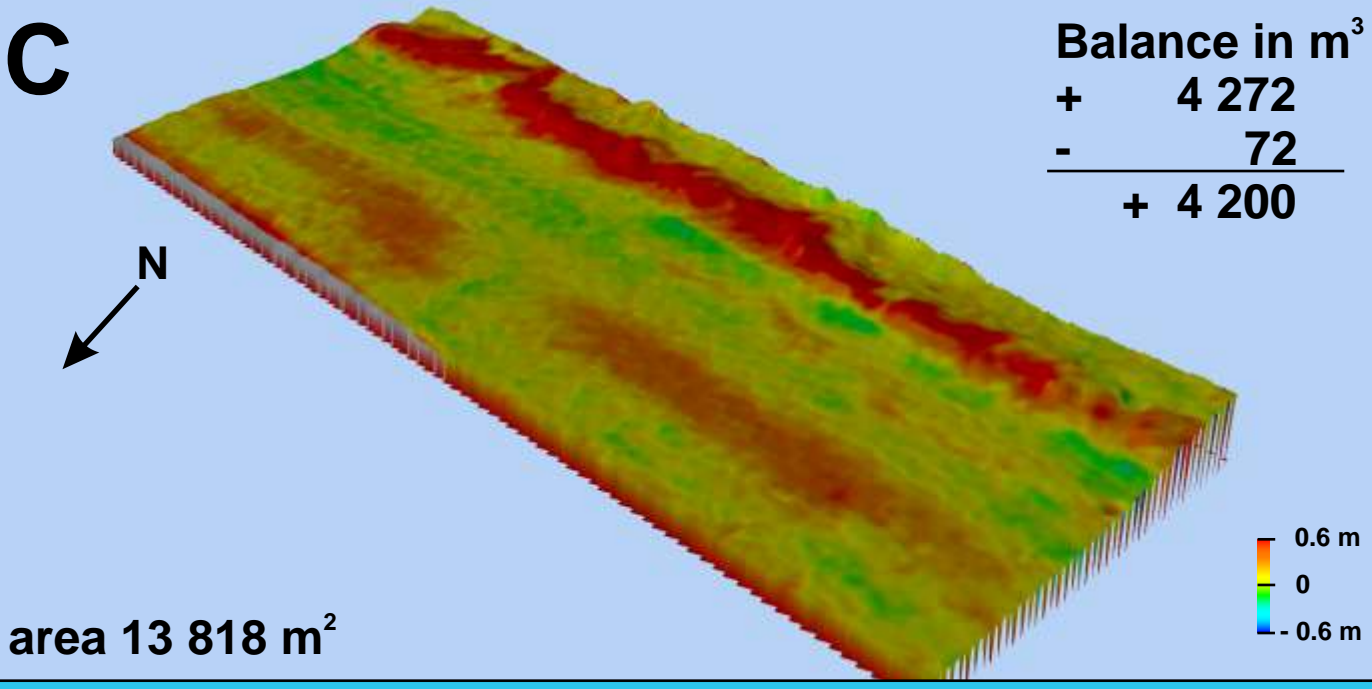
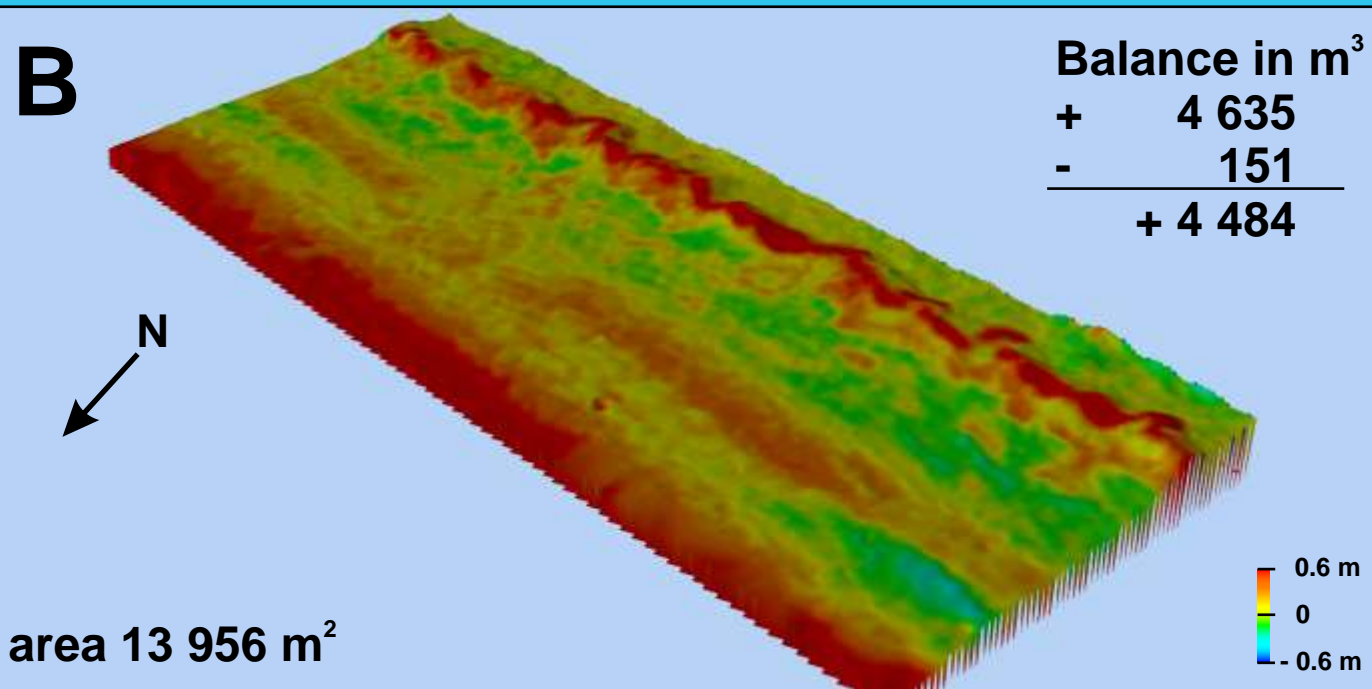
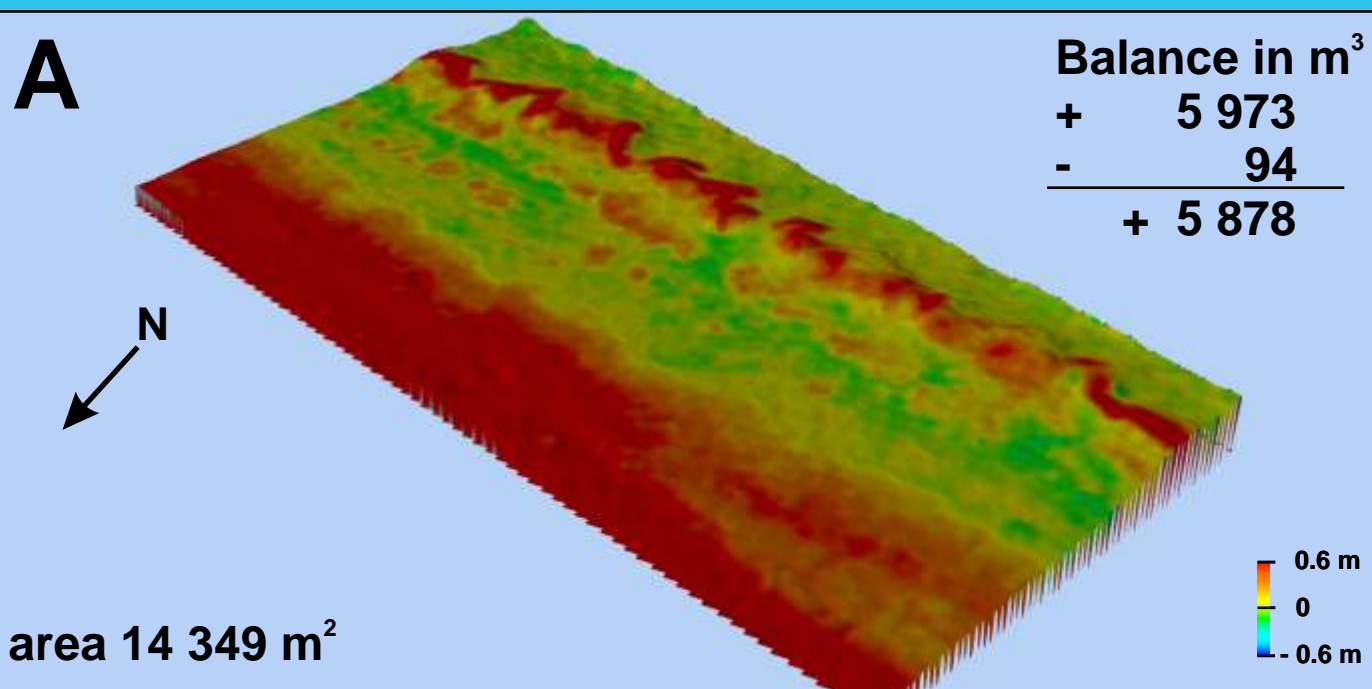
[m ³ /m ²]	A	B	C	D	E	whole
accumulation	+ 0.416	+ 0.332	+ 0.309	+ 0.288	+ 0.389	+ 0.197
erosion	- 0.007	- 0.011	- 0.005	- 0.001	- 0.024	- 0.011
balance	+ 0.410	+ 0.321	+ 0.304	+ 0.287	+ 0.365	+ 0.185
Active volume	0.423	0.343	0.314	0.289	0.413	0.208

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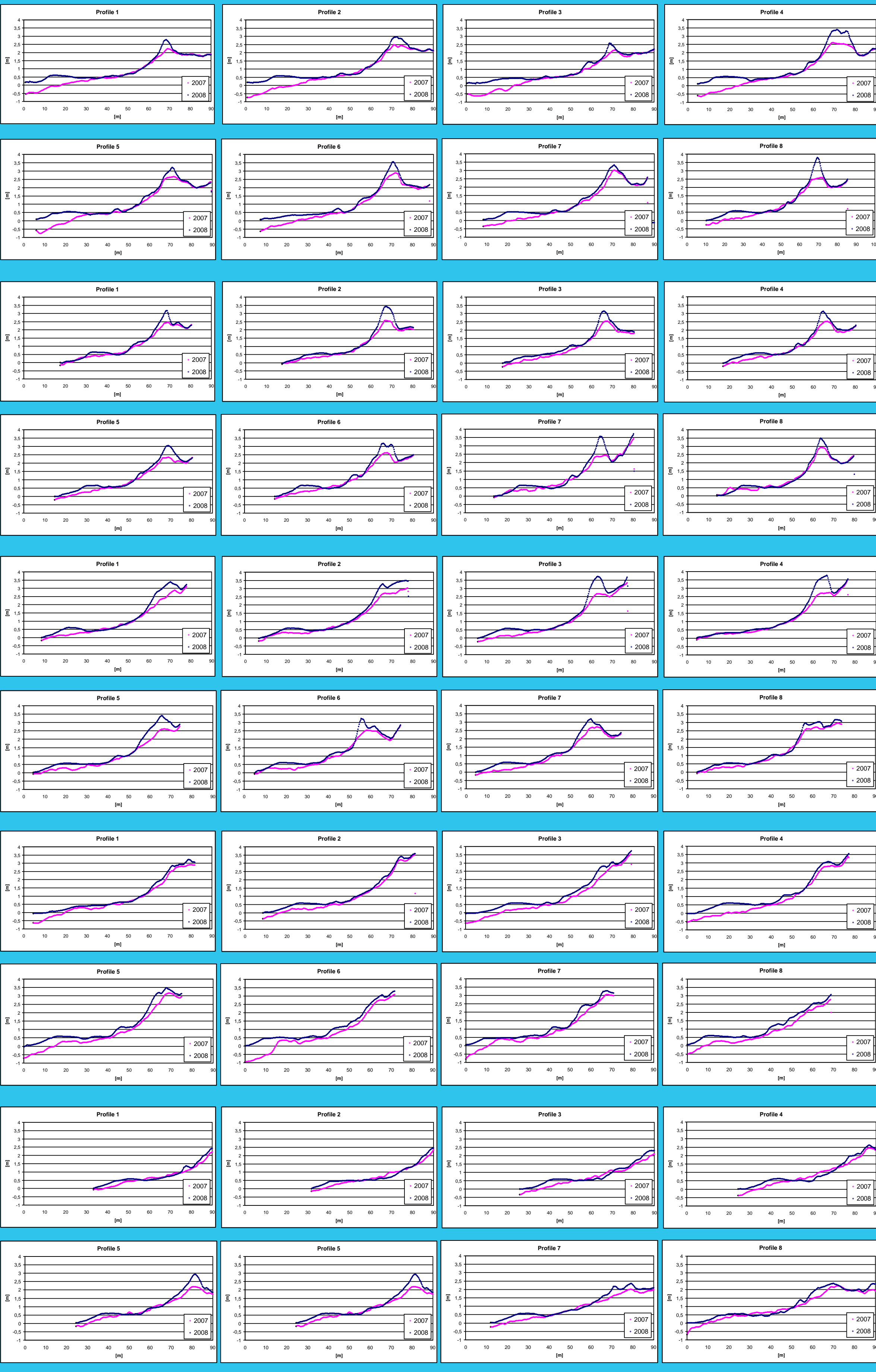
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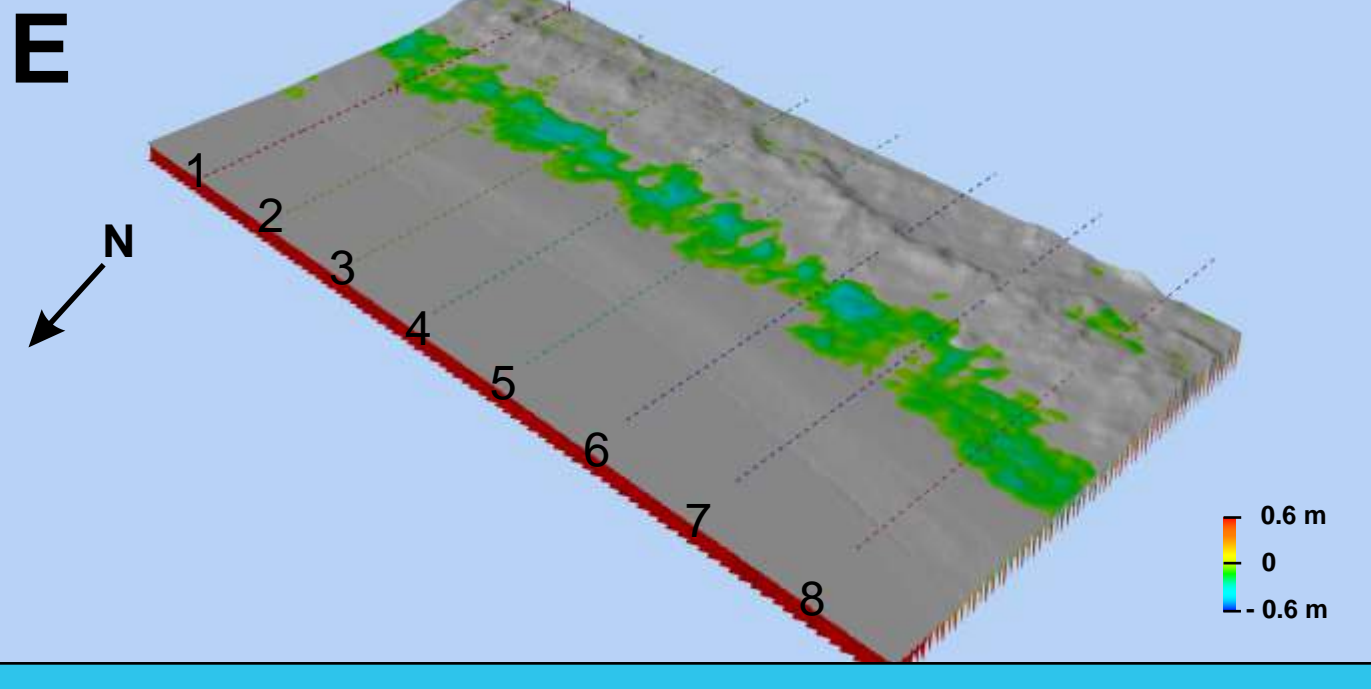
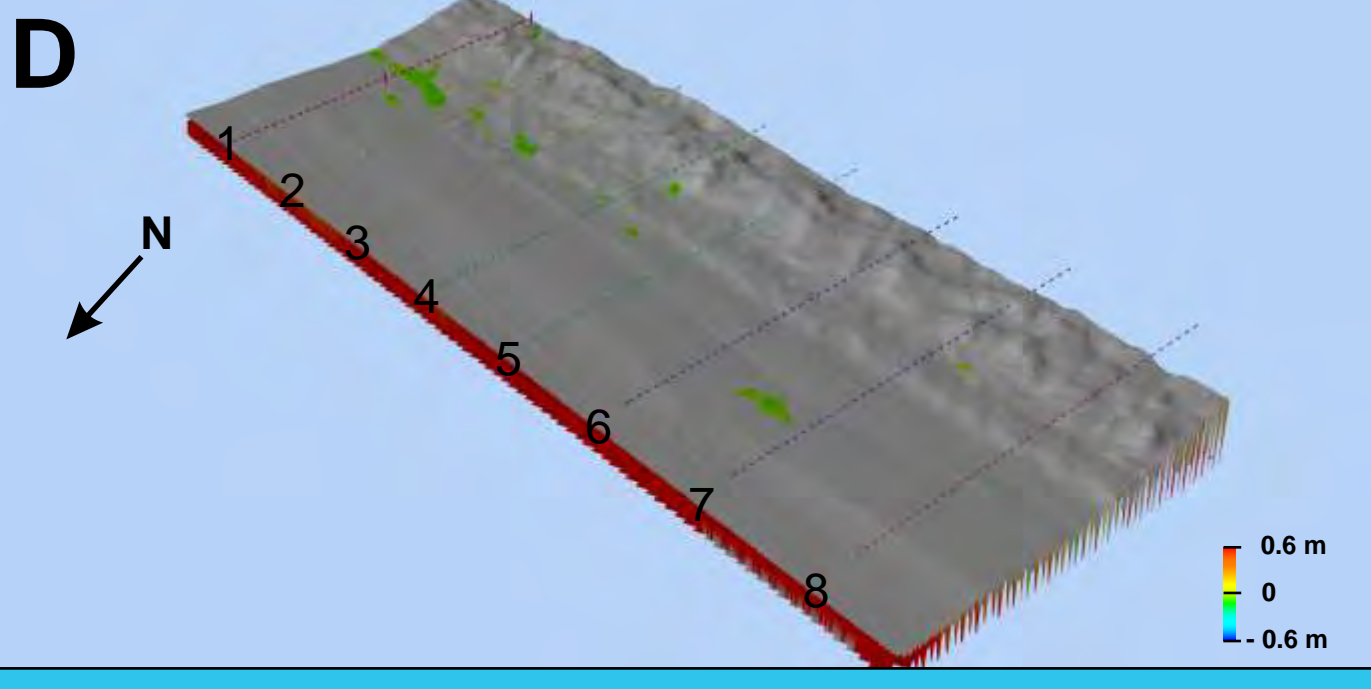
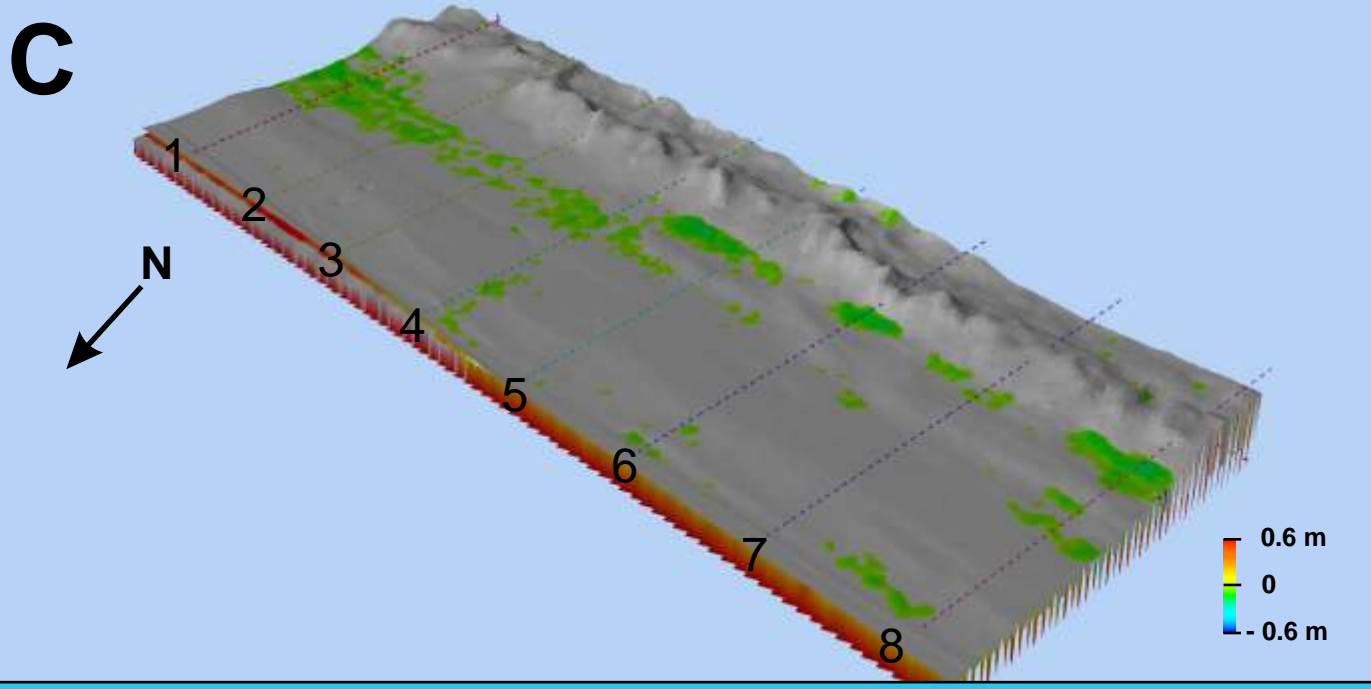
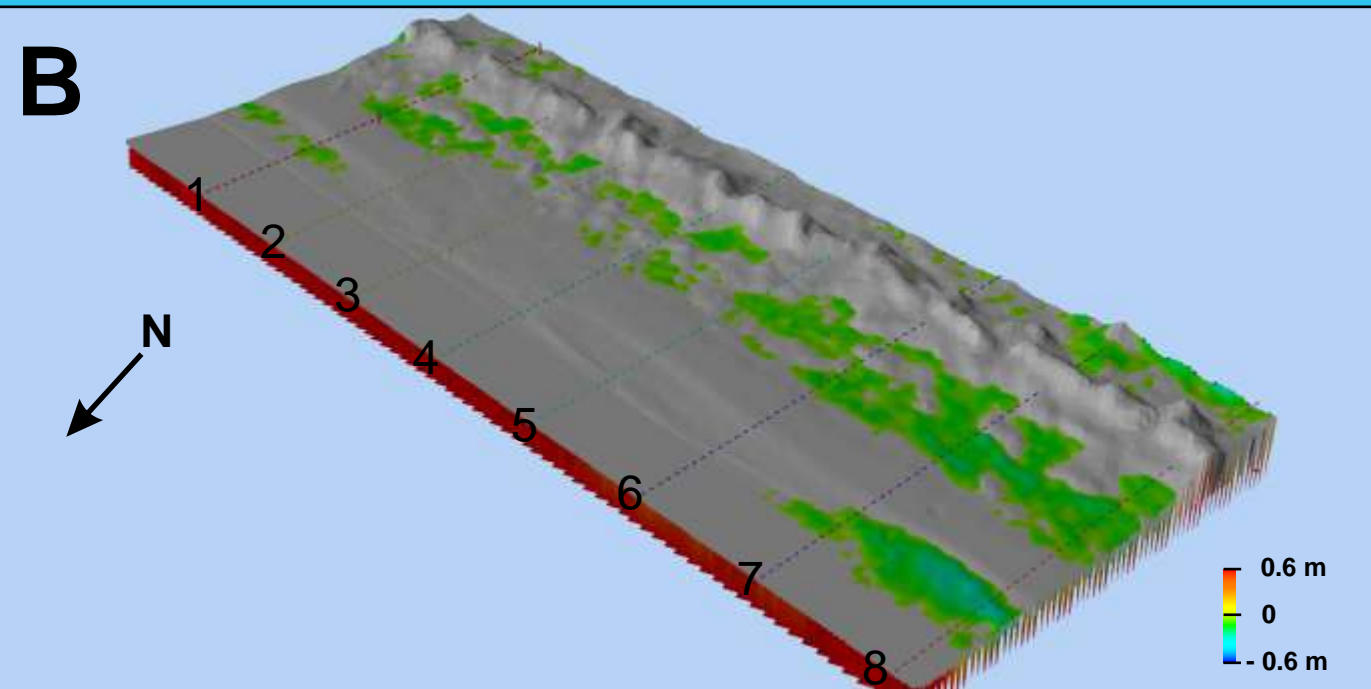
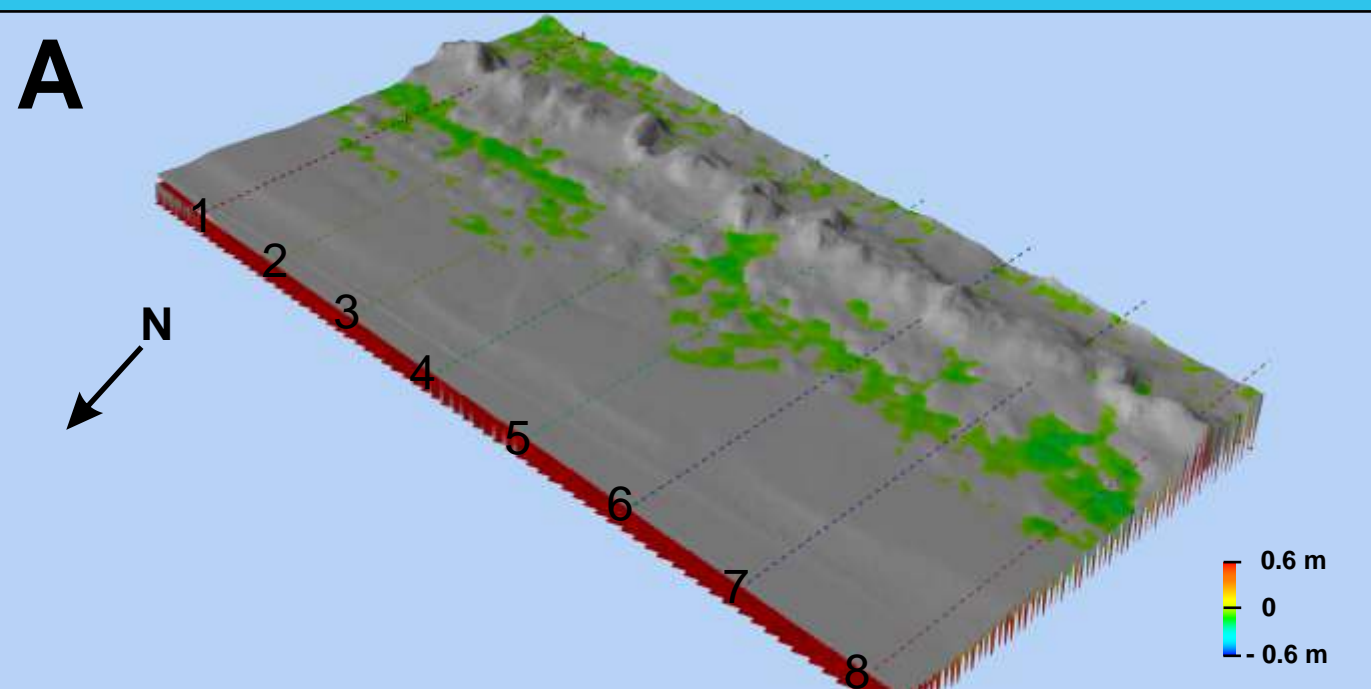
Changes on 3D Model 2007



Profiles



Erosion on 3D Model 2008



Volumetric changes of the beach and dune on 3D Model 2007

