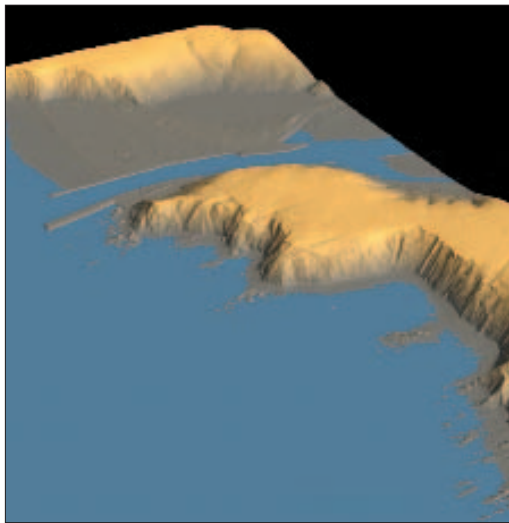


VII. Applied knowledge

Coastline monitoring

June 2005/Version 2



**Perspective view of the Ría de Pravia and Cabo Espiritu Santo (Asturias).
ICC-INDUROT collaboration.**

Coastal cartography is one of the main applications of the airborne laser scanner (LIDAR). In our country, these studies are of great interest. The breakwaters built to protect many of our beaches cannot avoid erosion when very heavy storms occur, and they constitute a barrier that prevents their natural regeneration. For this reason, it is necessary to regenerate beaches after the severest storm episodes.

Application

With airborne LIDAR the volumes of sand displaced can be measured and the way the coastline changes can be analyzed. A pilot program has been implemented on the Bogatell beach, in Barcelona, to demonstrate the possibilities of this technique.

There were heavy storms during the first months of 2002, which seriously affected the beaches here, and the local administrations involved opted for an artificial regeneration project on the Bogatell beach.

On 17 April and 23 July 2002, two flights were made over the beaches of Barcelona, between the port and the mouth of the river Besòs. On 17 April an analysis was made of the changes on the Bogatell beach, which had been severely damaged by the heavy storms that had occurred a little earlier. On 23 July the beach had already been regenerated. The two flights were made at an altitude of 2 300 metres. Three runs were made on 17 April and two on 23 July.

Results obtained

Figures 1 and 2 are representations in hypsometric tints of the digital terrain models obtained, corresponding to 17 April and 23 July 2002. The grid size of the terrain model generated is 1 meter.

Figure 3 is a representation of the model of differences. In the upper part a blue line that corresponds to the balustrade of the seafront promenade can be seen. This was an artefact introduced by the horizontal error of the system (around one meter). Elevation measurement has an RMS precision of 20 centimeters.

The sand added or removed under the water has not been taken into account in these calculations, since the sensor cannot take bathymetric measurements, and only the changes on dry land have been examined. It can be observed that there has been an increase in the area of sand along almost the whole length of the beach. On the other hand, there has been a slight reduction in the area of sand beside the southern breakwater.

Diferences in volume and area of sand

Positive difference in volume	23 884 m ³	Contribution of the regeneration made
Negative difference in volume	4 320 m ³	Loss of volume (re-used sand)
Positive difference in area	12 082 m ²	Area regenerated
Negative difference in area	239 m ²	Area lost

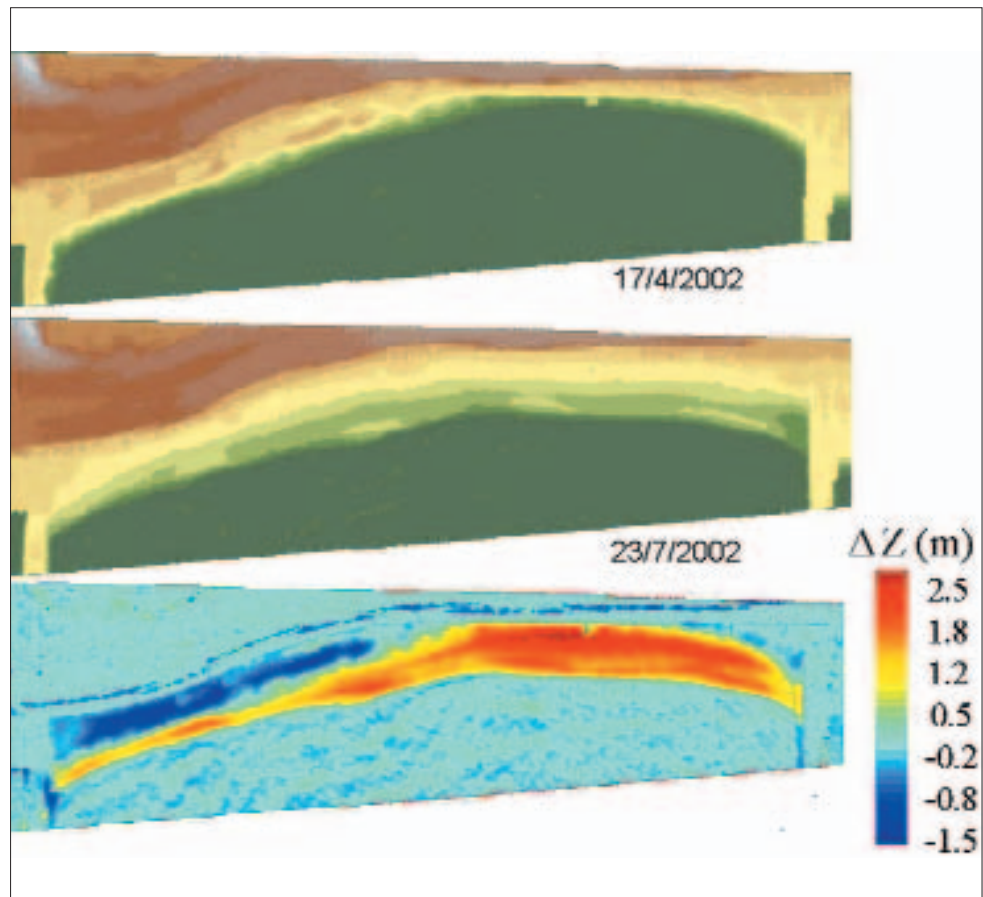


Figure 1 shows the Bogatell beach on 17 April 2002.

Figure 2 shows it on 23 July in the same year.

Figure 3: Model of differences.