Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06684, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06684
EGU General Assembly 2008

Using topographic lidar to map the potential impact of extreme flooding events for Sangatte coastal dunes, northern France

C. Rufin-Soler, A. Héquette, A. Gardel

Laboratoire d'Océanologie et de Géosciences, CNRS UMR 8187 LOG, Université du Littoral Côte d'Opale, 32 Avenue Foch, BP 80 - 62 930 Wimereux, France

Due to climate change, a rise in sea level and a possible increase in storminess during the 21^{st} century would likely endanger human populations and infrastructure located along shorelines, especially in low-lying coastal areas that are particularly sensitive to coastal erosion and marine flooding. Coastal erosion is already common along the unconsolidated shoreline of northern France where coastal dunes frequently form a natural barrier protecting the reclaimed lands of the coastal plain from marine flooding. A study was conducted on the Sangatte coastal dunes, west of the town of Calais in the Dover Strait, in order to assess the vulnerability of the coastal zone to extreme flooding events, the backshore behind the dunes having been inundated by marine waters seven times during historical times, including the 1953 storm surge event from the North Sea. The study combines geomorphology-based and statistical methodologies by using terrain elevation and extreme water level data derived from telemetric and tide-gauge measurements. Tide-gauge data from 1965 to 2001 (Pirazzoli, 2006) were used to estimate the heights of extreme water levels with return periods of 10, 50 and 100 years according to the Joint Probabilities Method of Pugh and Vassie (1979), yielding values of 854, 880 and 892 cm above local hydrographic datum by the year 2050 (including projected mean sea level rise). Airborne scanning LIDAR (Light Detection and Ranging) data were collected in July 2006 over an area of approximately 14 km^2 of coastal dunes and were used to generate a high-resolution Digital Elevation Model (DEM). The DEM was used to produce a series of potential flood maps for extreme water levels with return periods of 10, 50 and 100 years by the year 2050, high-

lighting the areas that are more likely subject to marine flooding in the next decades. The results show that a low elevated area to the east, where the crest of the dunes is less than 10 m high, could be overtopped by high water levels in the next future if a significant storm surge occurs at high tide. In the western part of the dune system, crest elevations are higher, commonly exceeding 20 m above marine datum, precluding marine water incursions. The coastal dunes in that area, which has been affected by marine flooding on several occasions, are much narrower, however, the width of the dune ridge being less than 30 m in several places. The DEM and water level data show that the base of the dunes can regularly be reached by the sea, even nowadays, which can easily lead to erosion, breaching and eventually flooding. This study demonstrates that DEMs derived from airborne Lidar data are efficient and adequate tools for accurate mapping over extensive areas and for determining zones that may be affected by coastal hazards.