Geophysical Research Abstracts
Vol. 16, EGU2014-8931, 2014
EGU General Assembly 2014

How to integrate geology, biology, and modern wireless technologies to assess biotic-abiotic interactions on coastal dune systems: a new multidisciplinary approach

Giovanni Sarti (1), Duccio Bertoni (2), Monica Bini (1), Daniela Ciccarelli (3), Adriano Ribolini (1), Matteo Ruocco (4), Alessandro Pozzebon (5), Fernanda Alquini (1), Riccardo Giaccari (6), and Stefano Tordella (7)

(1) University of Pisa, Science, Earth Department, Pisa, Italy (sarti@dst.unipi.it, +39 050 2215734), (2) University of Ferrara, Department of Physics and Earth Sciences, Italy, (3) University of Pisa, Science, Department of Biology, Italy, (4) University of Modena, Italy, (5) University of Siena,Department of Information Engineering, Italy, (6) Via Sterpulino, 1D, Pisa, Italy, (7) Via Ruschi, 13, Calci, Pisa, italy

Coastal dune systems are arguably one of the most dynamic environments because their evolution is controlled by many factors, both natural and human-related. Hence, they are often exposed to processes leading to erosion, which in turn determine serious naturalistic and economic losses. Most recent studies carried out on different dune fields worldwide emphasized the notion that a better definition of this environment needs an approach that systematically involves several disciplines, striving to merge every data collected from any individual analyses. Therefore, a new multidisciplinary method to study coastal dune systems has been conceived in order to integrate geology, biology, and modern wireless technologies. The aim of the work is threefold: i) to check the reliability of this new approach; ii) to provide a dataset as complete as ever about the factors affecting the evolution of coastal dunes; and iii) to evaluate the influence of any biotic and abiotic factors on plant communities. The experimentation site is located along the Pisa coast within the Migliarino – S. Rossore – Massaciuccoli Regional Park, a protected area where human influence is low (Tuscany, Italy). A rectangle of 100 x 200 m containing 50 grids of 20 x 20 m was established along the coastal dune systems from the coastline to the pinewood at the landward end of the backdune area. Sampling from each grid determined grain-size analysis carried out on surface sediment samples such as geologic aspects; topographic surveys performed by means of DGPS-RTK instruments; geophysical surveys conducted with a GPR equipment, which will be matched with core drilling activities; digital image analysis of high definition pictures taken by means of a remote controlled aircraft drone flying over the study area; biological data obtained by percent cover of each vascular plant species recorded in the sampling unit. Along with geologic and biologic methodologies, this research implemented the use of informatics technologies as well. A network of wireless sensors was created in order to measure several parameters including dune height, wind speed and direction, temperature, humidity. This technique enables high-frequency measurements, instantly sent to a laptop that stores all the information received.
The proposed approach is not overly expensive and should allow new ways to thoroughly define coastal dune systems. In addition, the results provided by this study might be useful to enhance and improve coastal protection schemes involving dune artificial reconstruction, which is frequently used as a soft approach to defend endangered sectors of the coast.