



The Impact of Urbanization on the Regional Aeolian Dynamics of an Arid Coastal Dunefield

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The anthropogenic impact on the geomorphology of many landscapes are inextricably connected but are often neglected due to the difficulty in making a direct link between the quasi natural and human processes that impact the environment. This research focuses on the Maspalomas dunefield, located on the southern coast of Gran Canaria, in the Canary Island Archipelago. The tourism industry in Maspalomas has led to intensive urbanization since the early 1960's over an elevated alluvial terrace that extends into the dunefield. Urbanization has had a substantial impact on both the regional airflow conditions and the geomorphological development of this transverse dune system. As a result airflow and sediment has been redirected in response to the large scale construction efforts. In situ data was collected during field campaigns using high resolution three-dimensional anemometry to identify the various modifications within the dunefield relative to incipient regional airflow conditions. The goal is to analyse the flow conditions near the urbanized terrace in relation to areas that are located away from the influence of the buildings and to verify numerical modelling results. Computational Fluid Dynamics (CFD) modelling is used in order to expand the areal extent of analysis by providing an understanding of relevant flow dynamics (e.g. flow velocity, directionality, turbulence, shear stresses, etc.) at the mesoscale. An integrative three dimensional model for CFD simulations was created to address the impact of both the urban area (i.e. hotels, commercial centers, and residential communities) as well as the dune terrain on regional flow conditions. Early modelling results show that there is significant flow modification around the urban terrace with streamline compression, acceleration, and deflection of flow on the windward side of the development. Consequently downwind of the terrace there is an area of highly turbulent flow conditions and well developed separation and deceleration zones as flow becomes modified by the building geometries. A historical analysis was then carried out to look at the direct link between regional airflow conditions pre and post urbanization. This is done by removing the modelled buildings and simulating flow conditions across the paleo alluvial terrace that is representative of the terrain prior to 1961. Modelling results show that there are largely unperturbed regional flow dynamics prior to urbanization with flow velocity, directionality, and turbulence remaining largely homogeneous at the mesoscale. Recent aerial LiDAR surveys show a distinct trend in the sediment dynamics (i.e. areas of accelerated and retarded dune migration) that correspond well to the modified flow conditions that have been simulated at the dunefield scale. This research begins to address the impact of societal pressures on natural systems by analysing the process-form relationship that has arisen from the coevolution of the Maspalomas dunefield.