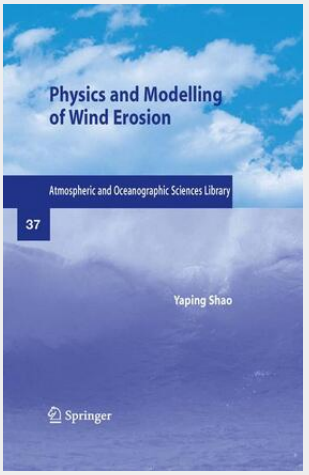
Shao

Physics and Modelling of Wind Erosion



Wind erosion occurs in many arid, semiarid and agricultural areas of the world. It is an environmental process in?uenced by geological and climatic variations as well as human activities. In general, wind erosion leads to land degradation in agricultural areas and has a negative impact on air quality.
Dustemissiongeneratedbywinderosionisthelargestsourceofaerosolswhich directly or indirectly in?uence the atmospheric radiation balance and hence global climatic variations. Strong wind-erosion events, such as severe dust storms, may threaten human lives and cause substantial economic damage. The physics of wind erosion is complex, as it involves atmospheric, soil and land-surface processes. The research on wind erosion is multidisciplinary, covering meteorology, ?uid dynamics, soil physics, colloidal science, surface soil hydrology, ecology, etc. Several excellent books have already been written about the topic, for instance, by Bagnold (1941, The Physics of Blown Sand and Desert Dunes), Greeley and Iversen (1985, Wind as a Geological P- cess on Earth, Mars, Venus and Titan), Pye (1987, Aeolian Dust and Dust Deposits), Pye and Tsoar (1990, Aeolian Sand and Sand Dunes). However, considerable progress has been made in wind-erosion research in recent years and there is a need to systematically document this progress in a new book.

This book provides a comprehensive summary of the recent developments in wind erosion research and a clear outline of its future directions. The physics of wind erosion, from particle entrainment to transport and deposition, is described with rigor from the viewpoints of fluid dynamics and soil physics. The techniques for quantitative wind-erosion prediction through computational modelling constitutes a unique feature of this book in contrast to others published in the same field. The author has advocated the development of integrated wind-erosion modelling systems which couple dynamic models for the atmosphere and land surface with spatially distributed data for land-surface conditions. The successful applications of such a system have demonstrated its usefulness in wind-erosion assessment and prediction on regional to continental scales. The book offers a valuable reference point for researchers and postgraduate students engaged in wind-erosion related studies, ranging from global climate change to atmospheric aerosols, dust storms, air quality, and land conservation. This second edition has been expanded and updated throughout. It includes new information regarding mineral dust, a major focal point of studies on climate change in recent years as well as lidar information. It features some simplified sections to be more readily accessible by readers.

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