

Using Computational Fluid Dynamics for Wind Flow over a Complex Topography

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**Presented at SIRC 2004 – The 16th Annual Colloquium of the Spatial Information Research Centre
University of Otago, Dunedin, New Zealand
November 29th-30th 2004**

ABSTRACT

The aim of this paper is to examine the modelling of the wind flow over a complex dune topography using Computational Fluid Dynamics (CFD). The area of research interest is a massive foredune behind which is a transgressive dune at Mason Bay, Stewart Island, New Zealand. It is a complex coastal dune system for which an extensive LIDAR dataset of the geometry is available. An essential part of the numerical modelling is the representation of the complex dune surface within the simulation software. The key is to balance the complexity with the finite mesh size dictated by computer power. This project is a good example of the success, or otherwise, of the interaction between the simulation software and the spatial dataset.

An overview of the CFD process will be given with two and three dimensional examples from the dune system considered. This will highlight the issues that exist with using such a dataset to describe the geometry of the system. The ability and limitations of the commercially available CFD software in helping to understand/gain an insight into the flow over such a complex topography are discussed.

The ultimate aim of the project is to compare the numerical wind data with that taken in the field in order to validate the assumptions and models used. Some results for the two-dimensional case will be shown to demonstrate the effectiveness of the modelling.

Keywords and phrases: computational fluid dynamics, coastal dunes, wind flow, sand transport, complex topography