Nonlinear Sciences > Pattern Formation and Solitons

3D Dune Dynamics as a Coupled Dynamics of 2D Cross-Sections

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(Submitted on 18 Mar 2010 (v1), last revised 26 Mar 2010 (this version, v2))

To analyze theoretically the stability of the shape and the migration process of transverse dunes and barchans, we propose a {\it skeleton model} of 3D dunes described with coupled dynamics of 2D cross-sections. First, 2D cross-sections of a 3D dune parallel to the wind direction are extracted as elements of a skeleton of the 3D dune, hence, the dynamics of each and interaction between them is considered. This model simply describes the essential dynamics of 3D dunes as a system of coupled ordinary differential equations. Using the model we study the stability of the shape of 3D transversal dunes and their deformation to barchans depending on the amount of available sand in the dune field, sand flow in parallel and perpendicular to wind direction.

Comments:	6 pages, 8 figures, letter
Subjects:	**Pattern Formation and Solitons (nlin.PS)**
Cite as:	**arXiv:1003.3563v2 [nlin.PS]**

Submission history

From: Hirofumi Niiya [view email]

[v1] Thu, 18 Mar 2010 11:52:04 GMT (538kb)

[v2] Fri, 26 Mar 2010 18:08:18 GMT (538kb)

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