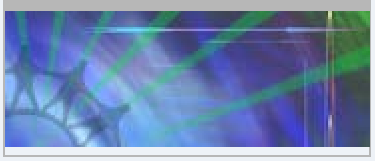
National Science Foundation
WHERE DISCOVERIES BEGIN

SEARCH

NSF Web Site

Awards



Search Awards

Recent Awards

Presidential and Honorary Awards

About Awards

How to Manage Your Award

Grant Policy Manual

Grant General Conditions

Cooperative Agreement Conditions

Special Conditions

Federal Demonstration Partnership

Policy Office Website

Award Abstract #0967857

Collaborative Research: Fundamental Investigation of Turbulent Ablation

NSF Org:	CBET Division of Chemical, Bioengineering, Environmental, and Transport Systems
Initial Amendment Date:	May 17, 2010
Latest Amendment Date:	May 17, 2010
Award Number:	0967857
Award Instrument:	Standard Grant
Program Manager:	Theodore L. Bergman CBET Division of Chemical, Bioengineering, Environmental, and Transport Systems ENG Directorate for Engineering
Start Date:	May 15, 2010
Expires:	April 30, 2013 (Estimated)
Awarded Amount to Date:	$204945
Investigator(s):	Yves Dubief ydubief@cems.uvm.edu (Principal Investigator)
Sponsor:	University of Vermont & State Agricultural College 85 SO. PROSPECT ST.

BURLINGTON, VT 05405 802/656-3660

NSF Program(s):	EXP PROG TO STIM COMP RES, FLUID DYNAMICS, THERMAL TRANSPORT PROCESSES
Field Application(s):	
Program Reference Code(s):	9150, 064E, 059E, 057E, 056E
Program Element Code(s):	9150, 1443, 1406

ABSTRACT

0967857

Dubief

This research will aid development of the fundamental understanding necessary to determine how a turbulent flow interacts with an eroding or ablating surface. Specifically, the coherent structures within a turbulent boundary layer, for example, trigger and drive the growth of non-uniform surface topography. In turn, the evolving topography influences the coherent structures within the turbulent flow. The coupling between the flow and solid structures can exist under either isothermal or non-isothermal conditions involving heat transfer.

Intellectual Merit: The research team includes investigators at the University of Vermont and the University of New Hampshire. The computational component of the research is aimed at developing a generalized algorithm to simulate the spatially-varying ablation of an initially-smooth surface under heated conditions. Corresponding experimentation will involve acquisition of detailed data to validate the computational model. The model will be based upon the direct numerical simulation methodology which is capable of predicting the fine detail of the flow field as well as the potentially complex surface shape evolution. Correspondingly, the experimental program will utilize, for example, particle image velocimetry to measure the detail of the flow structure, as well as optical methods to capture the surface shape evolution. Both isothermal and non-isothermal conditions will be considered.

Broader Impacts: The coupled dynamics of turbulent flow and surface erosion or ablation is important in applications ranging from high speed flight to latent energy storage. Additional applications include erosion and movement of sand or soil around bridge pilings, and beach erosion. The research will involve a diverse cadre of undergraduate students while a special topics graduate course will address the integration of experiment and computation.