Print Form

DEPARTMENT OF MATHEMATICS

VIGRE Funding Report

(due 30 days after semester of support)

Semester/Summer and Year: Fall 2008

Name: Carlos Chiquete

List the graduate courses you have taken this semester (including independent studies), your grades, and the instructors:

Course	Title	Grade	Instructor
MATH576A	Numerical analysis of PDE's	A	Brio

List the title, date and location of any talks you have given, either here or elsewhere:

Initial-value problem for small perturbations in an idealized CJ detonation, November 23, 2008, 61st Annual Meeting of the APS Division of Fluid Dynamics, San Antonio, TX.

If you are working on your dissertation, include a one paragraph description of your research progress. If you have not yet begun dissertation research, describe your progress toward finding a dissertation topic and advisor and beginning that research.

Some highlights

I have proven the equivalence of two separate methods to obtain asymptotic solutions to the underlying linearized stability equations. This is a crucial step for defining the initial and boundary value problem that defines the stability of the detonation wave.

We also worked on numerics as well as analytical issues. The multidomain spectral collocation method for determining the stability was improved by finding some ways to make it more efficient.

List publications, if any.

Check all activities you completed during the funded period:

Academics:

- ☐ Independent Study
- ☐ Oral Comprehensive Exam
- ☐ Commence Thesis Research
- ☒ Conference attendance
- ☒ Conference participation
- ☐ Complete PhD

Professional development and outreach:

- ☐ AP Calculus Visit
- ☐ High School Workshops
- ☐ Undergraduate Research Project
- ☐ Undergraduate Research Seminar
- ☐ Super TA
- ☐ Mentoring junior graduate students for the qualifying exams
- ☐ RTG (help organize)
- ☒ Research Seminar (help organize)

☒ Other (please specify)

MARC tutoring and Tucson Kids Club math presentation.

Attach a brief statment about your academic progress and professional development during the period of support.

VIGRE Final Narrative Report
Fall of 2008

CARLOS CHIQUETE
Program in Applied Mathematics

January 16th, 2009

1 Overview

The most significant goal for the Fall 2008 period was to prepare a paper for publication and prepare these results for presentation in the proceedings of the American Physical Society Division of Fluid Dynamics meeting in San Antonio in November of 2008. This was accomplished and the work was presented at the meetings[1]. In addition, my advisor, Anatoli Tumin, presented some additional results we were able to obtain in a separate talk[2]. Also, we continued research into my dissertation topic during the rest of the semester. Finally, the semester saw my outreach activity continue with the MARC tutoring program and I was also involved in a visit to the University of the Tucson Kids Club.

2 Research

During the fall of 2008, I again focused on my research into the linear stability theory of detonation waves. The work is a continuation of previous work in this subject.

As mentioned, two different but related talks were submitted to the 61st Annual Meeting of the APS Division of Fluid Dynamics. The titles are as follows "Initial-value problem for small perturbations in an idealized CJ detonation" and "Multidomain spectral collocation method for three-dimensional perturbations in idealized CJ detonations". The talks were given and we received some good feedback and a new research direction.

This new direction was pursued. It involved proving the equivalence of two approaches to obtain leading order asymptotics for the underlying linearized stability equations. This work will eventually form part of my dissertation. I also tested and improved the numerical method presented in the second talk.

[1]Abstract: EQ.00002 : Initial-value problem for small perturbations in an idealized CJ detonation, Carlos Chiquete and Anatoli Tumin

[2]Abstract: EQ.00006 : Multidomain spectral collocation method for three-dimensional perturbations in idealized CJ detonations, Anatoli Tumin and Carlos Chiquete

3 Academic progress

I also completed MATH576A and have only one more class (MATH576B, Spring 2009) to finish my degree requirements in this area.

4 Professional and outreach activities

During the semester I served as the president of the SIAM student chapter on campus. We organized talks including Dr. Dimitrios Psaltis from Physics, and Dr. Tamara Rogers from the Lunar Planetary Lab. Beyond the talks, I helped organize and participated in a three hour long presentation in mathematics to a group of kids from the Tucson Kids Club. This is an almost annual activity of the SIAM chapter.

I also continued my involvement as a tutor at the MARC[3] program in calculus (all three courses) and even some pre-calculus. This went on the whole semester from the second week to the last.

5 Conclusion

Over this funding period, we presented our results to the wider community in our research area. Much of the work will ultimately appear in my dissertation and so it is a step forward in graduating in a timely manner as well. My outreach this semester went beyond the undergraduates as I interacted with seven through twelve year-olds. It was a great experience to try to make math exciting to those kids and to remember what it was like to be that age. Finally, I want to thank the VIGRE committee for their great work and thus making this progress possible.

[3]Minority Access to Research Careers