

# Kinetic Energy Cascades in Mesoscale Simulations.

by

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presented to the University of Waterloo  
in fulfillment of the  
thesis requirement for the degree of  
Master of Mathematics  
in  
Applied Mathematics

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Abstract

This is the abstract.

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## **Acknowledgements**

I would like to thank all the people who made this possible.

## **Dedication**

To my Aunt Maureen, who always encouraged me to pursue the various interests in my life. I wish you were here to read this thesis.

# Table of Contents

List of Tables	viii
List of Figures	ix
1 Introduction	1
1.1 State of the Art . . . . .	1
1.2 Some Meaningless Drivel . . . . .	1
2 Observations	3
APPENDICES	5
A PDF Plots From Matlab	6
A.1 Using the GUI . . . . .	6
A.2 From the Command Line . . . . .	6

# List of Tables



# List of Figures

# Chapter 1

## Introduction

In the beginning there was  $\pi$ :

$$e^{\pi i} + 1 = 0 \tag{1.1}$$

### 1.1 State of the Art

See equation [1.1](#) on page [1](#).<sup>1</sup>

### 1.2 Some Meaningless Drivel

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<sup>1</sup>A famous equation.

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# Chapter 2

## Observations

This would be a good place for some figures and tables.

Some notes on figures and photographs...

- A well-prepared PDF should be
  1. Of reasonable size, *i.e.* photos cropped and compressed.
  2. Scalable, to allow enlargement of text and drawings.
- Photos must be bit maps, and so are not scaleable by definition. TIFF and BMP are uncompressed formats, while JPEG is compressed. Most photos can be compressed without losing their illustrative value.
- Drawings that you make should be scalable vector graphics, *not* bit maps. Some scalable vector file formats are: EPS, SVG, PNG, WMF. These can all be converted into PNG or PDF, that pdf<sub>l</sub>atex recognizes. Your drawing package probably can export to one of these formats directly. Otherwise, a common procedure is to print-to-file through a Postscript printer driver to create a PS file, then convert that to EPS (encapsulated PS, which has a bounding box to describe its exact size rather than a whole page). Programs such as GSView (a Ghostscript GUI) can create both EPS and PDF from PS files. Appendix [A](#) shows how to generate properly sized Matlab plots and save them as PDF.
- It's important to crop your photos and draw your figures to the size that you want to appear in your thesis. Scaling photos with the `includegraphics` command will cause

loss of resolution. And scaling down drawings may cause any text annotations to become too small.

For more information on L<sup>A</sup>T<sub>E</sub>X see the uWaterloo Skills for the Academic Workplace course notes at [saw.uwaterloo.ca/latex](http://saw.uwaterloo.ca/latex).<sup>1</sup>

The classic book by Leslie Lamport [?], author of L<sup>A</sup>T<sub>E</sub>X, is worth a look too, and the many available add-on packages are described by Goossens *et al* [?]. Some on-line documentation is linked to from [saw.uwaterloo.ca/latex](http://saw.uwaterloo.ca/latex).

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<sup>1</sup> Note that while it is possible to include hyperlinks to external documents, it is not wise to do so, since anything you can't control may change over time. It *would* be appropriate and necessary to provide external links to additional resources for a multimedia “enhanced” thesis. But also note that if the **hyperref** package is not included, as for the print-optimized option in this thesis template, any `\href` commands in your logical document are no longer defined. A work-around employed by this thesis template is to define a dummy `\href` command (which does nothing) in the preamble of the document, before the **hyperref** package is included. The dummy definition is then redefined by the **hyperref** package when it is included.

# APPENDICES

# Appendix A

## Matlab Code for Making a PDF Plot

### A.1 Using the GUI

Properties of Matab plots can be adjusted from the plot window via a graphical interface. Under the Desktop menu in the Figure window, select the Property Editor. You may also want to check the Plot Browser and Figure Palette for more tools. To adjust properties of the axes, look under the Edit menu and select Axes Properties.

To set the figure size and to save as PDF or other file formats, click the Export Setup button in the figure Property Editor.

### A.2 From the Command Line

All figure properties can also be manipulated from the command line. Here's an example:

```
x=[0:0.1:pi];
hold on % Plot multiple traces on one figure
plot(x,sin(x))
plot(x,cos(x),'--r')
plot(x,tan(x),'.-g')
title('Some Trig Functions Over 0 to \pi') % Note LaTeX markup!
legend('{\it sin}(x)', '{\it cos}(x)', '{\it tan}(x)')
hold off
```

```
set(gca,'Ylim',[-3 3]) % Adjust Y limits of "current axes"  
set(gcf,'Units','inches') % Set figure size units of "current figure"  
set(gcf,'Position',[0,0,6,4]) % Set figure width (6 in.) and height (4 in.)  
cd n:\thesis\plots % Select where to save  
print -dpdf plot.pdf % Save as PDF
```