

LATEX

for engineers and scientists

by Irina Nikolkina

Overview

Edit/Format/Preview Process

Typical Input File

LaTeX Document Structure

Edit/Format/Preview Process

- Put text and LaTeX commands in a file
- Issue the latex command to format the file
- Display the .pdf file
- Print

To use LaTeX, you need to **install a TeX distribution**.

TeX distributions are packaged collections of packages and programs that enable you to typeset without having to manually fetch files and configure things.

The recommended distributions for Windows are **MikTeX** and TeX Live.

Typical Input File

```
\documentstyle{article}
```

```
\begin{document}
```

In a large town, full of houses and people, there is not room for everybody to have even a little garden, therefore they are obliged to be satisfied with a few flowers in flower-pots.

In one of these large towns lived two poor children who had a garden something larger and better than a few flower-pots. They were not brother and sister, but they loved each other almost as much as if they had been. Their parents lived opposite to each other in two garrets, where the roofs of neighboring houses projected out towards each other and the water-pipe ran between them...

```
\end{document}
```

LaTeX Document Structure

At a minimum, a LaTeX document consists of

```
% This is myfile.tex
% notes to yourself can go here

\documentclass[options]{style}
optional specifications
— e.g., declaring use of packages

\begin{document}
    :
\end{document}
```

} Anything following % is ignored
(used for comments).


} *Preamble*
(blank lines do not matter)

} *Body*
This is the document *environment*.

All that follows is ignored
(could be used for comments).

LaTeX Document Structure

At a minimum, a LaTeX document consists of



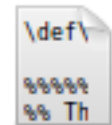
```
% This is myfile.tex
% notes to yourself can go here

\documentclass[options]{style}
  optional specifications
  — e.g., declaring use of packages

\begin{document}
  :
\end{document}
```

In preamble, there are many options, depending upon the style (**article**, book, letter, report or slides).

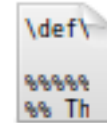
Most publishers have their **own style**, which they provide for you to download.



AGUTeX.cls

LaTeX Document Structure

AGU LaTeX document consists of



AGUTeX.cls

```
\documentclass[draft,jrgrga]{AGUTeX}
```

```
\begin{document}
```

```
\begin{abstract}
```

```
\end{abstract}
```

```
\begin{article}
```

```
\section{Introduction}
```

```
\begin{acknowledgments} \end{acknowledgments}
```

```
\begin{thebibliography} \end{thebibliography}
```

```
\end{article}
```

```
\end{document}
```

LaTeX Document Structure

AGU LaTeX document consists of

% Author names in capital letters:

```
\authorrunninghead{DIDENKULOVA ET AL.}
```

% Shorter version of title entered in capital letters:

```
\titlerunninghead{ROGUE WAVES IN BASIN OF INTERMEDIATE DEPTH}
```

%Corresponding author mailing address and e-mail address:

```
\authoraddr{Corresponding author: I. Didenkulova, Institute of Cybernetics at  
Tallinn University of Technology, Akadeemia tee 21, 12618, Tallinn, Estonia.  
(ira@cs.ioc.ee)}
```


LaTeX Document Structure

AGU LaTeX document consists of

`% Title`

`\title{Rogue waves in the basin of intermediate depth and the possibility of their formation due to the modulational instability}`

LaTeX Document Structure

AGU LaTeX document consists of

`% Authors and Affiliations`

`\authors{Ira Didenkulova,\altaffilmark{1,2} Irina Nikolkina\altaffilmark{1},
and Efim Pelinovsky\altaffilmark{3}}`

`\altaffiltext{1}{Institute of Cybernetics at Tallinn University of Technology,
Tallinn, Estonia.}`

`\altaffiltext{2}{MARUM - Center for Marine Environmental Sciences,
University of Bremen, Bremen, Germany.}`

`\altaffiltext{3}{Institute of Applied Physics, Nizhny Novgorod, Russia.}`

LaTeX Document Structure

AGU LaTeX document consists of

% Equation (1)

\begin{equation} **\label**{eq:frs}

$kh > 1.363,$

\end{equation}

% refer Equation (1) in text: “instability criterion Eq. (1) also ... ”

instability criterion Eq.**(\ref**{eq:frs}) also ...

LaTeX Document Structure

AGU LaTeX document consists of

% Figure (1)

\begin{figure}[hb!]

\centering

\includegraphics[width=3.2in] {Fig1.eps}

\caption {Rogue wave period plotted against the water depth of their occurrence.

\label{fig:fst}}

\end{figure}

% refer Figure (1) in text: “Fig. (1) demonstrates”

Fig. (**\ref**{fig:fst}) demonstrates ...

LaTeX Document Structure

Optional parameters to fine the placement of tables and figures:

```
% Figure (1)
```

```
\begin{figure}[hb!]
```

```
\centering
```

```
\includegraphics[width=3.2in]{Fig1.eps}
```

```
\caption {Rogue wave period plotted against the water depth of their occurrence.}
```

```
\label{fig:fst}
```

```
\end{figure}
```

```
% refer Figure (1) in text: "Fig. (1) demonstrates"
```

```
Fig. (\ref{fig:fst}) demonstrates ...
```

- h, here
- t, top
- b, bottom
- p, page of float

You may "insist" on these specifications by adding an exclamation mark (!).

LaTeX Document Structure

Positioning figure:

```
% Figure (1)
```

```
\centering
```

```
\begin{figure}[hb!]
```

```
\centering
```

Positioning text:

```
\includegraphics[width=2in]{Fig1.eps}
```

```
\begin{center} ... \end{center}
```

```
\caption {Rogue wave period plotted against the water depth of their occurrence.}
```

```
\begin{flushleft} ... \end{flushleft}
```

```
\label{fig:fst}
```

```
\begin{flushright} ... \end{flushright}
```

```
\end{figure}
```

```
% refer Figure (1) in text: "Fig. (1) demonstrates"
```

```
Fig. (\ref{fig:fst}) demonstrates ...
```

LaTeX Document Structure

Include an *.eps file

```
% Figure (1)
\begin{figure}[hb!]
  \centering
  \includegraphics[width=3.2in] {Fig1.eps}
  \caption {Rogue wave period plotted against the water depth of their occurrence.
           \label{fig:fst}}
\end{figure}

% refer Figure (1) in text: "Fig. (1) demonstrates"
Fig. (\ref{fig:fst}) demonstrates ...
```

LaTeX Document Structure

You can reference everything that is numbered:
`\label{marker}`

`% Figure (1)`

- **sec:** section

`\begin{figure}[hb!]`

- **fig:** figure

`\centering`

- **tab:** table

`\includegraphics[width=3.2in]{Fig1.eps}`

- **eq:** equation

caption {Rogue wave period plotted against the water depth of their occurrence.

label{fig:fst}}

`\end{figure}`

`% refer Figure (1) in text: "Fig. (1) demonstrates"`

`Fig. (\ref{fig:fst}) demonstrates ...`

LaTeX Document Structure

AGU LaTeX document consists of

```
% Figure (1)
```

```
\begin{figure}[hb!]
```

```
\centering
```

```
\includegraphics[width=3.2in] {Fig1.eps}
```

```
\caption {Rogue wave period plotted against the water depth of their occurrence.
```

```
\label{fig:fst}}
```

```
\end{figure}
```

```
% refer Figure (1) in text: "Fig. (1) demonstrates"
```

```
Fig. (\ref{fig:fst}) demonstrates ...
```

LaTeX Document Structure

AGU LaTeX document consists of

```
% Bibliography
```

```
\begin{thebibliography}{}
```

```
\bibitem{}
```

```
\bibitem[\textit{Dysthe et~al.}(2008)]{Dysthe} Dysthe, Kristian and  
Krogstad, Harald E. and Muller, Peter (2003), Physical mechanisms of  
the rogue wave phenomenon, \textit{Eur. J. Mech B-Fluid}, \textit{22},  
603--634.
```

```
\end{thebibliography}
```

LaTeX Document Structure

AGU LaTeX document consists of

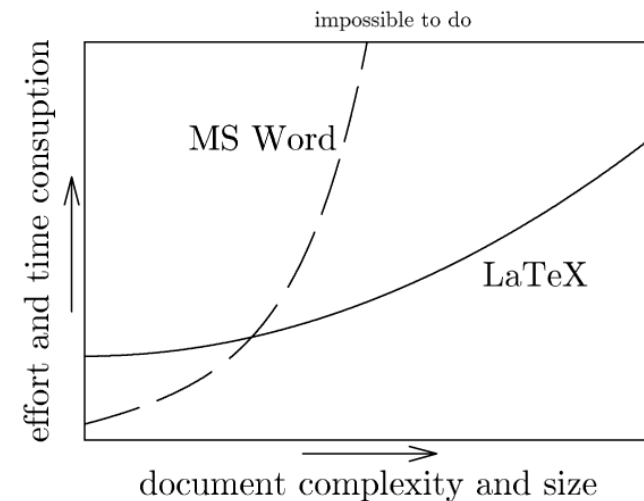
	What you write		How it appears
<code>% Bibliography</code>	This is <code>\textbf{boldface}</code> .	\Rightarrow	This is boldface .
<code>\begin{thebibliography}</code>	This is <code>\textit{italic}</code> .	\Rightarrow	This is <i>italic</i> .
<code>\bibitem{}</code>	This is <code>\textrm{roman}</code> .	\Rightarrow	This is roman.
<code>\bibitem[{\textsc{small caps}}]</code>	This is <code>\textsc{small caps}</code> .	\Rightarrow	This is SMALL CAPS.
<code>\bibitem[{\textsf{sans serif}}]</code>	This is <code>\textsf{sans serif}</code> .	\Rightarrow	This is sans serif.
<code>\bibitem[{\textsl{slanted}}]</code>	This is <code>\textsl{slanted}</code> .	\Rightarrow	This is <i>slanted</i> .
<code>\bibitem[{\texttt{typewriter}}]</code>	This is <code>\texttt{typewriter}</code> .	\Rightarrow	This is typewriter.
<code>\end{thebibliography}</code>			

Why LaTeX?

- **support for transliteration and for non-latin alphabets**
- **separation of content and style**
- **scalability (1-page letter or a 300 page book)**
- **high quality output**
- **performance**
- **used with the bibliography/reference package, BibTeX**
- **files are very small (a text file)**
- **it's free**
- **platform independent (Windows, Macs or Linux)**

Conclusion

- **If you're writing a short document in English with no special characters, use Microsoft Word.**
- **For longer documents, like a masters or doctoral dissertation - invest your time in learning how to use LaTeX.**



LATEX

working with MiKTeX

by Irina Nikolkina

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Version 2.9.4521, Windows 32-bit
Size: 153.42 MB
- Basic MiKTeX 2.9.4521 64-bit Installer
Version 2.9.4521, Windows 64-bit
Size: 155.42 MB
- MiKTeX 2.9.4503 Net Installer
Version 2.9.4503, Windows 32-bit
Size: 7.01 MB
- MiKTeX 2.9.4503 64-bit Net Installer
Version 2.9.4503, Windows 64-bit
Size: 9.27 MB
- MiKTeX Portable 2.9.4250
Version 2.9.4250, Windows 32-bit
Size: 157.45 MB
- MiKTeX 2.9.4106 Source Code
Version 2.9.4106, all platforms
Size: 20.75 MB

Control Panel > System and Security > System

View basic information about your computer

Windows edition
Windows 7 Home Premium
Copyright © 2009 Microsoft Corporation. All rights reserved.
Service Pack 1
[Get more features with a new edition of Windows 7](#)

System

Manufacturer:	ASUSTeK Computer Inc.
Rating:	5.7 Windows Experience Index
Processor:	Intel(R) Core(TM) i7-2670QM CPU @ 2.20GHz 2.20 GHz
Installed memory (RAM):	8,00 GB
System type:	64-bit Operating System
Pen and Touch:	No Pen or Touch Input is available for this Display

ASUSTeK Computer Inc. support
Website: [Online support](#)

Download MiKTeX source code if you want to incorporate MiKTeX into your own software product.

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To install a basic TeX/LaTeX system, download and run this installer. MiKTeX has the ability to install missing packages automatically, i.e., this installer is suitable for computers connected to the Internet.



Basic MiKTeX 2.9.4521 64-bit Installer
Version 2.9.4521, Windows 64-bit
Size: 155.42 MB

To install a basic TeX/LaTeX system, download and run this installer. MiKTeX has the ability to install missing packages automatically, i.e., this installer is suitable for computers connected to the Internet.

Ouverture de basic-miktex-2.9.4521-x64.exe

Vous avez choisi d'ouvrir :

- basic-miktex-2.9.4521-x64.exe**
qui est un fichier de type : Binary File (155 Mo)
à partir de : http://ctan.vgtu.lt

Voulez-vous enregistrer ce fichier ?

download all packages and install system.

download all packages and install system.



MiKTeX Portable 2.9.4250
Version 2.9.4250, Windows 32-bit
Size: 157.45 MB

The portable edition allows you to run MiKTeX from a portable storage device.



MiKTeX 2.9.4106 Source Code
Version 2.9.4106, all platforms
Size: 20.75 MB

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Basic MiKTeX Version 2.9.4503

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Version 2.9.4503, Windows 32-bit
Size: 7.01 MB

MiKTeX 2.9.4503 64-bit Net Installer
Version 2.9.4503, Windows 64-bit
Size: 9.27 MB

MiKTeX Portable 2.9.4250
Version 2.9.4250, Windows 32-bit
Size: 157.45 MB

MiKTeX 2.9.4106 Source Code
Version 2.9.4106, all platforms
Size: 20.75 MB

This installer allows you download all packages and install a complete TeX/LaTeX system.

This installer allows you download all packages and install a complete TeX/LaTeX system.

The portable edition allows you to run MiKTeX from a portable storage device.

Download MiKTeX source code if you want to incorporate MiKTeX into your own software product.

43% de 1 fichier - Téléchargements

basic-miktex-2.9.4521-x64.exe	
install_flashplayer11x32au_mssd_aih.exe	novembre 12
BlackICE-MKVI-10.2.7z	novembre 8
Заявка 12-05-33087.pdf	novembre 8
Заявка 12-05-33087.pdf	novembre 8

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mirrors.ctan.org/systems/win32/miktex/setup/setup-2.9.4503-x64.exe

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miktex.org/2.9/setup

Computer > OS (C:) > Users > Irina > Downloads

Name	Date modified	Typ
basic-miktex-2.9.4521-x64	19/11/2012 21:54	App
kviitung	11/11/2012 14:59	Adc
BlackCE-MKVI-10.2	08/11/2012 21:54	Win
CartonA5 Beaujolais Nouveau_fr	08/11/2012 17:29	Mic
Заявка 12-05-33087	08/11/2012 01:36	Adc
zajavka_108540_608136288	08/11/2012 00:38	Adc
The.Big.Bang.Theory.S06E05.PROPER.VOSTFR.HDTV.XviD-Xtrem	05/11/2012 21:54	VLC
The.Big.Bang.Theory.S06E06.FASTSUB.VOSTFR.HDTV.XviD-Xtrem	05/11/2012 21:24	VLC
L_Aile_Ou_La_Cuisse	03/11/2012 05:11	VLC
La cage aux folles - Michel Serrault_Ugo Tognazzi (DvD-Rip) [XviD-Fr]	27/10/2012 12:28	VLC
The.Big.Bang.Theory.S06E04.PROPER.VOSTFR.HDTV.XviD-ATeam	23/10/2012 22:59	VLC
The.Big.Bang.Theory.S06E03.PROPER.VOSTFR.HDTV.XviD-ATeam	20/10/2012 12:09	VLC
The.Big.Bang.Theory.S06E02.PROPER.VOSTFR.HDTV.XviD-ATeam	20/10/2012 12:06	VLC
The.Big.Bang.Theory.S06E01.PROPER.VOSTFR.XviD-ATeam	20/10/2012 12:00	VLC
Vilde tee 82 87 oct 2012	13/10/2012 12:03	Adc
LeagueofLegends	08/10/2012 00:31	App
Atheros_Wi-Fi_AR1xxx_AR2xxx_AR5xxx_AR9xxx_10.0.0.75	29/09/2012 15:50	Win

basic-miktex-2.9.4521-x64 Date modified: 19/11/2012 21:54 Date created: 19/11/2012 21:53
Application Size: 155 MB

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Basic MiKTeX 2.9.4521 Installer
 Basic MiKTeX 2.9.4521 Installer (64-bit)

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Shared Installation
You have the option to share the MiKTeX installation with other users.

Install MiKTeX for:

- Anyone who uses this computer (all users)
- Only for: Irina

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Installation Directory
Choose a location for the installation directory.

Install MiKTeX to:
C:\Program Files\MiKTeX 2.9

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Basic MiKTeX 2.9.4521 Installer (64-bit)

Settings
Set your preferences.

Preferred paper: A4

Install missing packages on-the-fly: Ask me first

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To install a basic TeX/LaTeX system, download and run this installer. MiKTeX has the ability to install missing packages.

Basic MiKTeX 2.9.4521 Installer (64-bit)

Information
Review the settings.

MiKTeX Setup Wizard has enough information to start the task. If you want to review or change any of the settings, click Back. If you are satisfied with the settings, click Start.

Install basic packages to
C:\Program Files\MiKTeX 2.9

Install MiKTeX for all users

Preferred paper size is A4

Packages will be installed after confirmation by user

< Back Start Cancel

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
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
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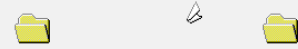
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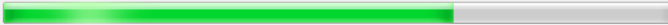
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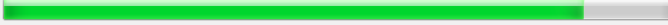
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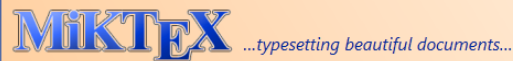
Loading package database...
starting package maintenance...
installation directory: "C:\Program Files\MiKTeX 2.9"
package repository: C:\Users\Irina\AppData\Local\Temp\mik4168
visiting repository C:\Users\Irina\AppData\Local\Temp\mik4168...
repository type: local package repository
                    
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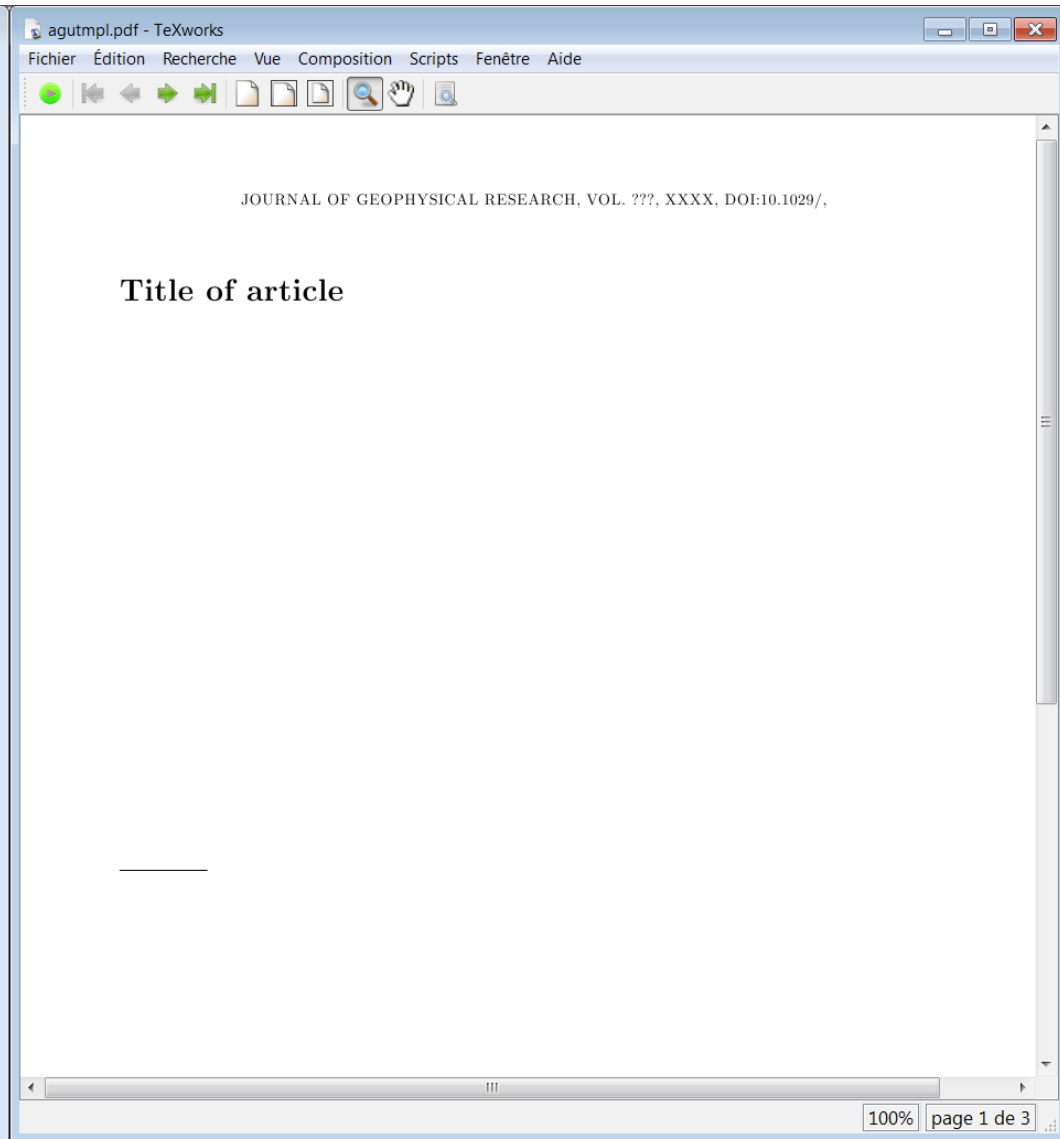
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\authors{Ira Didenkulova,\altaffilmark{1,2}
Irina Nikolkina\altaffilmark{1}, and Efim Pelinovsky\altaffilmark{3}}

\altaffiltext{1}{Institute of Cybernetics at Tallinn University of Technology, Tallinn, Estonia.}

\altaffiltext{2}{MARUM - Center for Marine Environmental Sciences, University of Bremen, Bremen, Germany.}

\altaffiltext{3}{Institute of Applied Physics, Nizhny Novgorod, Russia.}

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% ABSTRACT
%
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Properties of rogue waves in the basin of intermediate depth are discussed in comparison with known properties of rogue waves in deep waters. Based on observations of rogue waves in the ocean of intermediate depth we demonstrate that the modulational instability can still play a significant role in their formation for basins of 20 m and larger depth. For basins of smaller depth, the influence of modulational instability is less probable. By using the rational solutions of the nonlinear Schrödinger equation (breathers), it is shown that the rogue wave packet becomes wider and contains more individual waves in intermediate rather than in deep waters, which is also confirmed by observations.
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%
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\section{Introduction}
Abnormally high waves unexpectedly appearing \mbox{for a short} time at the sea surface (rogue waves) represent the hot topic in science in the last two decades. \mbox{The physical} mechanisms of their formation are described in \cite{KharifandPelinovsky, Dysthe, Kharifetal2009, Garrett, DidenkulovaPelinovsky2011, Slunyaev2011}

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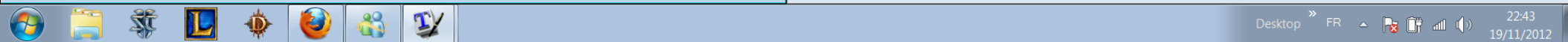
Ira Didenkulova,^{1,2} Irina Nikolkina¹, and Efim Pelinovsky³

Corresponding author: I. Didenkulova, Institute of Cybernetics at Tallinn University of Technology, Akadeemia tee 21, 12618, Tallinn, Estonia. (ira@cs.ioc.ee)

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DIDENKULOVA ET AL.: ROGUE WAVES IN BASIN OF INTERMEDIATE DEPTH X - 7


$$\gamma = \gamma_{\infty} G(kh), \quad \gamma_{\infty} = -\frac{\omega k^2}{2} = -\frac{\omega^5}{2g^2}, \quad (9)$$

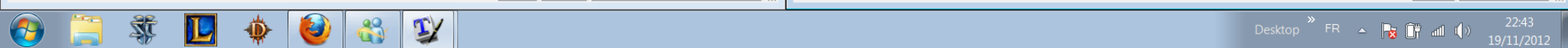


$$G = \frac{1}{4\sigma^4} \left[ \frac{1}{c_{gr}^2 - gh} \left\{ 4c_{ph}^2 + 4c_{ph}c_{gr}(1 - \sigma^2) + gh(1 - \sigma^2)^2 \right\} + \frac{1}{2\sigma^2}(9 - 10\sigma^2 + 9\sigma^4) \right], \quad (10)$$


here  $\sigma = \tanh(kh)$ ,  $c_{ph}$  and  $c_{gr}$  are the phase and group velocities of the linear surface gravity waves for  $\omega$  and  $k = k(\omega)$ , and  $x$  is the running coordinate moving with the group velocity. The behavior of corrections  $M$  and  $G$  with respect to the parameter  $\alpha$ , defined in Eq.(3), is demonstrated in Fig.(3). The dispersion correction changes non-monotonically reaching its maximum value of 1.787 for  $kh = 1.718$ . It is equal to 1 in deep waters and is zero in shallow waters. The correction to nonlinearity coefficient changes monotonically and tends to 1 in deep waters and to minus infinity in shallow water. Note, that the wave becomes more linear while approaching the modulational instability limit: its nonlinearity decreases and its dispersion is still high and close to its maximum value. The dispersion coefficient  $\mu$  is always negative, while  $\sigma$  changes its sign from negative to positive passing through the critical value of  $kh$  66 [66]; 62 [62]; 64 [64]. For the modulational instability regime (focused regime), Eq. (6) can be reduced to its canonical form

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working with MiKTeX

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