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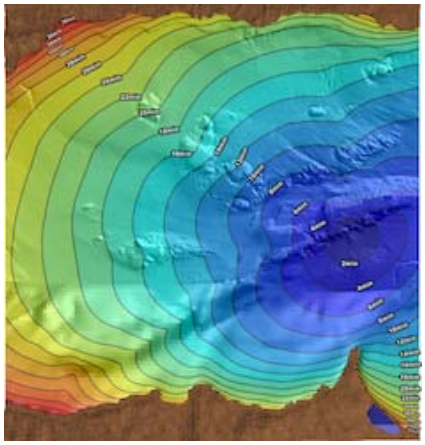
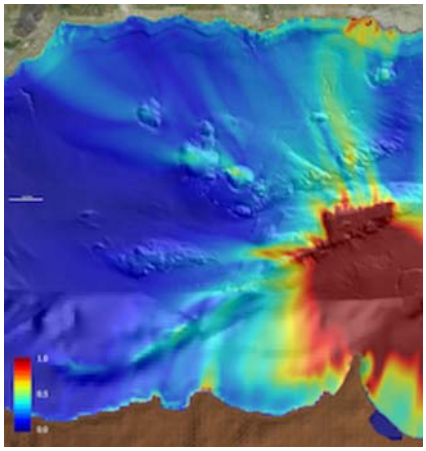
## Mathematical Modelling for Tsunami Early Warning Systems



**"Mathematical Modelling for Tsunami Early Warning Systems. An International Conference"** is a joint activity of the University of Malaga (UMA), the Mathematics-Industry Spanish Network (MATH-IN) and the Spanish Society of Applied Mathematics (SEMA), under the framework of The International Year for the Earth Planet MPE 2013. More than 100 scientific societies, universities, research institutes and other research institutions from all over the world have agreed to launch the initiative of the MPE 2013, on the understanding that Mathematics have a fundamental role facing major challenges posed for our planet and our civilization.



One of these challenges is the early prediction of natural hazards, in order to minimize their sometimes catastrophic impacts, through effective plans for disaster prevention, evacuation and aid. Among these natural disasters feature prominently, for their destructive power, the tsunamis. The development of mathematical and technological tools for the early detection of these large tsunami waves and the numerical simulation of their devastating coastal effects in far shorter times (extremely much shorter) than the real time is, currently, an area of very active research.

The conference is aimed at bringing together scientists from around the world with expertise or interest in Tsunami Early Warning Systems (TEWS) but with special emphasis on the North-Eastern Atlantic, Mediterranean and connected seas region (NEAMTWS), in order to assess the current state of fast tsunami computation for rapid faster than real time forecasting. **The scope includes not only mathematical modelling and numerical simulation of generation, propagation, and coastal amplification processes in the basis of a TEWS, but also monitoring, detection, operational forecasting, source inversion, educational policies, and information exchange, and warning issues, tsunami hazard assessment, and social science issues related to preparedness, training, insurance, and the development of structural and societal mitigation strategies and policies.**

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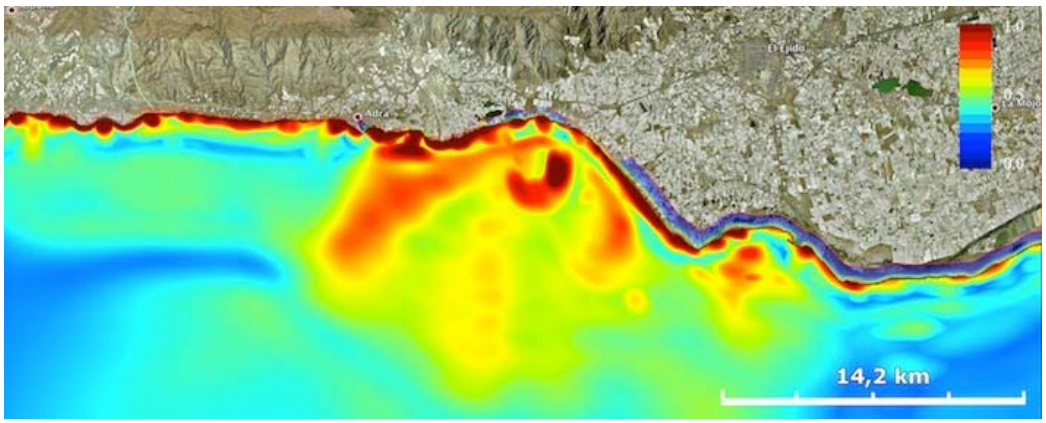
## Objectives

The main objectives of the workshop are:

1. Bringing together Applied Mathematicians, Geophysicists, and scientists from other disciplines together with public agencies decision-makers in order to discuss the current state of development of the models used in Tsunamis Early Warning Systems (TEWS), to analyze their deficiencies and detect challenges to overcome.
2. Promoting international and interdisciplinary collaboration in this area.
3. Strengthening the research in Spain in the development of this kind of numerical tools, and trying to interest students in Mathematics and Engineering to this exciting line of research as an investment in the future.
4. Performing outreach activities addressed to the general public, in order to convey the message of the importance of developing effective early warning systems for natural disasters and the key role that mathematical tools play in it.



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## Main Speakers

**Patrick Lynett**, University Southern California (USA)
*"Second-order corrections to depth-integrated long wave models"*

**Francois Schindelé**, CEA/DIF/DASE (France)
*"Recent achievements and challenges of the NEAMTWS"*

**Stefano Tinti**, Universitá di Bologna (Italy)
*"The role of uncertainties in tsunami forecast models"*

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## Invited Speakers

**Stéphane Abadie**, Université de Pau et des Pays de l'Adour (France)
*"Numerical simulation of Navier-Stokes equations for tsunamis generated by subaerial landslides and their impact on the coast"*

**Juan V. Cantavella**, IGN (Spain)
*"Design of the Spanish National Tsunami Warning Center"*

**Fernando Carrilho**, IMPA (Portugal)
*"The Portuguese National Tsunami Warning Center"*

**Manuel J. Castro**, Universidad de Málaga (Spain)
*"HySEA: A GPU-based model for Tsunami Early Warning Systems"*

**Gerasimos Chouliaras**, National Observatory of Athens (Greece)
*"Operational methods in the Hellenic National Tsunami Watch Center (HI_NTWC)"*

**Denys Dutykh**, LAMA, Université de Savoie (France)
*"Wave propagation over a rapidly varying bottom"*

**Mauricio González**, Universidad de Cantabria (Spain)
*"A methodology to ellaborate large scale national tsunami flooding maps combining NLSWE models with VOF RANS-based numerical models: An application for numerical data bases in TEWS"*

**Aurelio Mercado**, UPRM (Puerto Rico)
*"The Puerto Rico Tsunami Program after the 2004 Tsunami: Hazard and vulnerability assessment, public outreach and the Tsunami-Ready Program for Coastal Towns"*

**Öcal Necmioglu**, Bogazici University (Turkey)
*"Establishing a Tsunami Warning System in the Eastern Mediterranean: Challenges and outlook"*

**Alessio Piatanesi**, INGV (Italy)
*"Source inversion for tsunamigenic earthquakes"*

**Natalja Rakowsky**, Alfred Wegener Institute (Germany)
*"Retrospect on the modelling activities 2005 - 2014 for the German-Indonesian Tsunami Early Warning System (GITEWS)"*

**Amos Salamon**, Geologycal Survey of Israel (Israel)
*"Landslide tsunamis in the Levant – From historical archives to modern simulations"*

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## Schedule

| | Wednesday | Thursday | Friday |
|---|---|---|---|
| 8:45-9:00 | Opening | | |
| 09:00-10:00 | *Main 1*<br>*Stefano Tinti* | *Main2*<br>*Patrick Lynett* | *Main 3*<br>*Francois Schindelé* |
| 10:00-10:45 | *Conference 1*<br>*Öcal Necmioglu* | *Conference 5*<br>*Natalja Rakowsky* | *Conference 9*<br>*Alessio Piatanesi* |
| *10:45-11:15* | *Coffee break* | *Coffee break* | *Coffee break* |
| 11:15-12:00 | *Conference 2*<br>*Gerasimos Chouliaras* | *Conference 6*<br>*Manuel J. Castro* | *Conference 10*<br>*Denys Dutykh* |
| 12:00-12:45 | *Conference 3*<br>*Fernando Carrilho* | *Conference 7*<br>*Mauricio González* | *Conference 11*<br>*Stéphane Abadie* |
| 12:45-13:30 | *Conference 4*<br>*Juan V. Cantavella* | *Conference 8*<br>*Aurelio Mercado* | *Conference 12*<br>*Amos Salamon* |
| 13:30-15:30 | Lunch | Lunch | Lunch |
| 15:30-15:50 | *Communication 1*<br>*Diego Arcas* | *Communication 4*<br>*Martin Hammitzsch* | *Communication 7*<br>*Stefano Lorito* |
| 15:50-16:10 | *Communication 2*<br>*Begoña Pérez* | *Communication 5*<br>*Jamie Rodney* | *Communication 8*<br>*Ángel Amores* |
| 16:10-16:30 | *Communication 3*<br>*Anna Dzvonkovskaya* | *Communication 6*<br>*Martina Ulvrova* | *Communication 9*<br>*José M. González-Vida* |
| 16:30-17:30 | POSTER SESSION | | |
| 17:30-19:00 | | | |
| 19:00-20:00 | *Dissemination 1*<br>*Juan Carlos Mora* | City Tour | *Dissemination 3*<br>Diego Arcas |
| 20:00-21:00 | *Dissemination 2*<br>*Spanish Civil Protection* | | |
| 21:00-22:30 | | Conference Dinner | |

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## Wednesday, 9th April

**8:15-8:45 Registration of participants**

**8:45-9:00 Opening**

**Main Speaker**

Stefano Tinti, Universitá di Bologna (Italy)

*"The role of uncertainties in tsunami forecast models"*

**Invited Speakers**

1. Öcal Necmioglu, Bogazici University (Turkey)

   *"Establishing a Tsunami Warning System in the Eastern Mediterranean: Challenges and outlook"*

2. Gerasimos Chouliaras, National Observatory of Athens (Greece)

   *"Operational methods in the Hellenic National Tsunami Watch Center (HI_NTWC)"*

3. Fernando Carrilho, IMPA (Portugal)

   *"The Portuguese National Tsunami Warning Center"*

4. Juan V. Cantavella, ING (Spain)

   *"Design of the Spanish National Tsunami Warning Center"*

**Communications**

1. Diego Arcas.

   *"NOAA forecast system"*

2. Begoña Pérez.

   *"Tsunami detection component: discussion about the existing network and real-time data processing"*

3. Anna Dzvonkovskaya.

   *"Tsunami Surface Current Simulations and Measurements by Oceanographic High-Frequency Radar"*

**16:30-17:30 Poster Session**

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**Thursday, 10th April.**

**Main Speaker**

Patrick Lynett, University Southern California (USA)

*"Second-Order Corrections to Depth-Integrated Long Wave Models"*

**Invited Speakers**

1. Natalja Rakowsky, Alfred Wegener Institute (Germany)

   *"Retrospect on the modelling activities 2005 - 2014 for the German-Indonesian Tsunami Early Warning System (GITEWS)"*

2. Manuel J. Castro, EDANYA Group, Universidad de Málaga (Spain)

   *"HySEA: a GPU-based model for Tsunami Early Warning Systems"*

3. Mauricio González, Universidad de Cantabria (Spain)

   *"A methodology to ellaborate large scale national tsunami flooding maps combining NLSWE models with VOF RANS-based numerical models: An application for numerical data bases in TEWS"*

4. Aurelio Mercado, UPRM (Puerto Rico)

   *"The Puerto Rico Tsunami Program after the 2004 Tsunami: Hazard and vulnerability assessment, public outreach and the Tsunami-Ready Program for Coastal Towns"*

**Communications**

1. Martin Hammitzsch.

   *"Implementation and integration of GPU-accelerated easyWave for instant tsunami propagation calculations in the TRIDEC tsunami early warning system demonstrator"*

2. Jamie Rodney.

   *"GPU-based Modeling of Tsunami Propagation and Inundation"*

3. Martina Ulvrova.

   *"Numerical platform for volcanic tsunami modelling"*