

# Mathematics of Planet Earth



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## **Melting of ice caps, simulating power grids and modeling the dangers of the sun - the winners of the second Mathematics of Planet Earth competition announced**

London/Paris, October 21, 2017. [UNESCO](#), the [International Mathematical Union](#) (IMU), the [International Commission on Mathematical Instruction](#) (ICMI), and [IMAGINARY](#) are announcing the winners of [the second international competition for exhibition modules](#) for the [Open Source Exhibition Mathematics of Planet Earth \(MPE\)](#). This project aims to showcase ways in which the mathematical sciences are useful for understanding our planet and addressing the challenges of sustainable development and global changes.

The announcement will be part of the [opening ceremony of the MPE exhibition](#) at [Imperial College London](#), which is organized by [the EPSRC Centre for Doctoral Training \(CDT\) in the Mathematics of Planet Earth](#).

An international jury evaluated the 28 submissions from 16 countries and will award a total of US-\$ 8 000 of prize money to the three winners:

- 1) "[Simulating the melting of ice caps](#)"  
Authors: Maëlle Nodet (University Grenoble 1), Jocelyne Erhel (Inria)  
Country: France, Category: Software
  
- 2) "[Powergrid Dynamics Simulation](#)"  
Authors: Frank Hellmann and Paul Schultz (Potsdam Institute for Climate Impact Research)  
Country: Germany, Category: Software
  
- 3) "[EUHFORIA: modeling the dangers of the sun](#)"  
Author: Christine Verbeke (KU Leuven)  
Country: Belgium, Category: Film

The competition is part of the [international Mathematics of Planet Earth initiative \(MPE\)](#), a project devised by an international community of mathematicians and scientists. [The Open Source MPE Exhibition](#) was originally initiated by the community through the first international competition in 2013 and has been constantly growing since. The exhibition consists of interactive and physical modules, films and images. The modules can be reproduced and adapted by science museums and schools around the world.

*“The problem of rising ocean levels due to global warming and the melting of the Greenland and Antarctic ice sheets is of significant current interest, and the authors of the winner module demonstrate how applied mathematics and computational science contribute to our understanding of the problem.”* is one of the jury decisions.

[The exhibition in London](#) is open from October 21 - 29, 2017 (10 am to 6 pm) and is open to the general public with a free admission. All the winning modules can be downloaded under an open license from <http://imaginary.org/mpe>. Details on MPE can be found on [www.mathofplanetearth.org](http://www.mathofplanetearth.org).

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## Appendix with further details:

### Names of the members of the Jury of the MPE competition

- Mireille Chaleyat-Maurel, Emeritus Professor University Paris Descartes, Paris, France, Chair
- Eduardo Colli, University of Sao Paulo, Brazil
- Mama Foupouagnigni, Professor of Mathematics, University of Yaounde I, Cameroon Center President, AIMS Cameroon
- Ansie Harding, Department of Mathematics and Applied Mathematics, University of Pretoria, South Africa
- Hans G. Kaper, Georgetown University, Washington, DC, and Founding Chair, SIAM Activity Group on Mathematics of Planet Earth, USA
- Sreekar Vadlamani, TIFR Centre for Applicable Mathematics, Bangalore, India

### Submissions

28 submissions :

5 films

9 galleries

6 hands-on modules

8 software modules

16 different countries :

Belgium, Chile, France, Germany,

Greece, Italy, Mexico, Niger, Nigeria,

Portugal, Russia, Serbia, South Africa,

Switzerland, UK, USA

### Prizes

**First Prize:** "[Simulating the melting of ice caps](#)"

Authors: Maëlle Nodet (University Grenoble 1), Jocelyne Erhel (Inria)

Country: France

Category: Software

This submission makes a perfect case for “Mathematics of Planet Earth” (MPE). The problem of rising ocean levels due to global warming and the melting of the Greenland and Antarctic ice sheets is of significant current interest, and the authors demonstrate how applied mathematics and computational science contribute to our understanding of the problem. The module is presented as an interactive book, consisting of several pages. It describes the physical processes that take place both in the bulk and at the boundaries of the ice sheets; it describes how these processes are formulated in the language of mathematics, and how the resulting equations are reformulated as mathematical algorithms that can be implemented in computer software. At the end, there is a quiz to show that numerical simulations may require a compromise between accuracy and computation time. The texts are accurate and informative, with the right level of technical detail.

**Second Prize:** "[Powergrid Dynamics Simulation](#)"

Authors: Frank Hellmann and Paul Schultz (Potsdam Institute for Climate Impact Research)

Country: Germany

Category: Software

Powergrid failures are not alien to any of us. It is not only one of the challenges faced by many developing countries, but this is also a serious concern for many developed economies too. Needless to say, the stakes are often very high.

This exhibit submitted by Frank Hellman is a beautiful display through which one can, not only witness an array of mathematical concepts, but it also presents a toy example of how a stable power grid looks like, and what can possibly disrupt the stability of such a system. This exhibit represents a power grid through a dynamical graph, and is an excellent way to display how small perturbations at one node traverse in an interactive system like a graph.

**Third Prize:** "[EUHFORIA: modeling the dangers of the sun](#)"

Author: Christine Verbeke (KU Leuven)

Country: Belgium

Category: Film

The film EUHFORIA: modeling the dangers of the sun alerts the viewer to the dangers of the sun, emanating from Coronal Mass Ejection (CME) which appears once in a while. The mathematical model EUHFORIA predicts the arrival time and impact of such CMEs, enabling mankind to prepare for such an event. The appeal of the film lies in the clear exposition, and the visually pleasing presentation. The workings of the mathematical model is illustrated by colourful animated diagrams, conveying the important message of the film.

The competition for the African module remains open until August 31, 2018.

[The exhibition in London](#) is organized by the [EPSRC Centre for Doctoral Training \(CDT\) in the Mathematics of Planet Earth](#). It was jointly created by Imperial College London and the University of Reading to bring together world class academics, external partners and representatives from key commercial sectors.