### Project Information

- **TiPES**
- **Grant agreement ID:** 820970
- **Status:** Ongoing project
- **Start date:** 1 September 2019
- **End date:** 31 August 2023

Funded under H2020-EU.3.5.1.

- **Overall budget:** € 8 561 238.75
- **EU contribution:** € 8 561 238.75

Coordinated by

KOBEHAVNS UNIVERSITET
Denmark

### Project description

#### Models of prediction for Earth system's tipping points

The Earth has gone through abrupt transitions through its history, but the underlying mechanisms are still not fully understood, nor can current models simulate past abrupt transitions realistically. The TiPES project will focus on the urgent need to examine the tipping points at which subsystems of the Earth have changed, improve the modelling of abrupt transitions better, and provide an estimate of stability of desirable states. TiPES will therefore contribute to better prediction of possible future abrupt changes caused by anthropogenic global warming, clarify what crossing the tipping points means socioeconomically, and help policymakers plan strategies to create safe operating spaces for humanity.
Objective

There is rising concern that several subsystems of the Earth may respond highly nonlinearly at critical future levels of anthropogenic forcing; these levels have recently been associated with tipping points (TPs). It is paramount to identify safe operating spaces for humanity and the planet in terms of these critical forcing levels, in order to prevent harmful transitions to alternative, undesirable states of the Earth system. The mechanisms leading to such abrupt transitions are only partly understood, and further research in this regard is urgently needed. State-of-art Earth System Models appear to respond too smoothly at TPs and have difficulties in simulating abrupt transitions that occurred in the planet’s history. TiPES will address these problems from several angles: 1. The project will identify subsystems that may exhibit abrupt transitions, and couplings between them, by focussing on paleoclimatic records and abrupt transitions therein. Novel methods to detect Early Warning Signals of forthcoming TPs, and to make skilful predictions on their basis, will be developed. 2. The potential shortcomings of models in representing TPs will be evaluated; in particular, TiPES will investigate how Bayesian calibration techniques can help enable these models to simulate past abrupt transitions. 3. TiPES will develop a generalized theory of climate sensitivity that accounts for the presence of TPs and feedbacks across various time scales. 4. To define safe operating spaces. TiPES will focus on dynamical system theory and on global stability notions for non-autonomous systems in order to estimate the stability of desirable states. 5. The results obtained by the project will be communicated to policy makers in a manner that facilitates decisions and their implementation. TiPES will develop formal approaches to define the socioeconomic risks of crossing TPs, and to derive decision strategies to keep anthropogenic forcing below levels where abrupt transitions may occur.

Field of science

/humanities/history and archaeology/history
/natural sciences/physical sciences/astronomy/planetary science/planets

Programme(s)

Topic(s)

Call for proposal

H2020-LC-CLA-2018-2

Funding Scheme
## Funding Scheme

RIA - Research and Innovation action

### Coordinator

<table>
<thead>
<tr>
<th>KOBENHAVNS UNIVERSITET</th>
</tr>
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<tbody>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Norregade 10</td>
</tr>
<tr>
<td>1165 Kobenhavn</td>
</tr>
<tr>
<td>Denmark</td>
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Website [](#)  
Contact the organisation [](#)

### Participants (17)

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<tr>
<td>Address</td>
</tr>
<tr>
<td>The Queen’s Drive Northcote House</td>
</tr>
<tr>
<td>EX4 4QJ Exeter</td>
</tr>
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<tr>
<td>€ 1 111 250</td>
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<tr>
<td>Address</td>
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<tr>
<td>Telegrafenberg 31</td>
</tr>
<tr>
<td>14473 Potsdam</td>
</tr>
<tr>
<td>Activity type</td>
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<td>Research Organisations</td>
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<tr>
<td>THE UNIVERSITY OF READING</td>
<td>United Kingdom</td>
<td>€ 702 698.75</td>
<td>Whiteknights Campus, Whiteknights House, RG6 6AH Reading</td>
<td>Higher or Secondary Education Establishments</td>
</tr>
<tr>
<td>UNITED KINGDOM RESEARCH AND INNOVATION</td>
<td>United Kingdom</td>
<td>€ 574 390</td>
<td>Polaris House North Star Avenue</td>
<td>Research Organisations</td>
</tr>
<tr>
<td>UNIVERSITAET BERN</td>
<td>Switzerland</td>
<td>€ 496 696.25</td>
<td>Hochschulstrasse 6, 3012 Bern</td>
<td>Higher or Secondary Education Establishments</td>
</tr>
<tr>
<td>UNIVERSITEIT UTRECHT</td>
<td>Netherlands</td>
<td>€ 725 062.50</td>
<td>Heidelberglaan 8, 3584 CS Utrecht</td>
<td>Higher or Secondary Education Establishments</td>
</tr>
</tbody>
</table>
UNIVERSITE CATHOLIQUE DE LOUVAIN
Belgium
€ 545 845
Address
Place De L Universite 1
1348 Louvain La Neuve
Website
Contact the organisation
Activity type
Higher or Secondary
Education Establishments

TECHNISCHE UNIVERSITAET MUENCHEN
Germany
€ 419 206,25
Address
Arcisstrasse 21
80333 Muenchen
Website
Contact the organisation
Activity type
Higher or Secondary
Education Establishments

CONSIGLIO NAZIONALE DELLE RICERCHE
Italy
€ 256 777,50
Address
Piazzale Aldo Moro 7
00185 Roma
Website
Contact the organisation
Activity type
Research Organisations

ECOLE NORMALE SUPERIEURE
France
€ 184 625
Address
45, Rue D'ulm
75230 Paris Cedex 05
Website
Contact the organisation
Activity type
Higher or Secondary
Education Establishments
UNIVERSITETET I TROMSOE - NORGES ARKTISKE UNIVERSITET
Norway
EU contribution
€ 102 137,50
Address
Hansine Hansens Veg 14
9019 Tromso
Activity type
Higher or Secondary Education Establishments
Website
Contact the organisation

INESC TEC - INSTITUTO DE ENGENHARIADE SISTEMAS E COMPUTADORES, TECNOLOGIA E CIENCIA
Portugal
EU contribution
€ 48 250
Address
Rua Dr Roberto Frias Campus Da Feup
4200 465 Porto
Activity type
Research Organisations
Website
Contact the organisation

UNIVERSITY OF BRISTOL
United Kingdom
EU contribution
€ 200 885
Address
Beacon House Queens Road BS8 1QU Bristol
Activity type
Higher or Secondary Education Establishments
Website
Contact the organisation

STICHTING VU
Netherlands
EU contribution
€ 250 263,75
Address
De Boelelaan 1105
1081 HV Amsterdam
Activity type
Higher or Secondary Education Establishments
Website
Contact the organisation