WHat next? an Integrated PLanetary Atmosphere Simulator: from Habitable worlds to Hot jupiters

Fact Sheet

Project Information

WHIPLASH

Grant agreement ID: 679030

Project website

DOI
10.3030/679030

Project closed

EC signature date
18 May 2016

Start date
1 September 2016

End date
28 February 2022

Funded under
EXCELLENT SCIENCE - European Research Council (ERC)

Total cost
€ 1 480 421,00

EU contribution
€ 1 480 421,00

Coordinated by
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS
France

Objective

Thousands of exoplanets have now been found. In the next decade, the grand challenge is to characterize their atmospheres. This is the only way to unravel the origin of the wild, unexpected diversity we have uncovered. For this task, there are several planned missions—JWST being our next best opportunity. However, to be ready for the analysis and interpretation of such high-precision observations, we need new-generation tools fit to address the multiple challenges they will raise.

Indeed, until now, most atmospheric characterization observations—e.g. transit/eclipse spectroscopy—are analyzed with spherically symmetric, steady state 1D models that cannot accurately represent the very anisotropic atmospheres of most transiting exoplanets. This issue is worsened by the ubiquity of clouds, whose inhomogeneous spatial distribution—patchiness—prevents any satisfactory treatment in 1D.
In this project, we will develop a new framework to constrain the physics and composition of exo-atmospheres that will allow us to overcome these difficulties when analyzing and interpreting observations. This will be done by exploiting a new 3D planetary atmosphere simulator that integrates a global climate model and a 3D Monte Carlo radiative transfer code to generate observables. Using such an innovative approach, this ERC project will thus answer the following fundamental questions:
- What are the necessary conditions to sustain liquid water on terrestrial exoplanets? How can we infer observationally whether an atmosphere meeting these requirements is actually present?
- Can clouds explain the puzzling features of observed hot, gaseous exoplanets? What can these observations tell us on the dynamical and microphysical properties of clouds inside these atmospheres?
If we want theory to keep pace with the quality of future data, such a project is the necessary counterpart to the huge ongoing observational effort made by the community.

Fields of science (EuroSciVoc)

natural sciences > physical sciences > astronomy > planetary sciences > planets > **exoplanetology**

natural sciences > physical sciences > optics > **spectroscopy**

Programme(s)

H2020-EU.1.1. - EXCELLENT SCIENCE - European Research Council (ERC) MAIN PROGRAMME

Topic(s)

ERC-StG-2015 - ERC Starting Grant

Call for proposal

ERC-2015-STG

See other projects for this call

Funding Scheme

ERC-STG - Starting Grant

Host institution

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS

Net EU contribution

€ 1 424 801,00

Total cost

€ 1 480 421,00

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Region

Ile-de-France > Ile-de-France > Hauts-de-Seine

Activity type

Research Organisations

Links

Contact the organisation Website
Participation in EU R&I programmes
HORIZON collaboration network

Beneficiaries (2)

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS

France

Net EU contribution

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THIRD-PARTY

UNIVERSITE COTE D'AZUR

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Net EU contribution

€ 55 620,00

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Activity type

Higher or Secondary Education Establishments

Links

Contact the organisation
Participation in EU R&I programmes
HORIZON collaboration network

Total cost

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Last update: 16 September 2022

Permalink: https://cordis.europa.eu/project/id/679030