

Research Topic for the ParisTech/CSC PhD Program
(one page maximum)

***Field (cf. List of fields below):** *Environment Science and Technology, Geosciences*

Subfield: Space Weather

Title: Forecasting Solar Eruptions against Space Weather Impacts on Earth infrastructures

ParisTech School: Ecole Polytechnique

Advisor(s) Name:): Tahar Amari

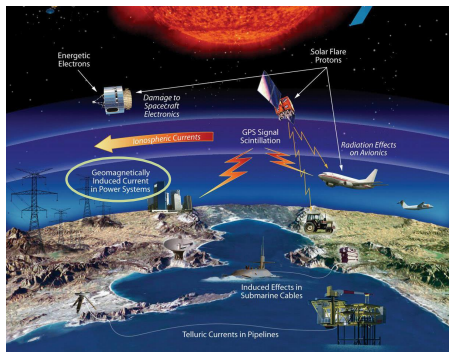
Advisor(s) Email: : tahar.amari@polytechnique.edu, URL : <http://www.cpht.polytechnique.fr/cpht/amari>

(Lab, website): *Centre de Physique Théorique. Ecole Polytechnique.*
<http://www.cpht.polytechnique.fr/>

Short description of possible research topics for a PhD: (10-15 lines in English + optional figure)

Solar Eruptions may have a strong economic impact on various sectors, power grids, satellites, communications, GPS, living organisms, Forecasting eruptions as well as their impact has become a new sector called Space Weather.

This project consists in building an operational model for forecasting the solar environment which includes the regions of the Sun from which eruptions can take off as well the whole Sun global background.



The applicant will work on and with several state-of-the-art numerical models developed in the Centre de Physique Théorique, using the solar surface magnetic field obtained from instruments on board present and future satellites. Those models will allow forecast the pre-eruptive signs of eruptions as well key parameters of space weather conditions. The prediction using the models at large distance will be compared to other kind of data, including in situ data close Earth environment.

Required background of the student: (Which should be the main field of study of the applicant before applying)

The applicant should have been trained in modeling, and/or data processing and will thus have followed courses in fields such as: computer science applied to fluid dynamics, physics, astrophysical or laboratory physics.

A list of 5(max.) representative publications of the group: (Related to the research topic)

Amari, T., Canou A., Aly J.J., Delyon, F., Alauzet F.: « Magnetic cage and rope as the key for solar eruptions. » **Nature** 554: 211-215 (2018).

Amari, T., Luciani J.F., Aly J.J.: « Small-scale dynamo magnetism as the driver for heating the solar atmosphere. » **Nature** 522: 188-191 (2015).

Amari, T. , Canou A., . Aly J.J : « Characterizing and predicting the magnetic environment leading to solar eruptions. » **Nature** 514: 465–469 (2014)