Articles scientifiques, données : comment ça marche?

Exemple de l'astronomie

Romaric Gravet
Docteur en sciences de l'Univers
Spécialité : Physique solaire
romaricgravetphd@gmail.com

19 novembre 2021

Introduction

Selon une étude...

Source : CERN

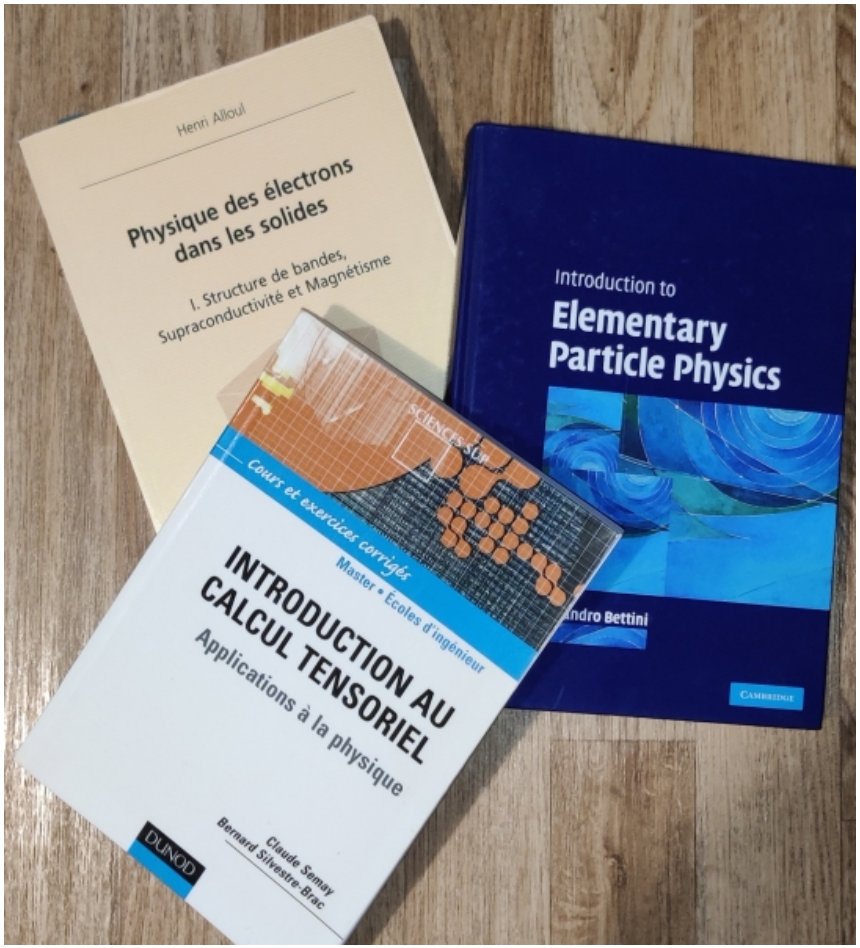
La littérature scientifique

La vulgarisation

- Auteur : Journaliste, vulgarisateur, chercheur,. . .
- Public cible : Tout public
- But : Populariser la science et les découvertes scientifiques
- Langue : Français
- Ne donne pas obligatoirement une vision objective du consensus scientifique

  N'est pas soumise à une revue par les pairs

Les livres "universitaires"



- Auteur : Chercheurs
- Public cible : Étudiants
- But : Fournir les bases techniques d'un domaine précis
- Langue : Français, anglais
- Ne donne pas obligatoirement une vision récente de l'état d'un sujet

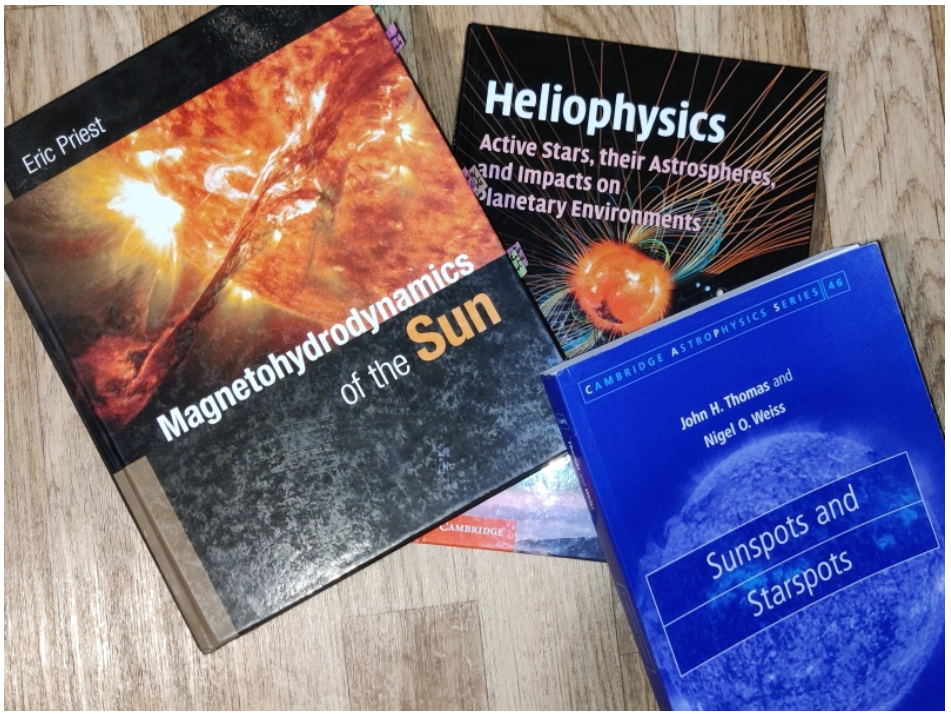
  N'est pas soumise à une revue par les pairs

Les livres "scientifiques"

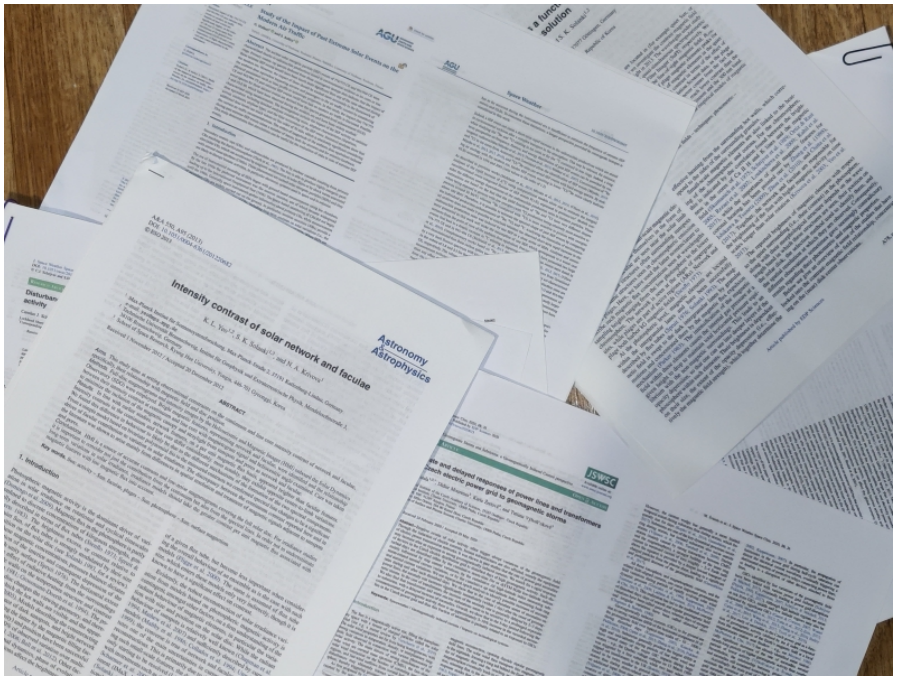
- Auteur : Chercheurs
- Public cible : Doctorants et chercheurs
- But : Fournir l'état de l'art d'un domaine précis et restreint
- Langue : Anglais
- Donne une vision récente de l'état d'un sujet

  Pas de revue par les pairs

  Mais souvent collaboratif

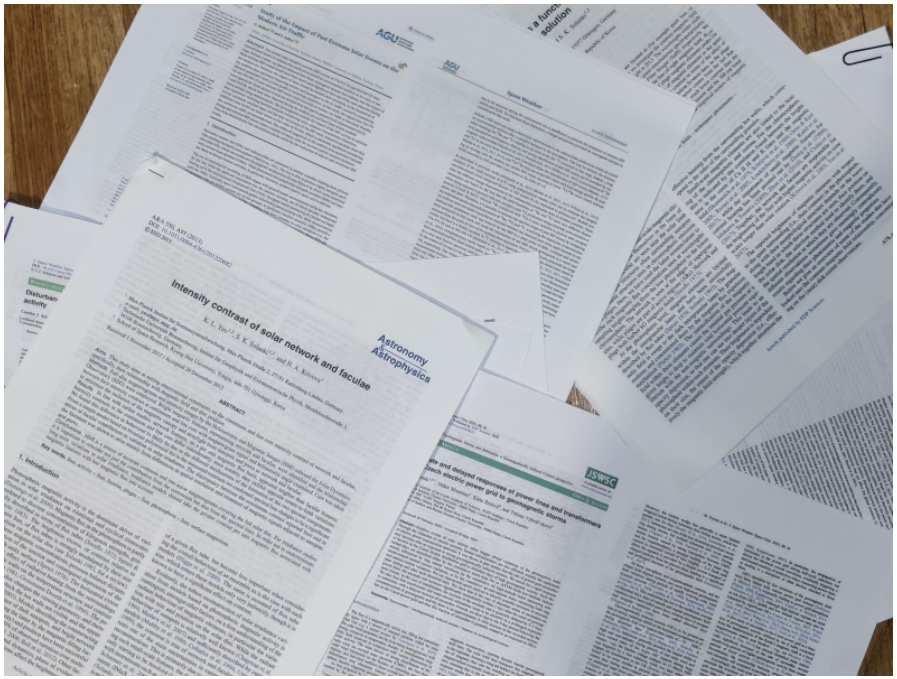


Les articles scientifiques



- Auteur : Chercheurs
- Public cible : Doctorants et chercheurs
- Langue : Anglais
- Type :

Les articles scientifiques



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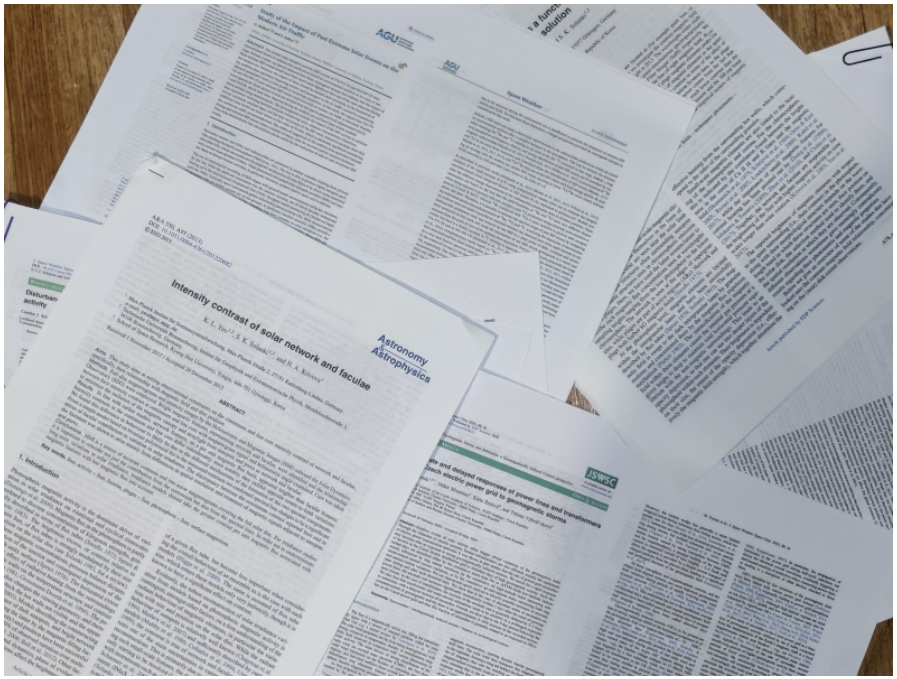
- Public cible : Doctorants et chercheurs
- Langue : Anglais
- Type :
  - Article $\Rightarrow$ présentent les résultats d'une étude/observation bien précise

Les articles scientifiques



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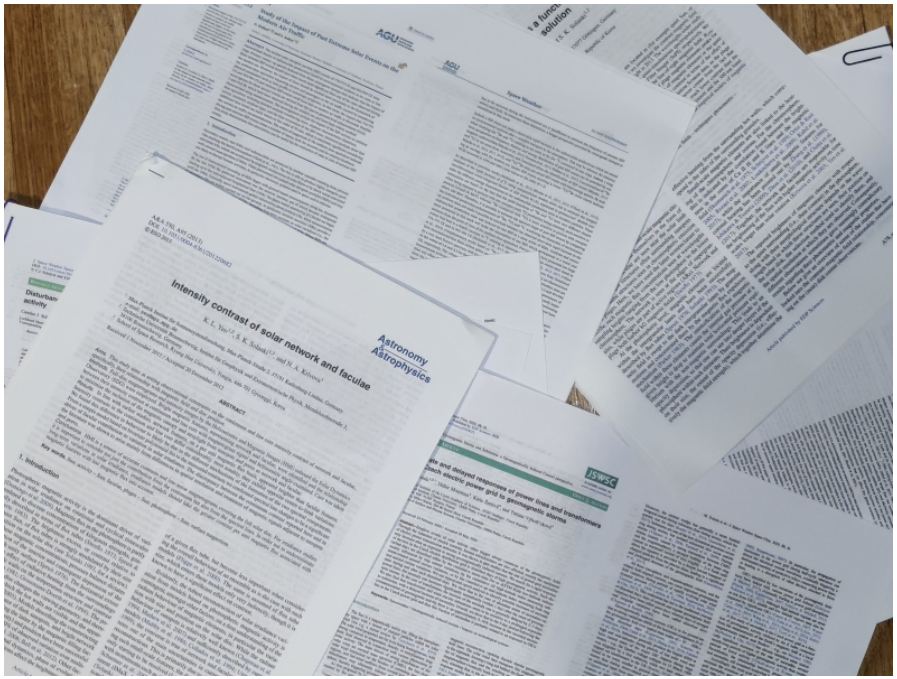
- Public cible : Doctorants et chercheurs
- Langue : Anglais
- Type :
  - Article ⇒ présentent les résultats d'une étude/observation bien précise
  - Méta-analyse ⇒ réévalue un sujet en combinant les données d'autres études portant sur le même sujet

Les articles scientifiques



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- Public cible : Doctorants et chercheurs
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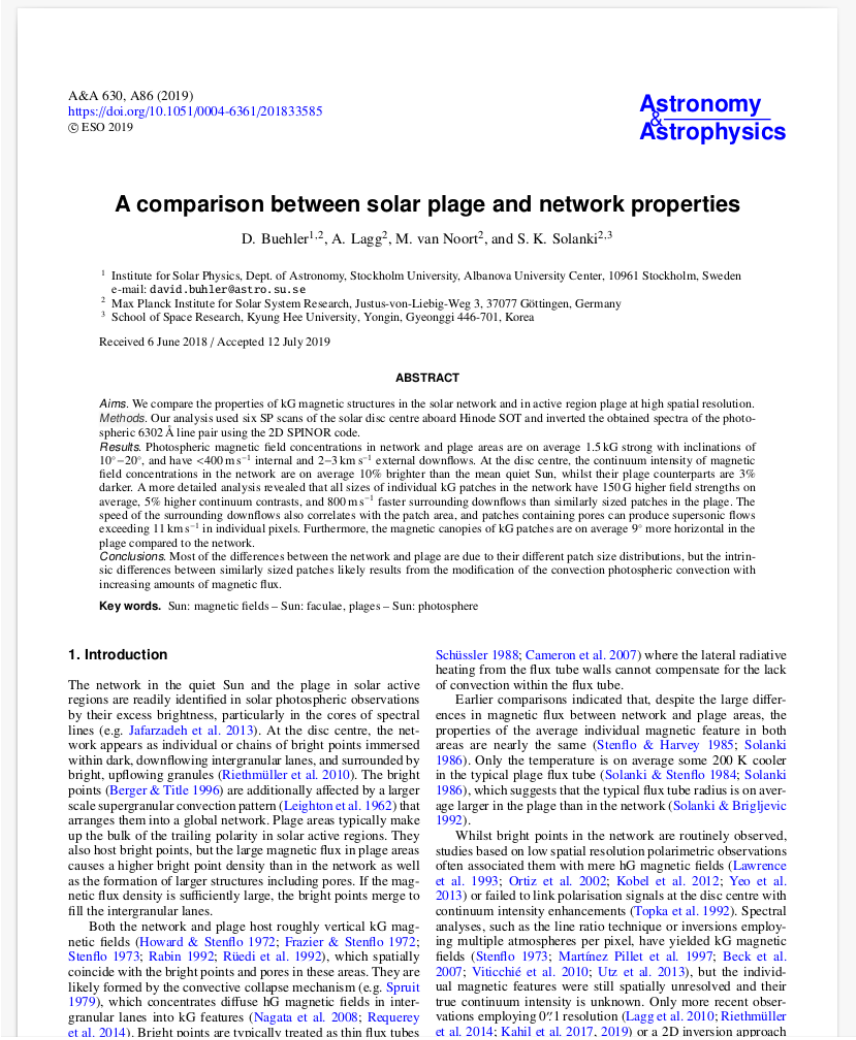
  - Méta-analyse ⇒ réévalue un sujet en combinant les données d'autres études portant sur le même sujet
  - Review ⇒ fait une revue des articles scientifiques concernant un sujet précis et essaie de faire ressortir les tendances générales.

La structure



A&A 630, A86 (2019)
https://doi.org/10.1051/0004-6361/201833585
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Astronomy & Astrophysics

A comparison between solar plage and network properties

D. Buehler[1,2], A. Lagg[2], M. van Noort[2], and S. K. Solanki[2,3]

[1] Institute for Solar Physics, Dept. of Astronomy, Stockholm University, Albanova University Center, 10961 Stockholm, Sweden
e-mail: david.buhler@astro.su.se
[2] Max Planck Institute for Solar System Research, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany
[3] School of Space Research, Kyung Hee University, Yongin, Gyeonggi 446-701, Korea

Received 6 June 2018 / Accepted 12 July 2019

ABSTRACT

Aims. We compare the properties of kG magnetic structures in the solar network and in active region plage at high spatial resolution.
Methods. Our analysis used six SP scans of the solar disc centre aboard Hinode SOT and inverted the obtained spectra of the photospheric 6302 Å line pair using the 2D SPINOR code.
Results. Photospheric magnetic field concentrations in network and plage areas are on average 1.5 kG strong with inclinations of 10°–20°, and have <400 m s^{-1} internal and 2–3 km s^{-1} external downflows. At the disc centre, the continuum intensity of magnetic field concentrations in the network are on average 10% brighter than the mean quiet Sun, whilst their plage counterparts are 3% darker. A more detailed analysis revealed that all sizes of individual kG patches in the network have 150 G higher field strengths on average, 5% higher continuum contrasts, and 800 m s^{-1} faster surrounding downflows than similarly sized patches in the plage. The speed of the surrounding downflows also correlates with the patch area, and patches containing pores can produce supersonic flows exceeding 11 km s^{-1} in individual pixels. Furthermore, the magnetic canopies of kG patches are on average 9° more horizontal in the plage compared to the network.
Conclusions. Most of the differences between the network and plage are due to their different patch size distributions, but the intrinsic differences between similarly sized patches likely results from the modification of the convection photospheric convection with increasing amounts of magnetic flux.

Key words. Sun: magnetic fields – Sun: faculae, plages – Sun: photosphere

1. Introduction

The network in the quiet Sun and the plage in solar active regions are readily identified in solar photospheric observations by their excess brightness, particularly in the cores of spectral lines (e.g. Jafarzadeh et al. 2013). At the disc centre, the network appears as individual or chains of bright points immersed within dark, downflowing intergranular lanes, and surrounded by bright, upflowing granules (Riethmüller et al. 2010). The bright points (Berger & Title 1996) are additionally affected by a larger scale supergranular convection pattern (Leighton et al. 1962) that arranges them into a global network. Plage areas typically make up the bulk of the trailing polarity in solar active regions. They also host bright points, but the large magnetic flux in plage areas causes a higher bright point density than in the network as well as the formation of larger structures including pores. If the magnetic flux density is sufficiently large, the bright points merge to fill the intergranular lanes.

Both the network and plage host roughly vertical kG magnetic fields (Howard & Stenflo 1972; Frazier & Stenflo 1972; Stenflo 1973; Rabin 1992; Rüedi et al. 1992), which spatially coincide with the bright points and pores in these areas. They are likely formed by the convective collapse mechanism (e.g. Spruit 1979), which concentrates diffuse hG magnetic fields in intergranular lanes into kG features (Nagata et al. 2008; Requerey et al. 2014). Bright points are typically treated as thin flux tubes Schüssler 1988; Cameron et al. 2007) where the lateral radiative heating from the flux tube walls cannot compensate for the lack of convection within the flux tube.

Earlier comparisons indicated that, despite the large differences in magnetic flux between network and plage areas, the properties of the average individual magnetic feature in both areas are nearly the same (Stenflo & Harvey 1985; Solanki 1986). Only the temperature is on average some 200 K cooler in the typical plage flux tube (Solanki & Stenflo 1984; Solanki 1986), which suggests that the typical flux tube radius is on average larger in the plage than in the network (Solanki & Brigljevic 1992).

Whilst bright points in the network are routinely observed, studies based on low spatial resolution polarimetric observations often associated them with mere hG magnetic fields (Lawrence et al. 1993; Ortiz et al. 2002; Kobel et al. 2012; Yeo et al. 2013) or failed to link polarisation signals at the disc centre with continuum intensity enhancements (Topka et al. 1992). Spectral analyses, such as the line ratio technique or inversions employing multiple atmospheres per pixel, have yielded kG magnetic fields (Stenflo 1973; Martínez Pillet et al. 1997; Beck et al. 2007; Viticchié et al. 2010; Utz et al. 2013), but the individual magnetic features were still spatially unresolved and their true continuum intensity is unknown. Only more recent observations employing 0.″1 resolution (Lagg et al. 2010; Riethmüller et al. 2014; Kahil et al. 2017, 2019) or a 2D inversion approach

- Titre
- Auteurs
- Abstract

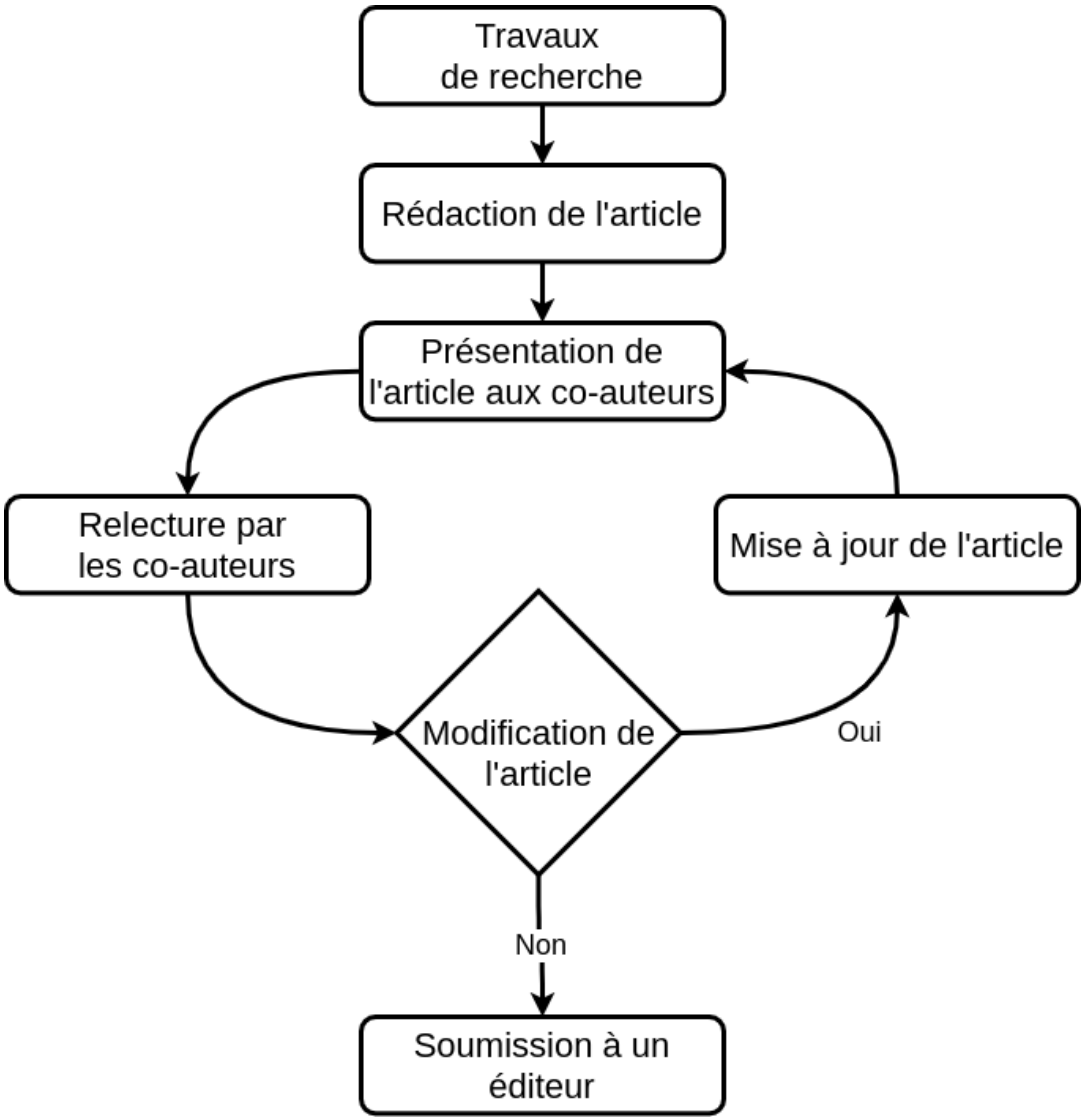
  Court résumé de l'étude
- Introduction

  État de l'art, contexte, hypothèse/question étudiée
- Méthodes

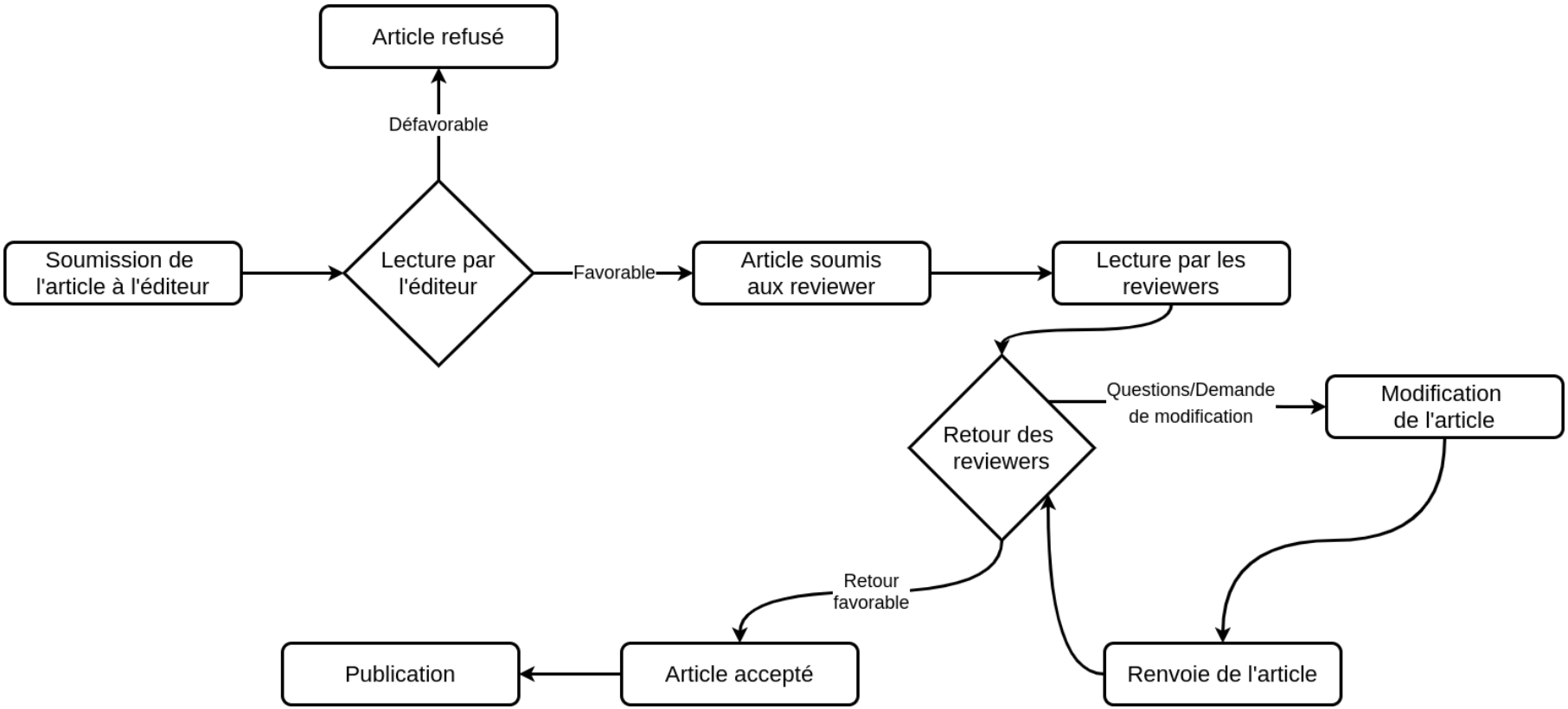
  Instruments utilisés, date d'observation, méthode d'analyse,...
- Résultats
- Discussion

  Analyse des résultats, implications pour l'hypothèse testée, limites de l'expérience,...
- La conclusion
- Bibliographie, annexes

L'écriture d'un article



La publication d'un article



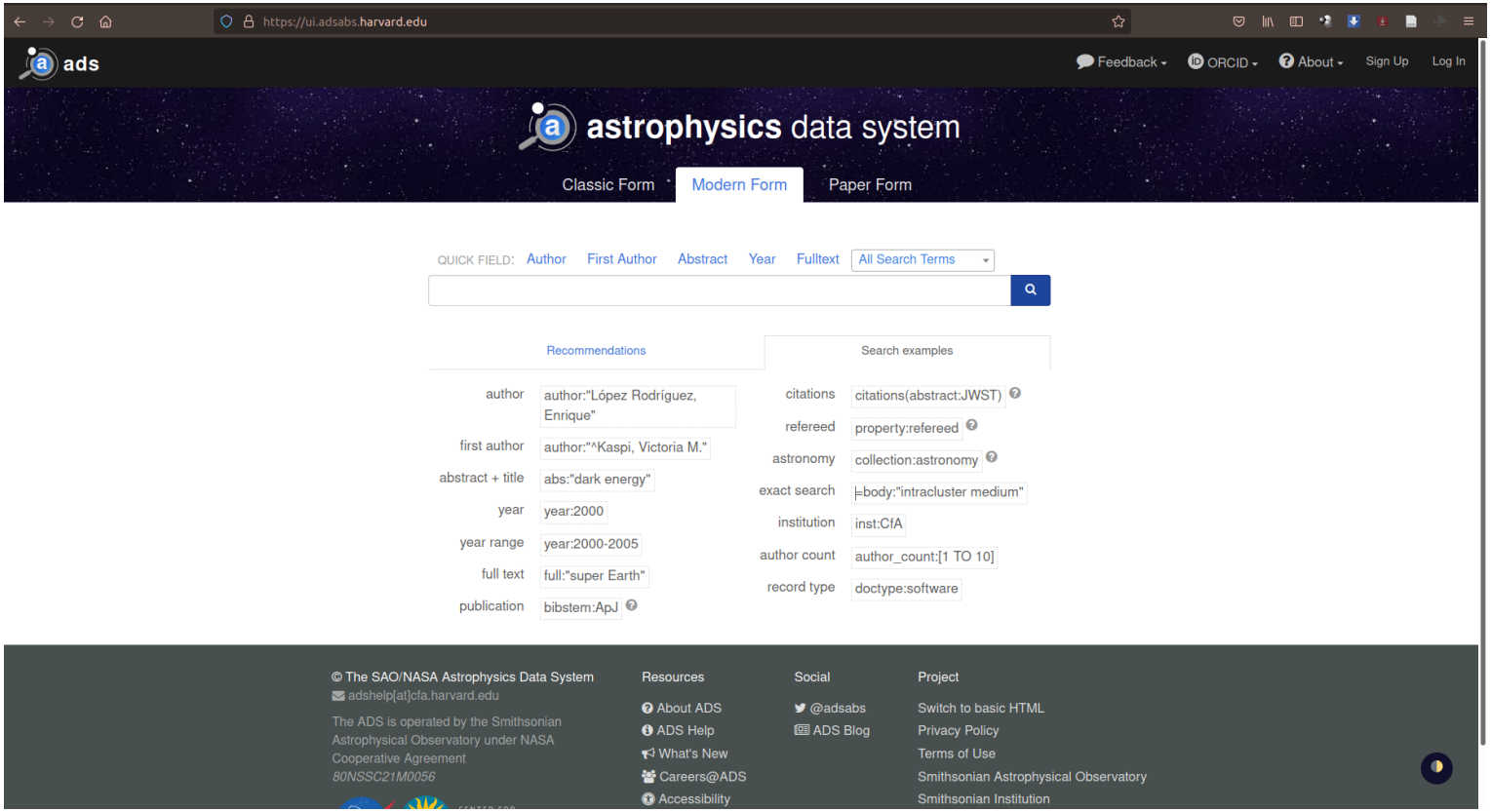
Les problèmes

- Les conflits d'intérêts
- La fraude
- La crise de la reproductibilité
- Le business de l'édition scientifique
- Les biais de publication
- Le laxisme dans le peer-review
- Les revues prédatrices
- ...

Articles et données comment les trouver ?

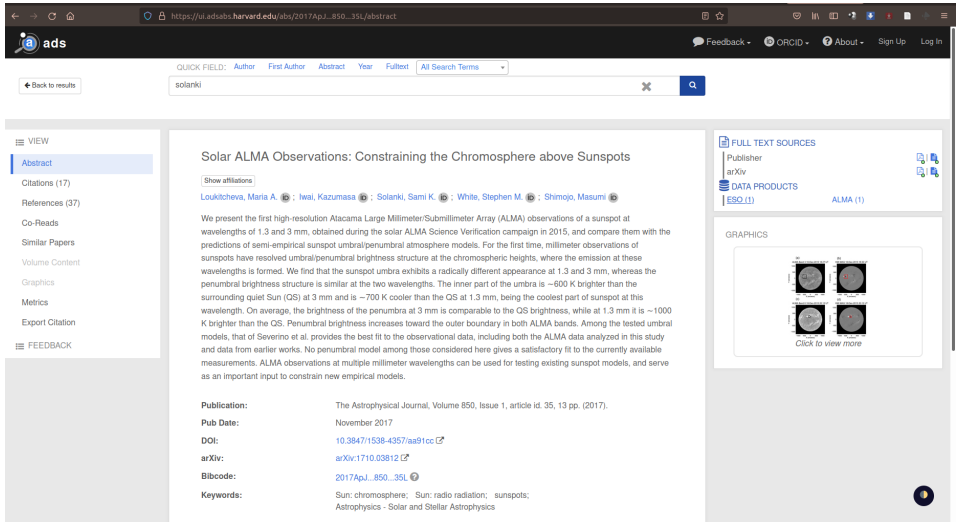
Les articles

Le moteur de recherche NASA Astrophysics Data System



Les articles

Obtenir un article de manière légale



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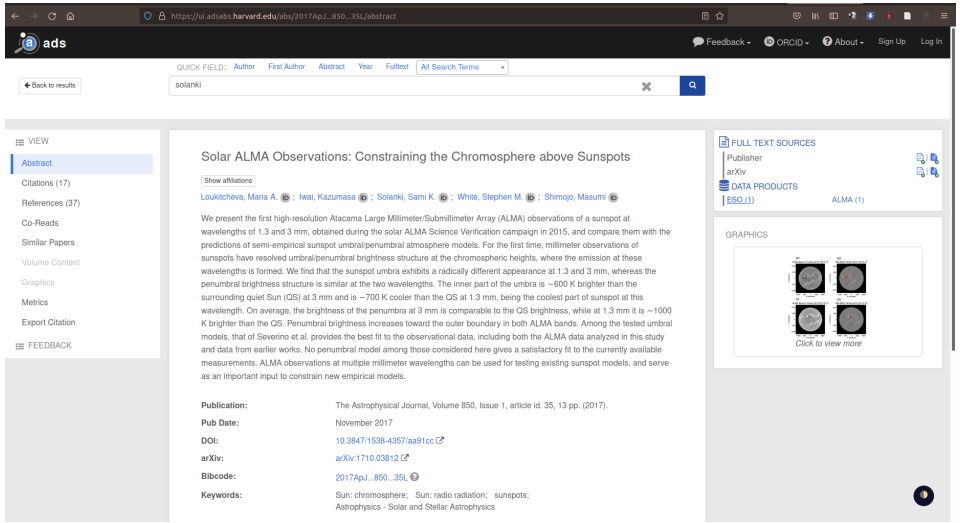

Via le site de l'éditeur

Les articles

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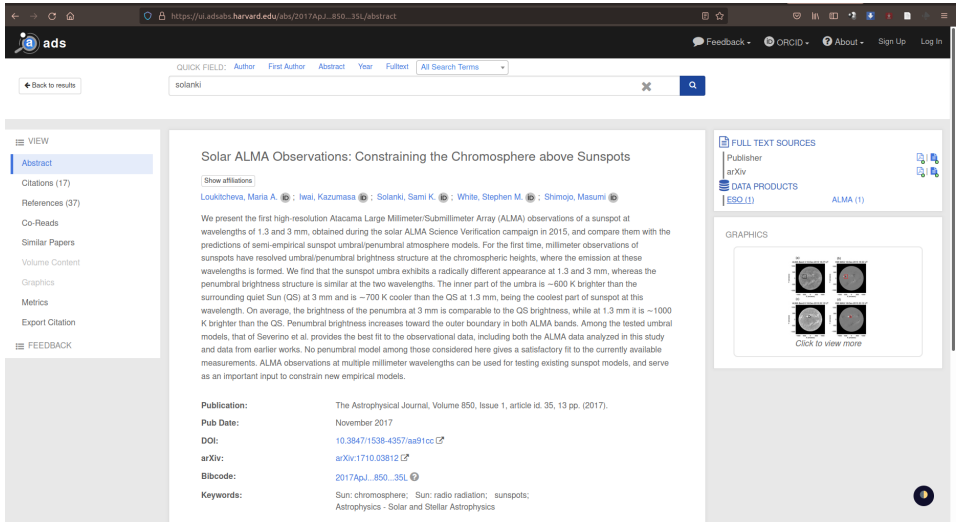
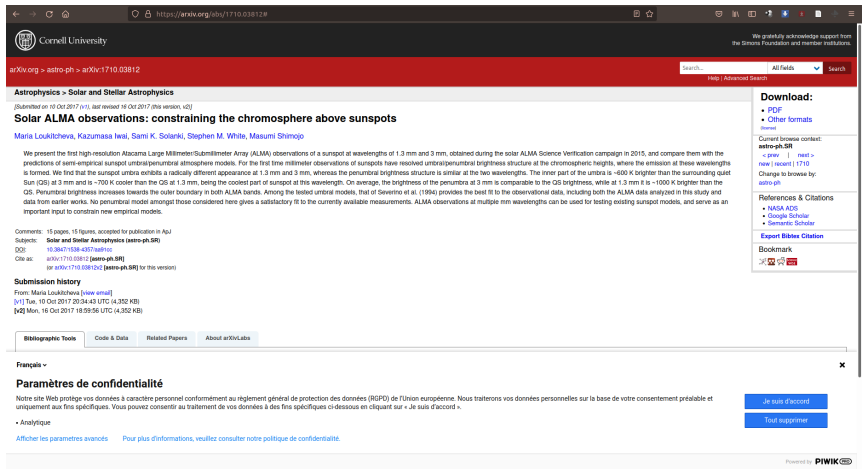


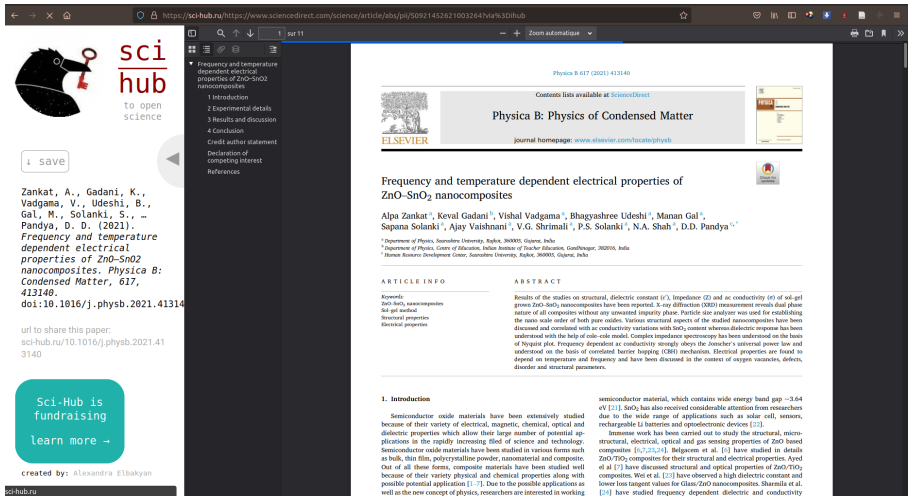
Via le site de l'éditeur

Via arXiv

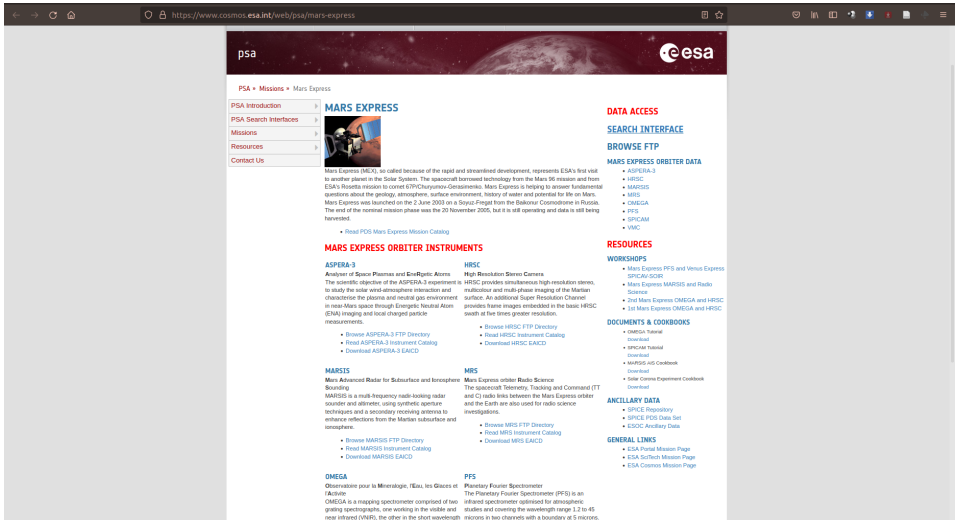


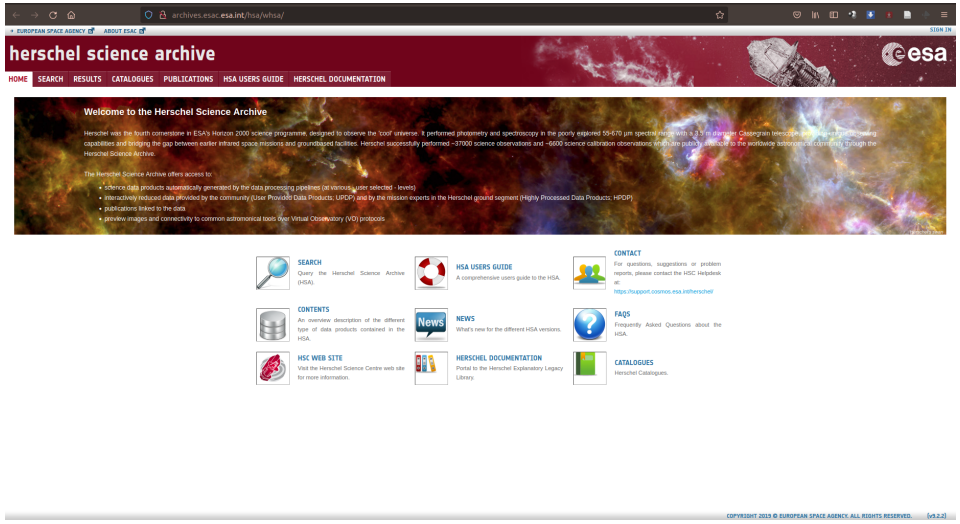
Les articles

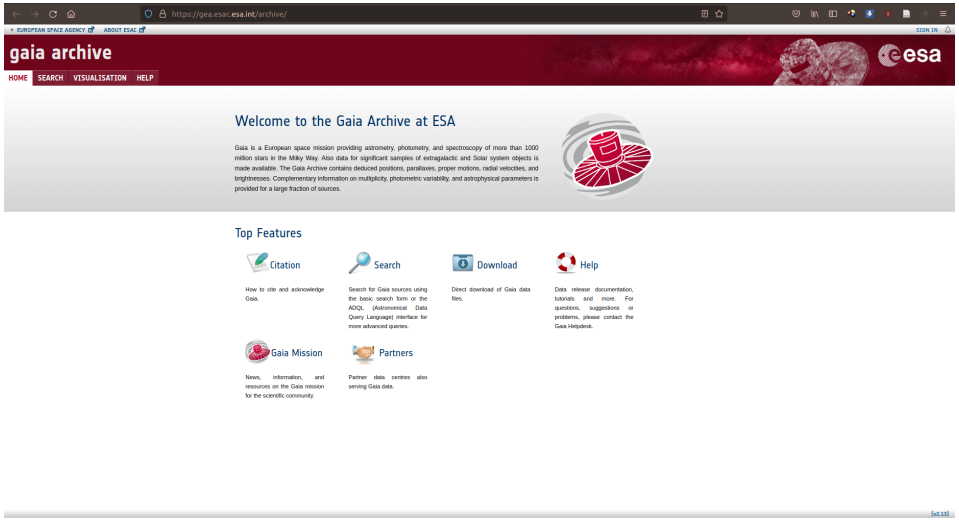
L'autre manière d'obtenir un article : Sci-Hub

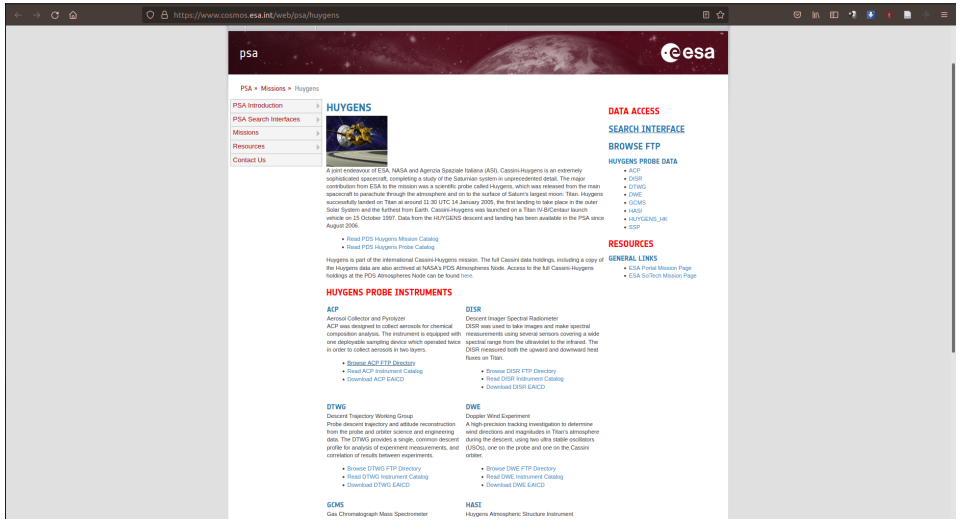


Les sites des missions

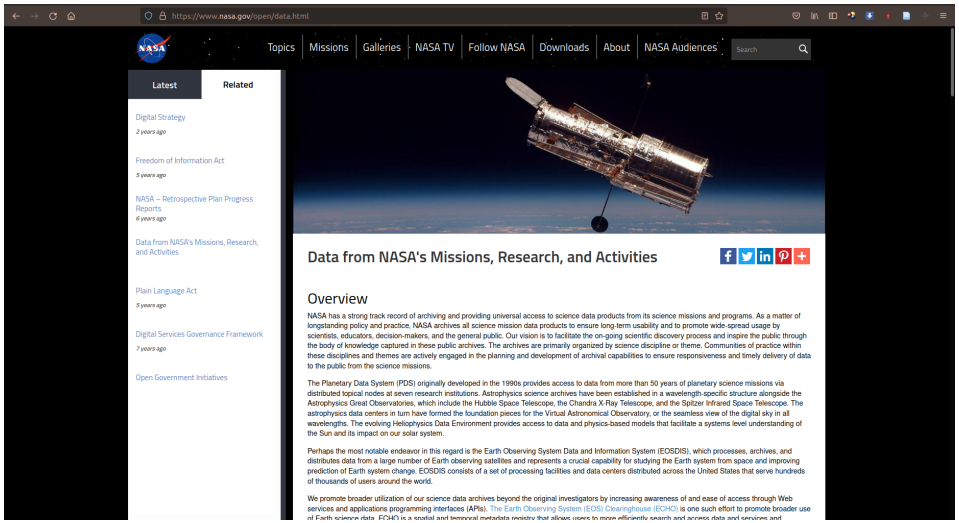


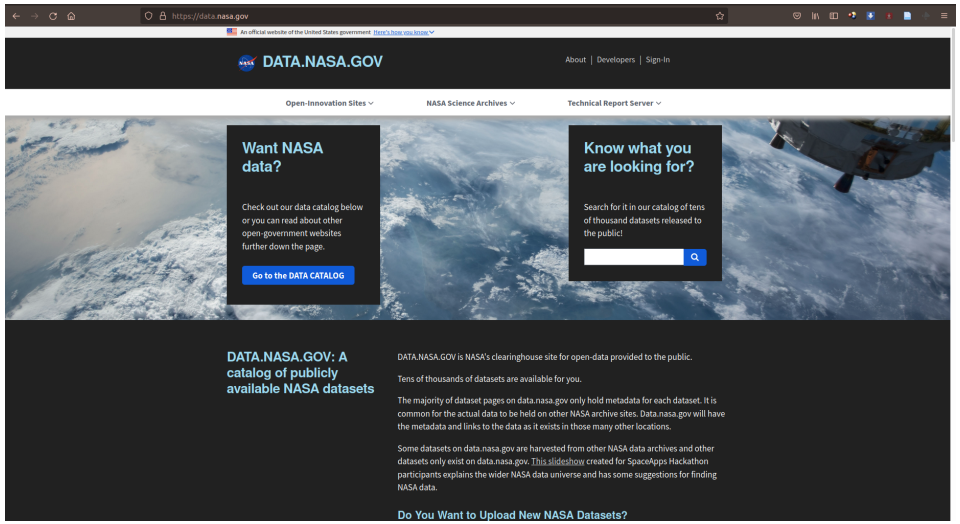


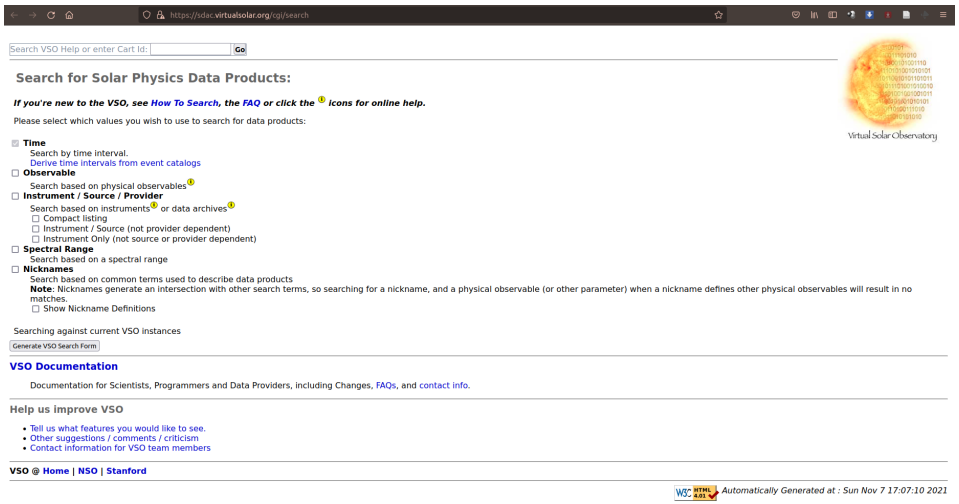




Les sites d'agences et les observatoires virtuel

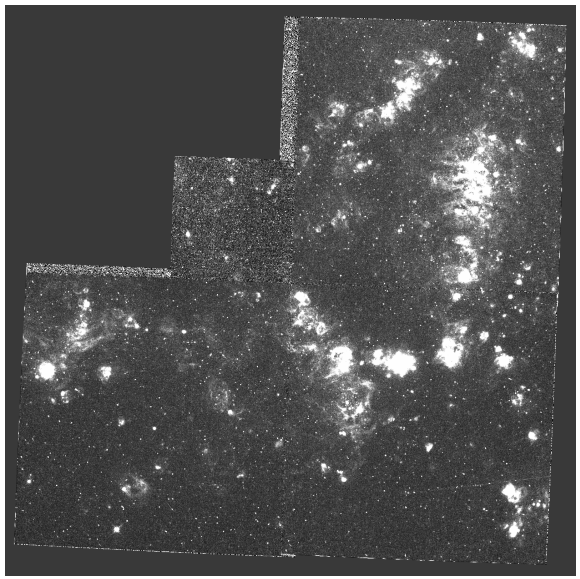


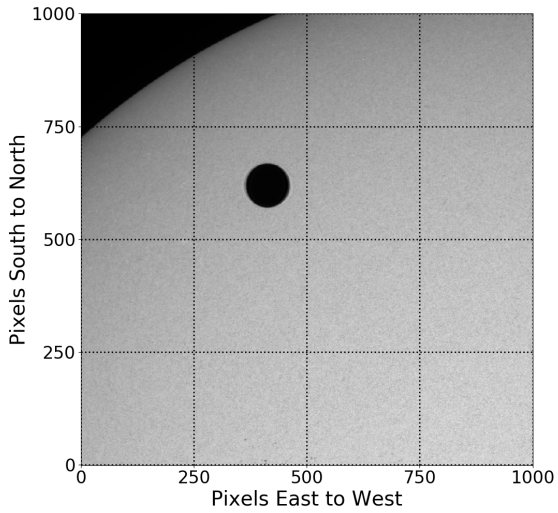




Point important :

Ces données sont accessibles librement et gratuitement





Epilogue :
Et les collaborations Pro-Am dans tout ça

Une ère de big data

Catalogues du ciel profond

- New General Catalog (1888) : 7 840 objets
- Morphological Catalogue of galaxies (1974) : 70 000 galaxies
- Champ CANDELS GOODS-S (2013) : 34 930 objets

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- Catalogue HD (1949) : 359 083 étoiles
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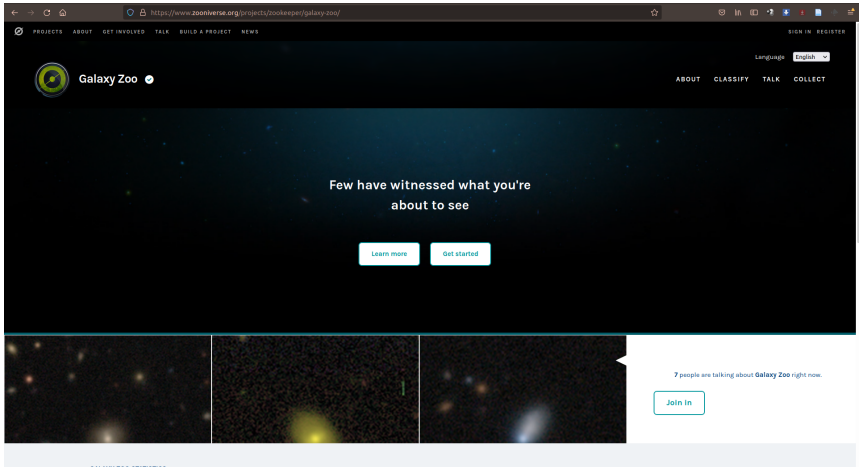
Il y a littéralement une explosion du volume des données. Comment traiter un tel volume de données ?

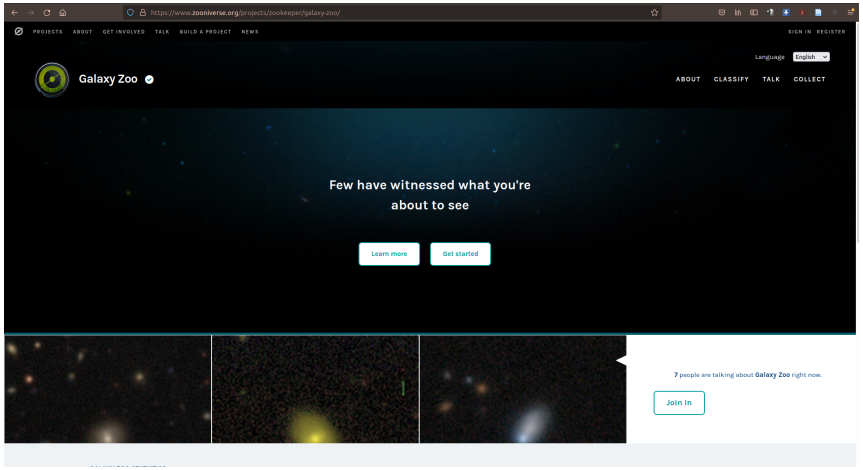
L'exemple de Galaxy Zoo



En 13 ans :

- 74 856 volontaires
- 3 444 148 galaxies classées

L'exemple de Galaxy Zoo



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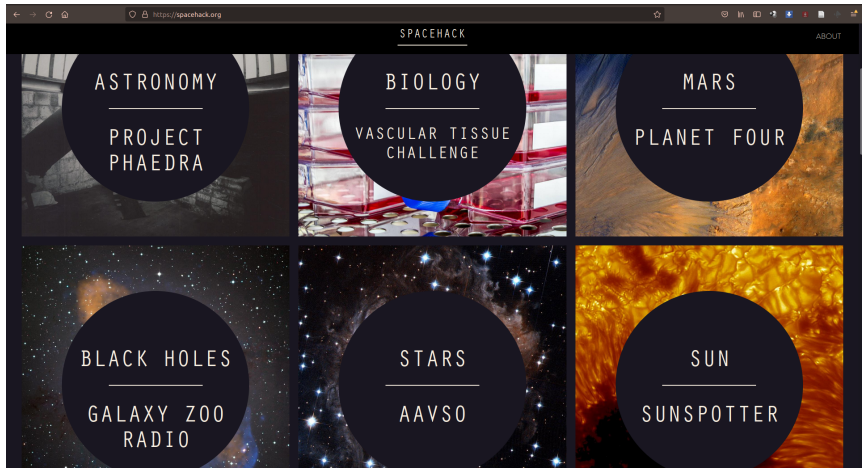
Cette initiative en a inspiré de nombreuses autres :

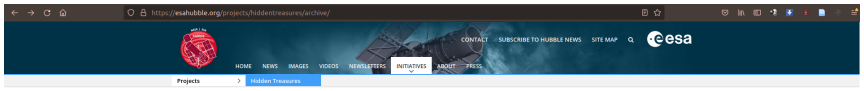
- Classement des taches solaires (Sunspotter)
- Analyse des vents martiens (Planet Four)
- Recherche de trou noir supermassif (Galaxy Zoo Radio)
- ...



De nouvelles voies

Mais pourquoi ne pas directement proposer aux amateurs d'investiguer les données ?

Hubble Hidden Treasures



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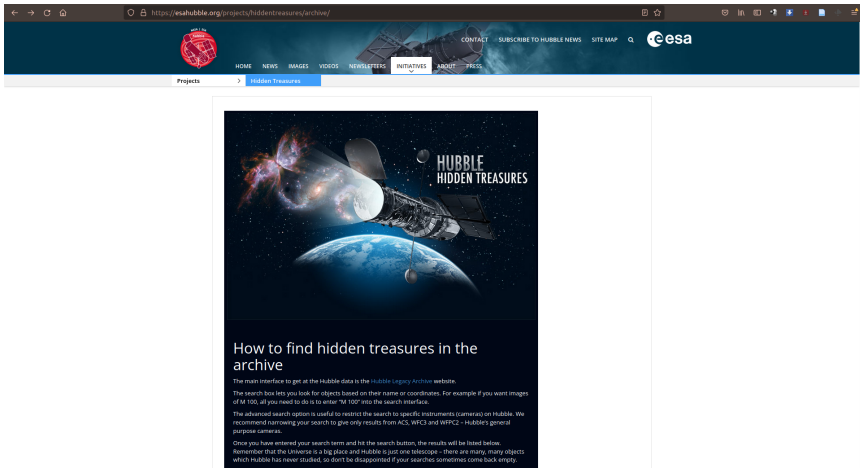
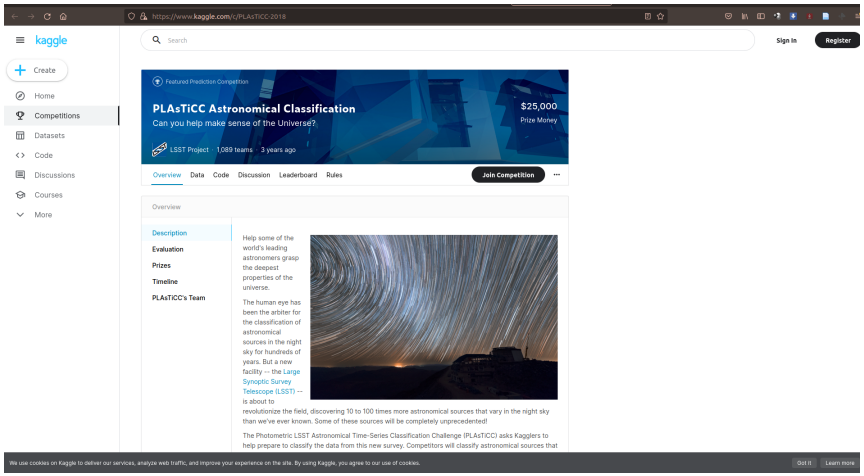
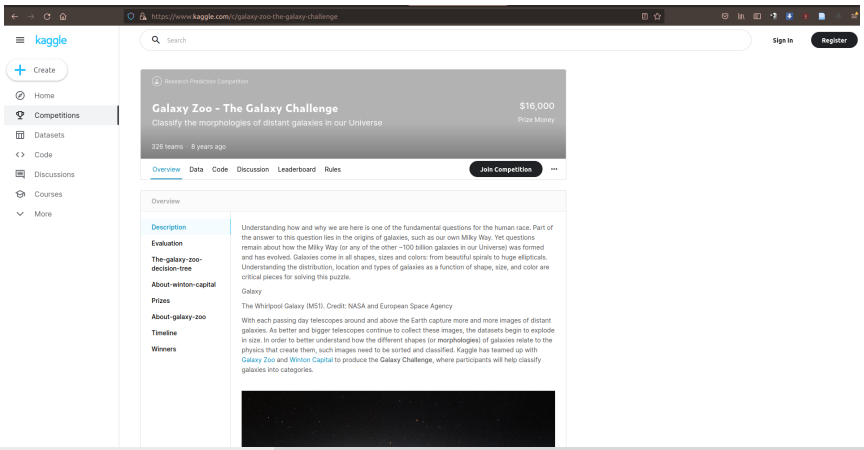


Concours Kaggle





Conclusion

Et si le traitement des données par les amateurs étaient une nouvelle voie à explorer pour les collaborations pro-am ?