# Quel temps fait-il sous le soleil ?

## Introduction à la météorologie spatiale

Creysseilles, janvier 2019

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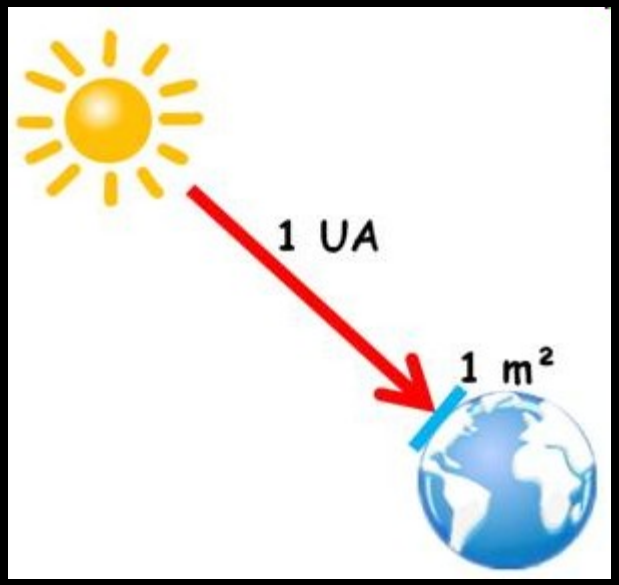
# météo? une affaire de soleil et nuages

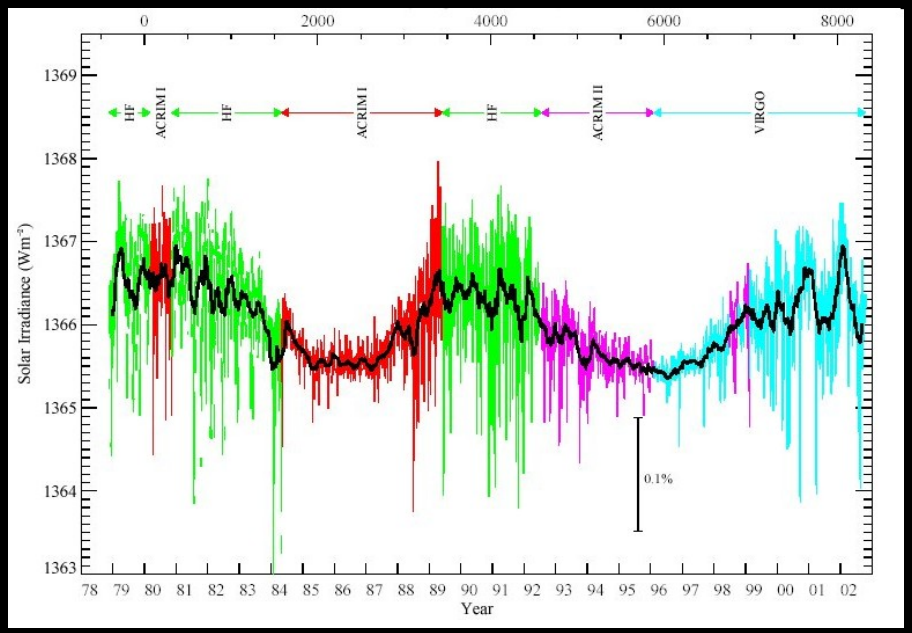
# Notre terre

# Notre étoile

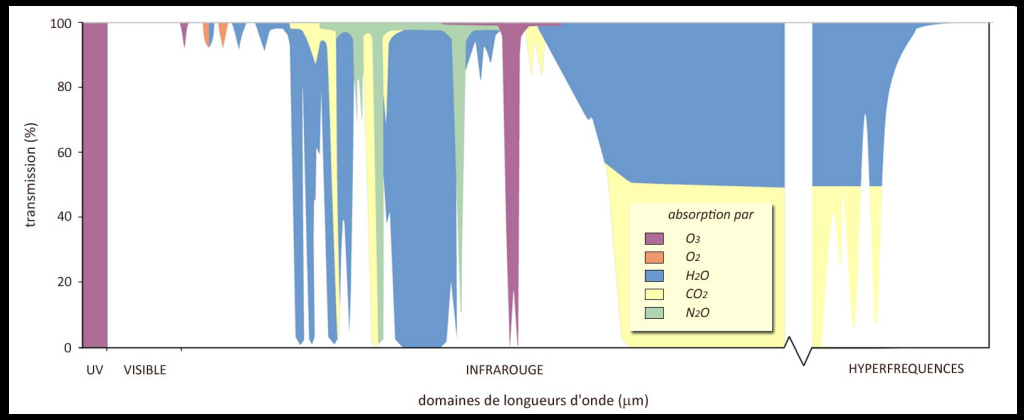
# La constante solaire

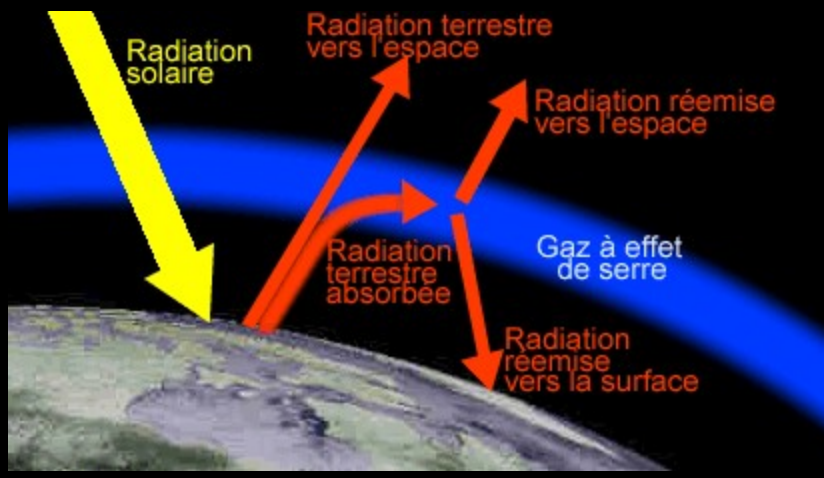


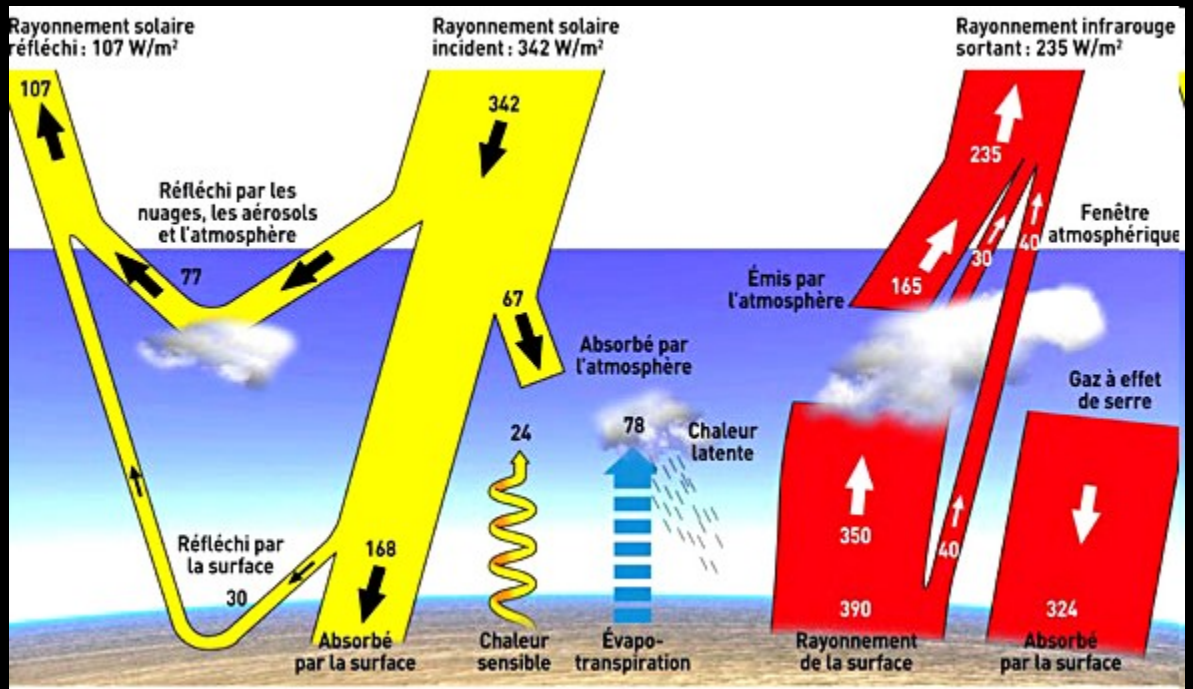

- Quantité d'énergie solaire que recevrait une surface de 1 m² située à une distance de 1 UA (distance moyenne Terre-Soleil), exposée perpendiculairement aux rayons du Soleil, en l'absence d'atmosphère.
- Valeur moyenne:1,37 kW par m²
- Elle varie d'environ 0,2% sur trente ans.



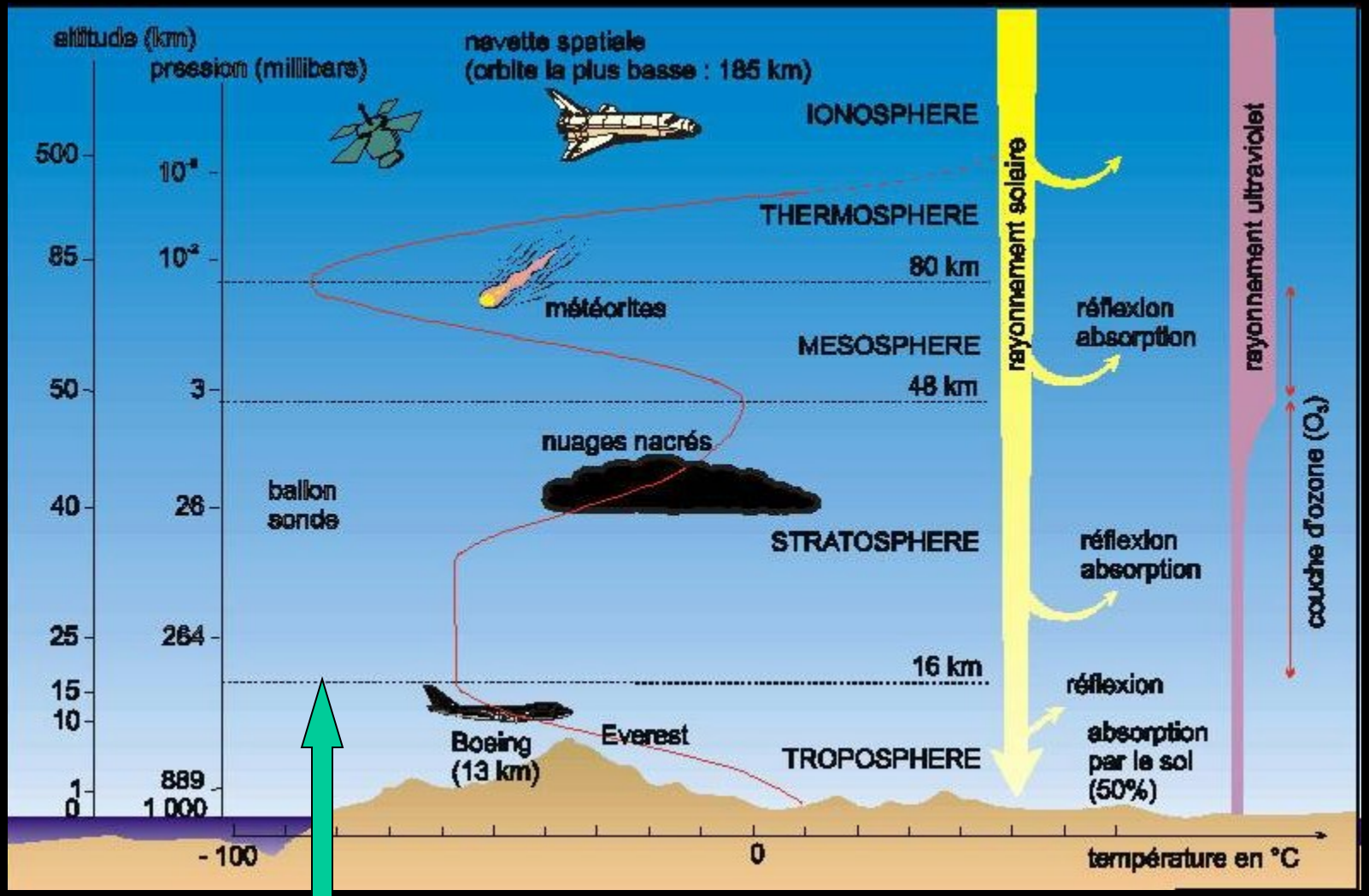
# Impact du rayonnement



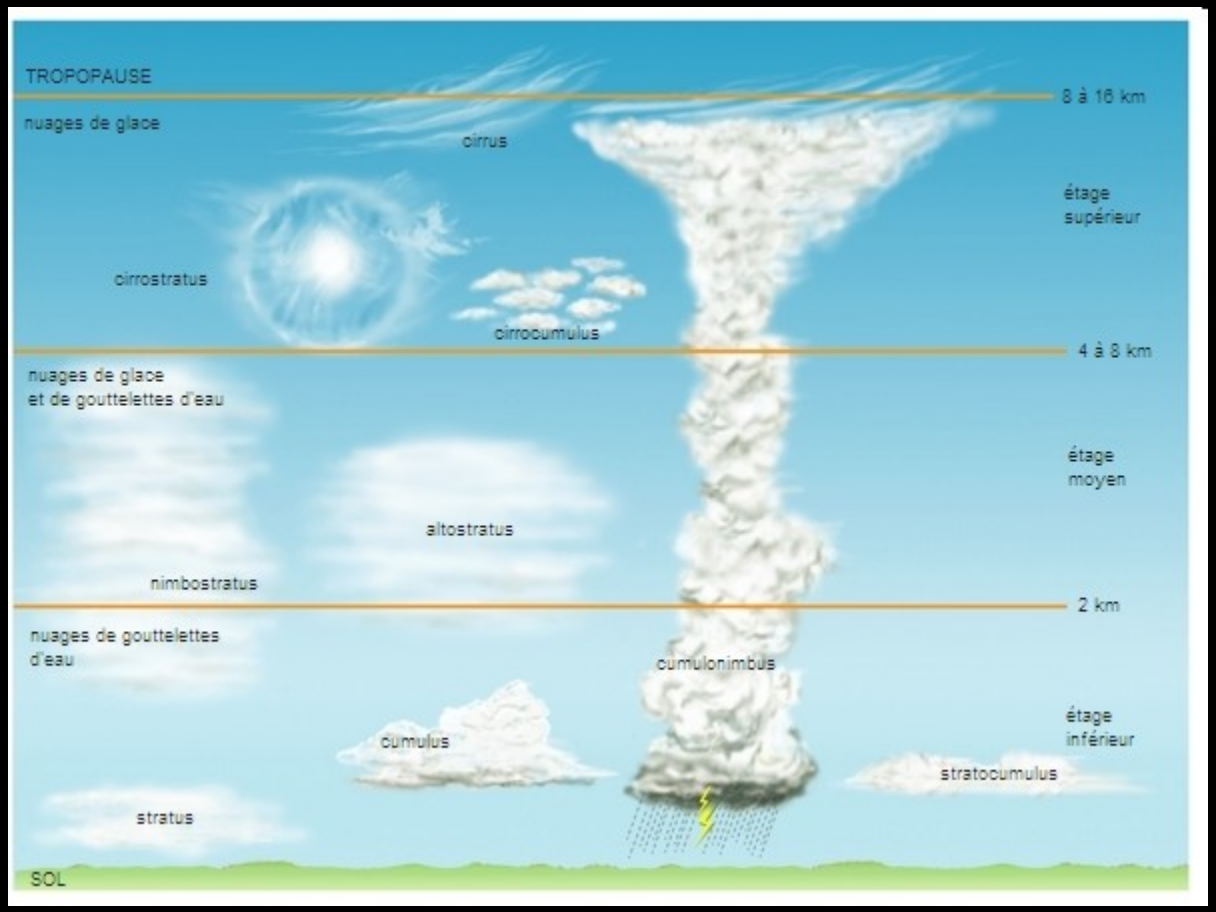



# Notre atmosphère



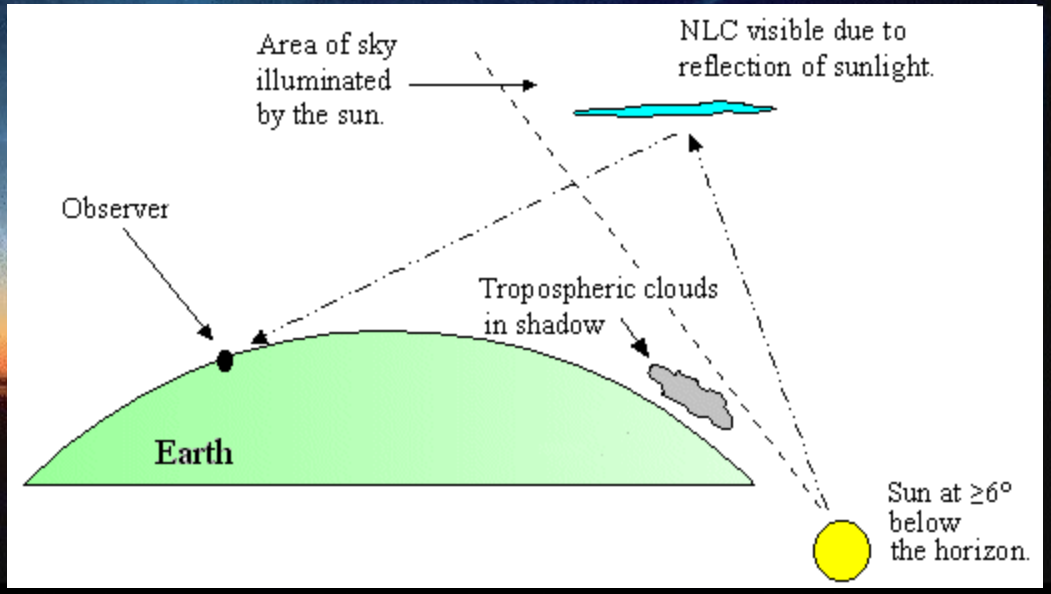

9/10 de la masse de l'atmosphère en dessous de 16 km

# Les nuages et leur classification



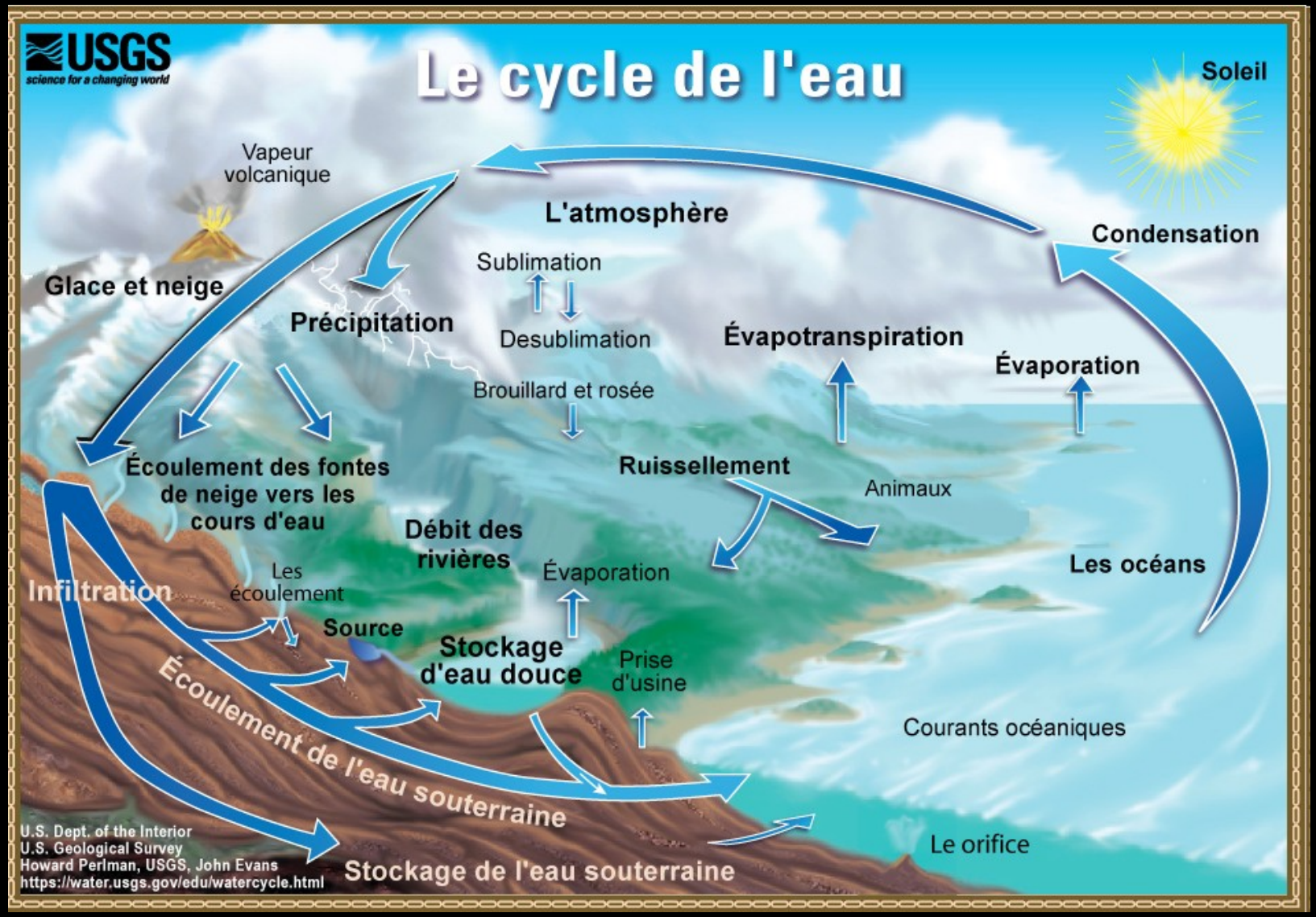
# Nuages nocturnes lumineux

autour de 80 km !

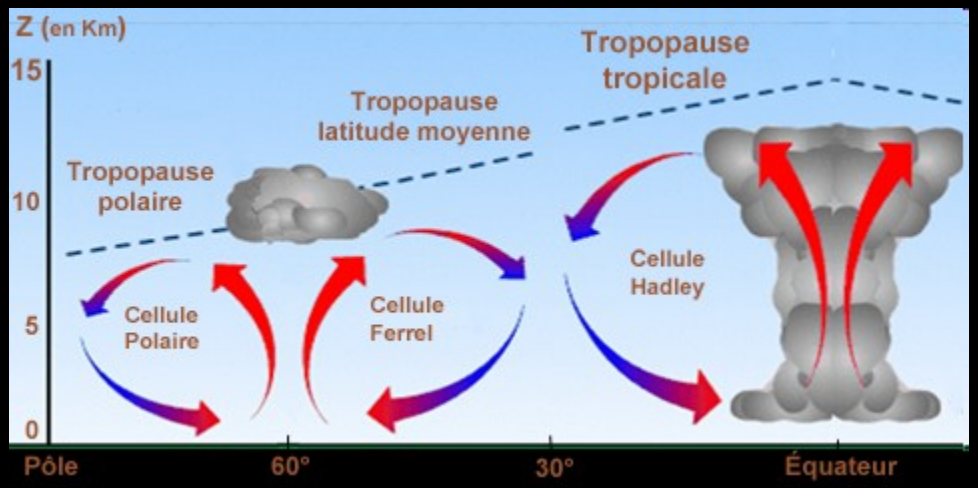


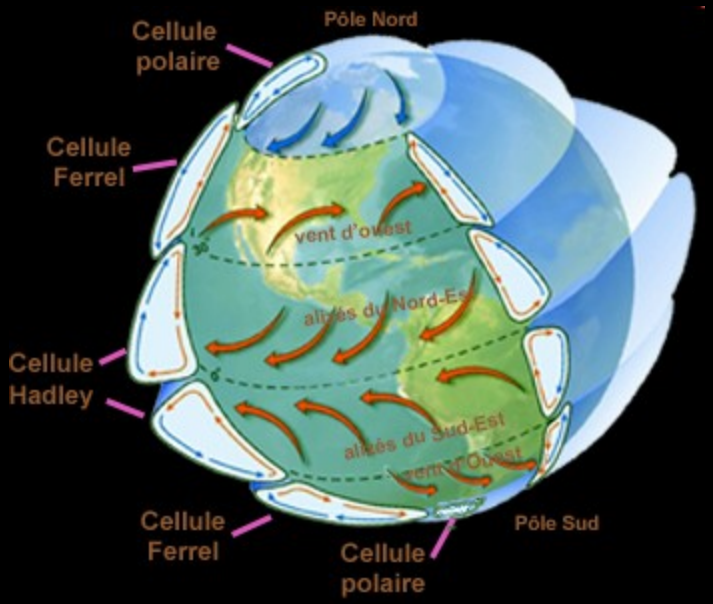
# orage

# Le cycle de l’eau

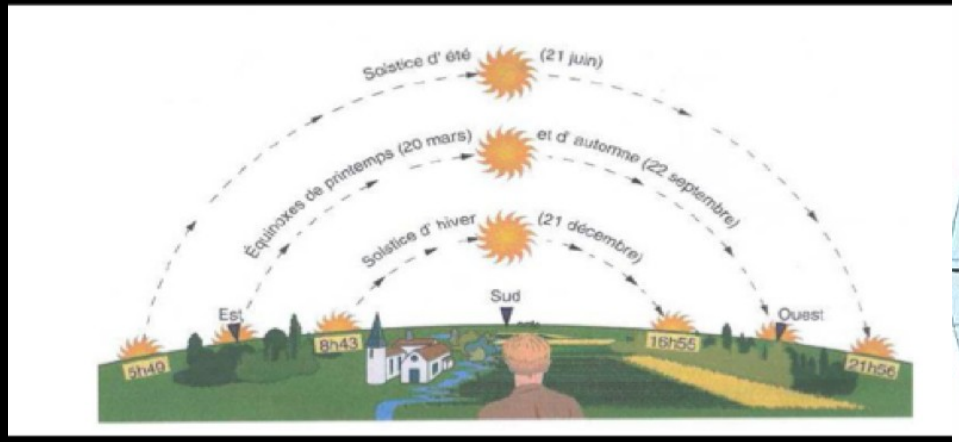


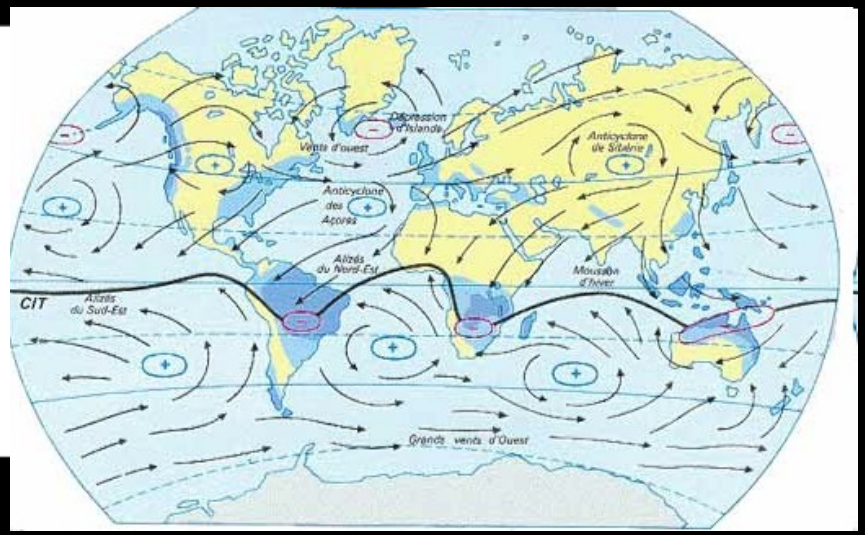
# Les mouvements de l'atmosphère



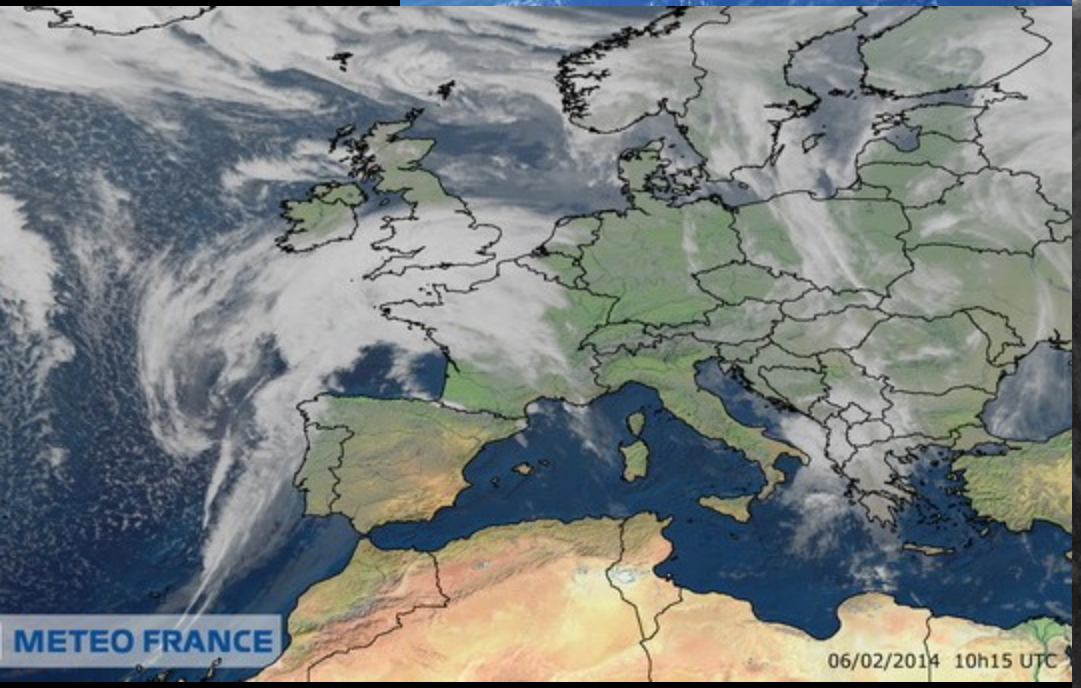



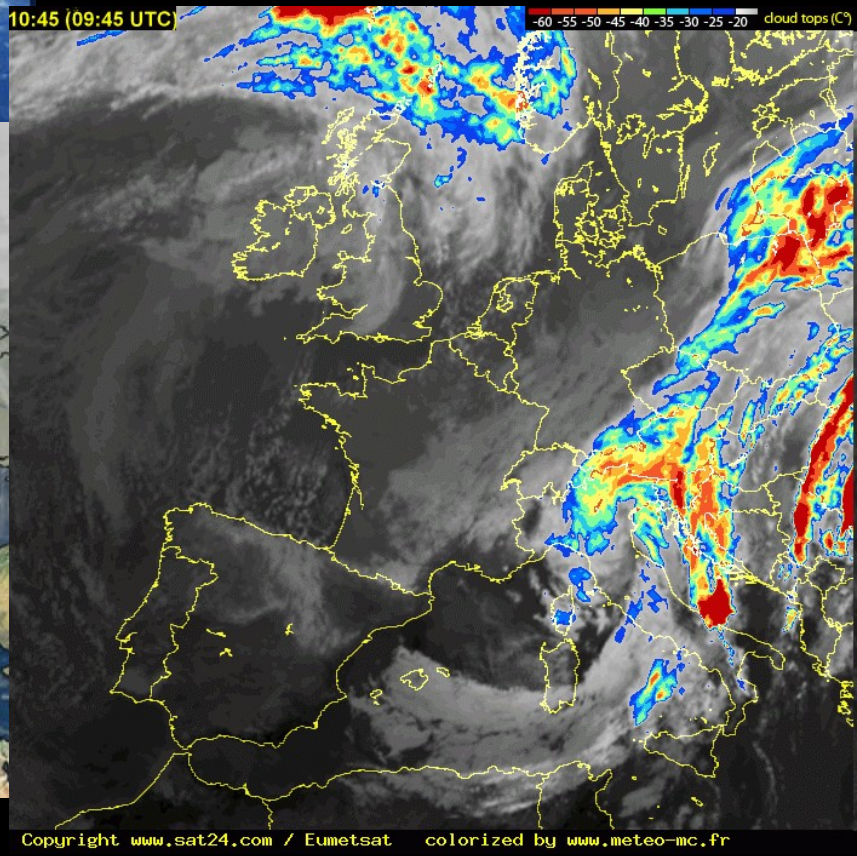

selon les saisons



# Satellites d'observation météo



# autres phènomènes atmosphériques
# les météores

- photométéores: arcs-en-ciel, halos, raies anticrépusculaires..
- hydrométéores: pluie, neige.. brumes, grêles.. trombes..
- lithométéores: tempêtes de poussières, de sable, éruptions, météorites
- électrométéores: orages, aurores..

météorologie =
étude et prévision des phénomènes atmosphériques

# Photométéores

# Hydrométéore

# Lithométéore

# au-dessus de 80 km d’altitude

# Électrométéore

# au-dessus de 80 km d’altitude

# 450 km d'altitude

# Retournons au soleil

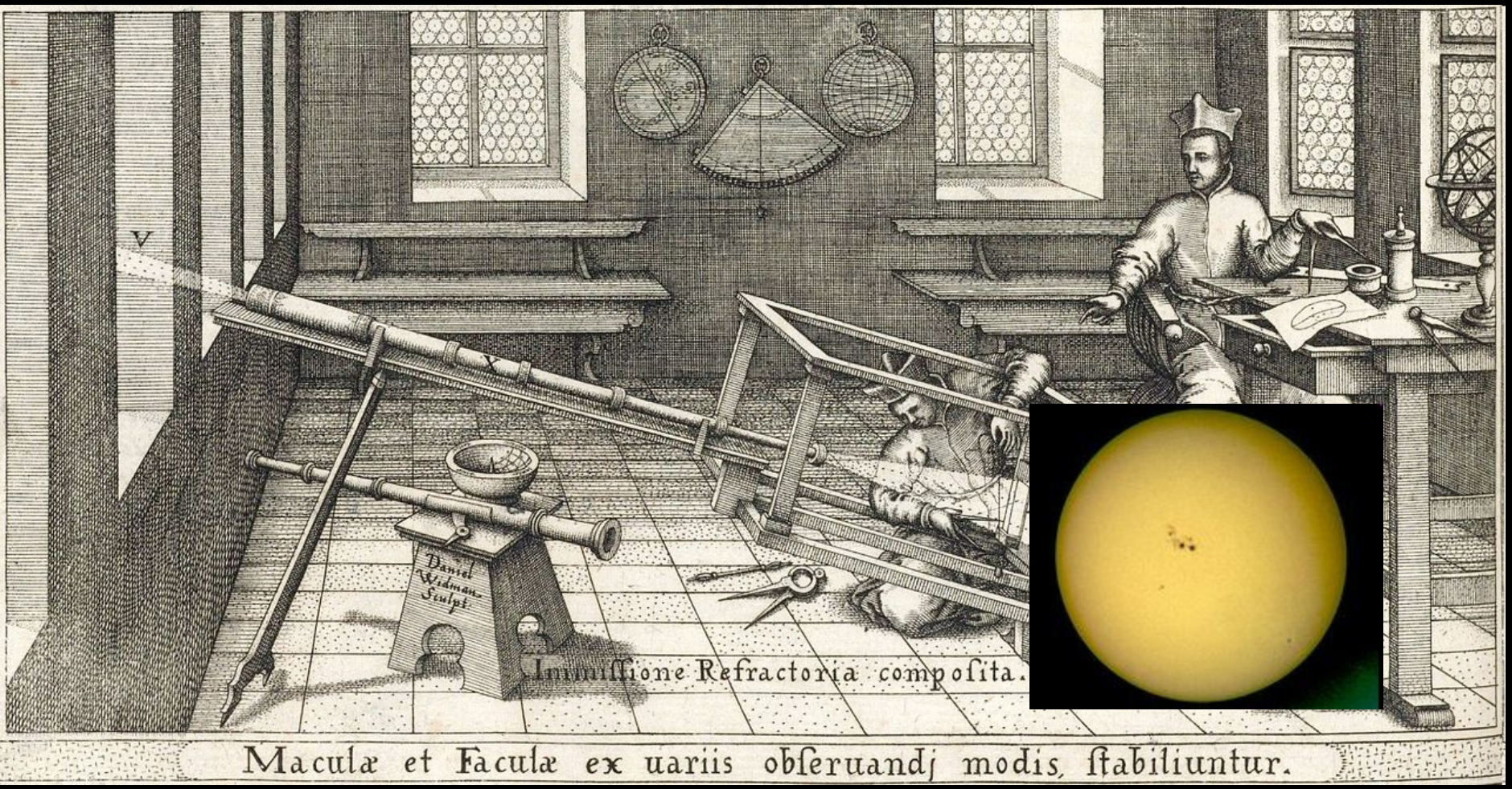
- Est-il si constant ?

- N’a-t-il pas quelques caprices moins apparents ?

# Des taches sur le soleil !?

juillet 2014

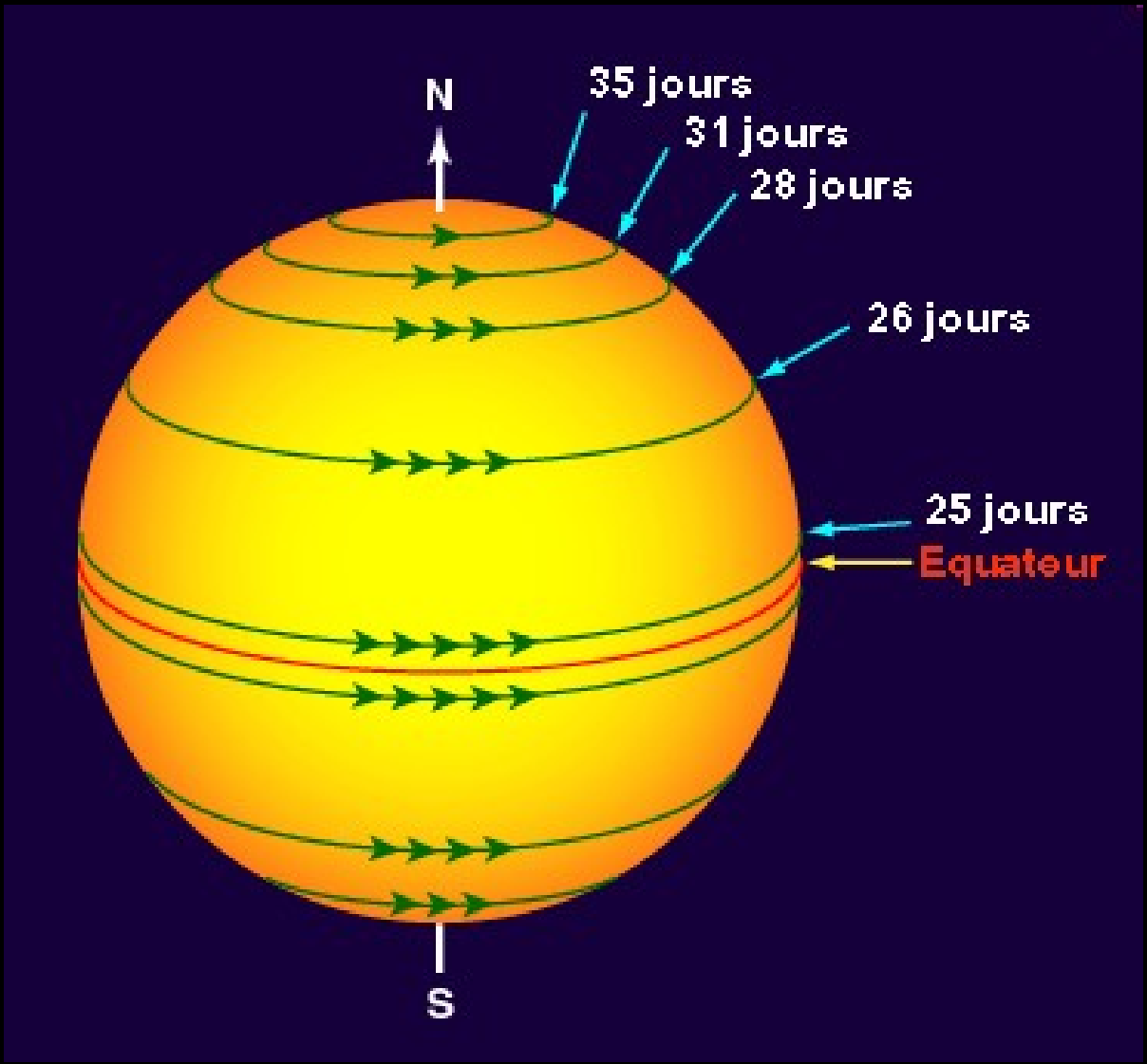
# Observations et relevés



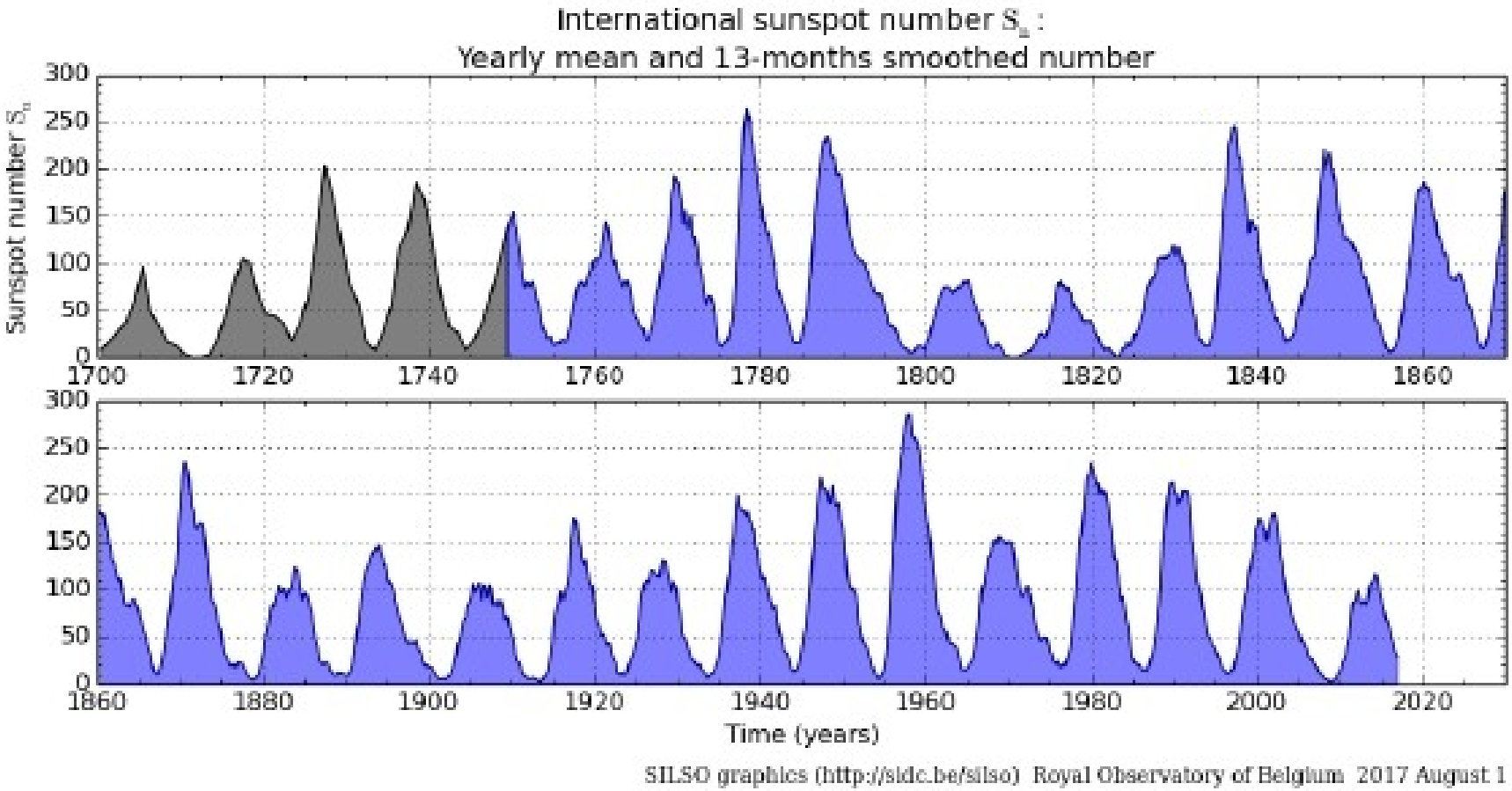

Schneider étudiant les taches solaires en 1625

(premières observations en 1611 par Galilée et lui-même)

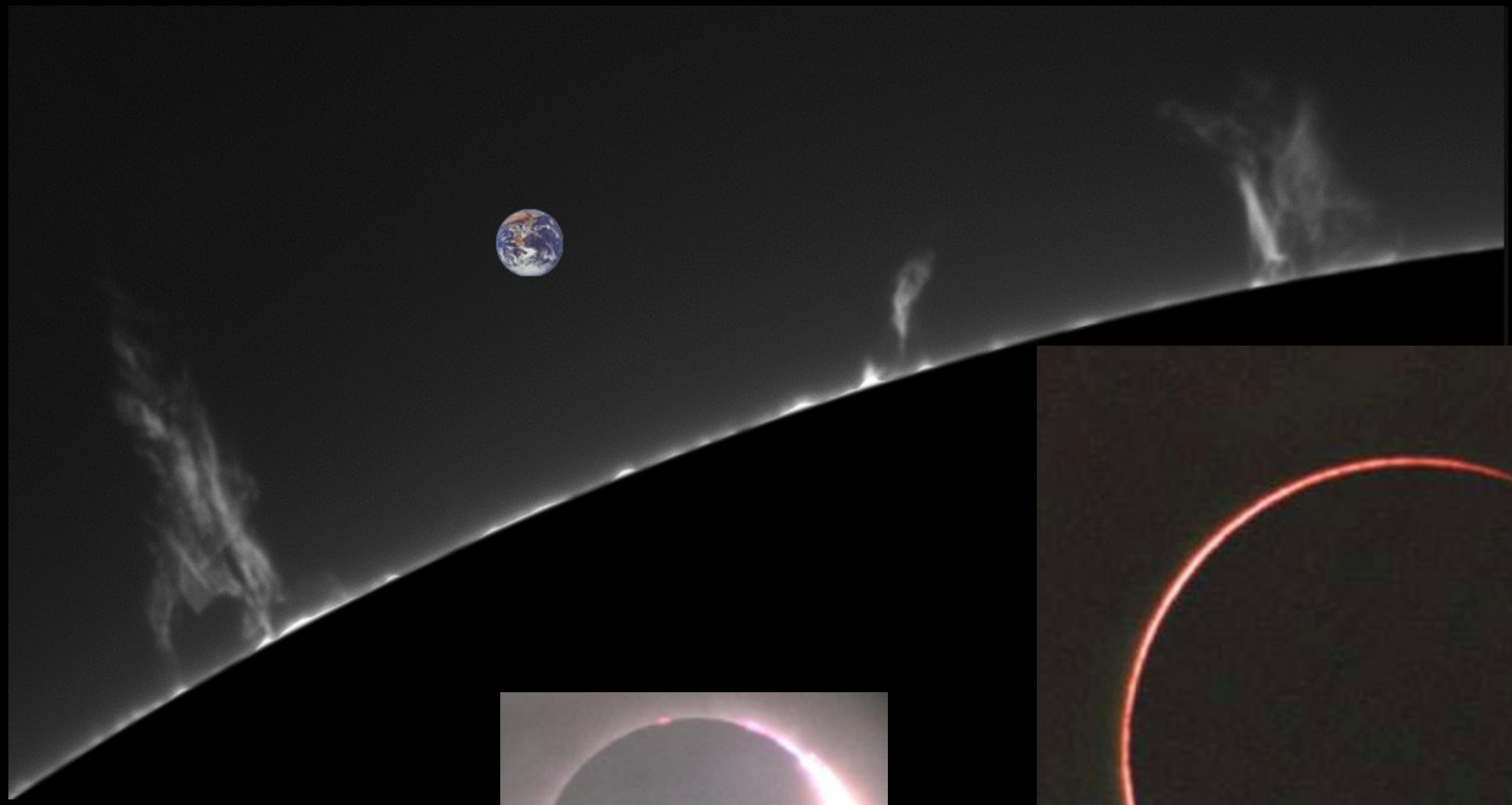
# rotation solaire



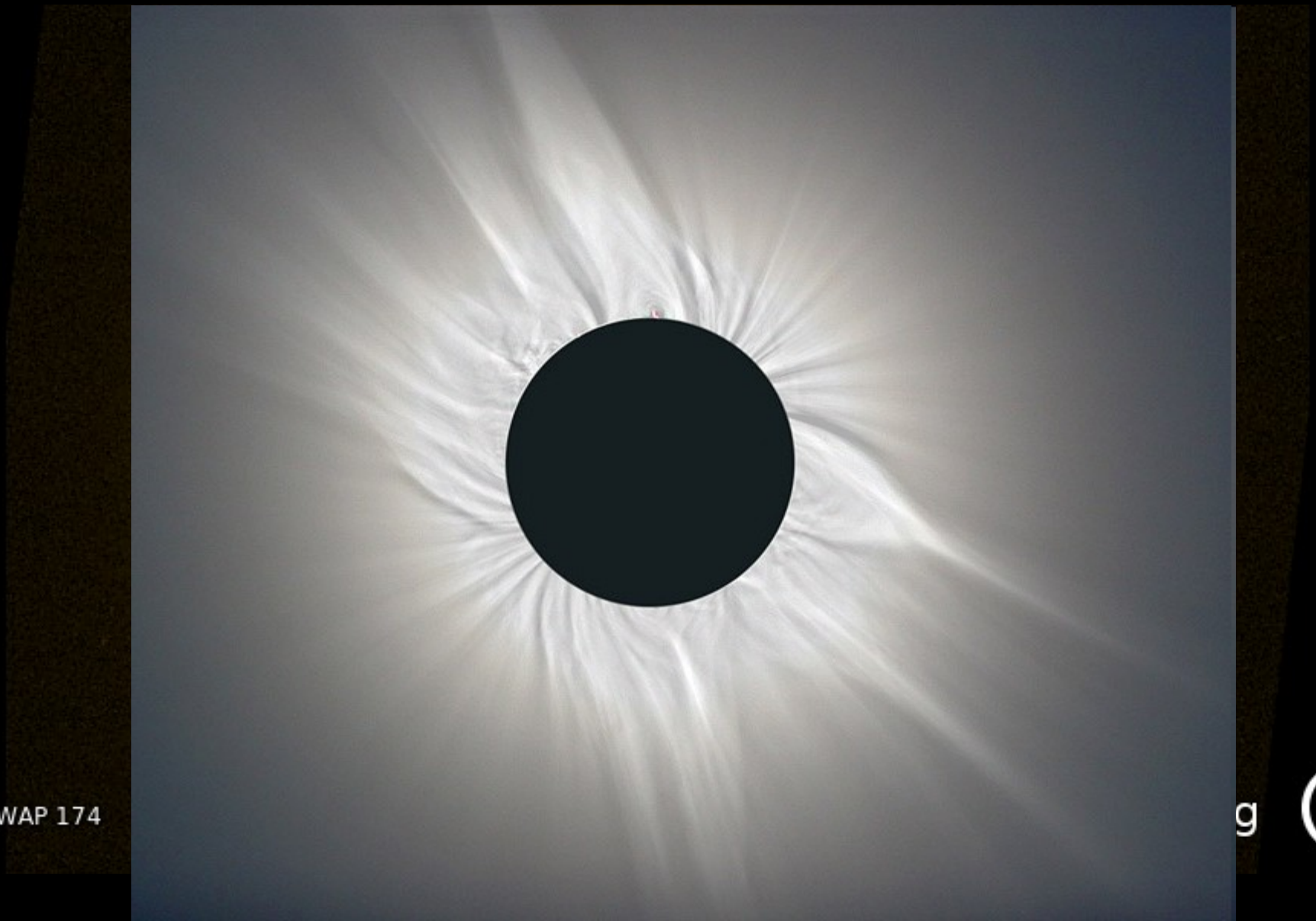
# nombre de tâches : cycle de ~11 ans



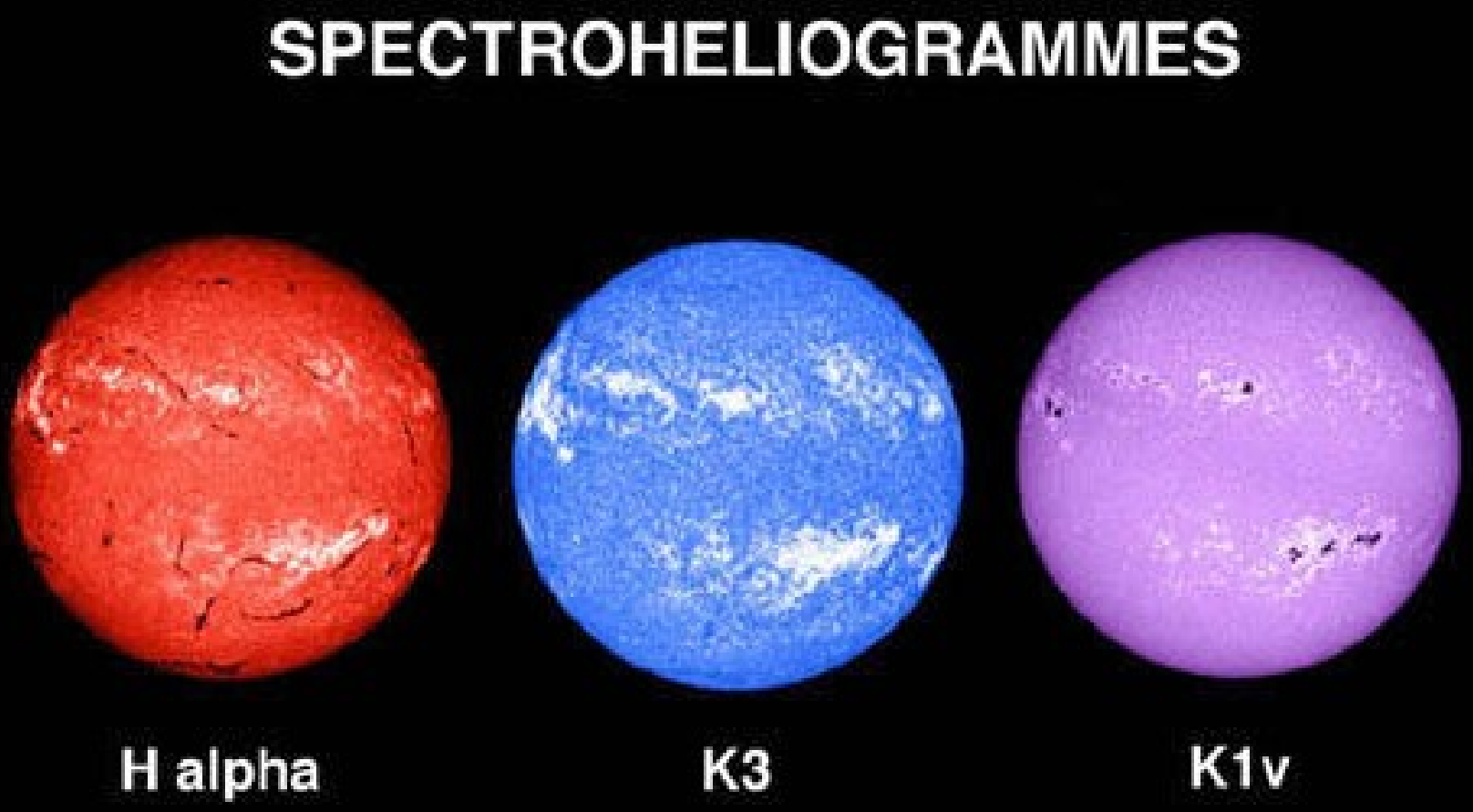
# Protubérances solaires



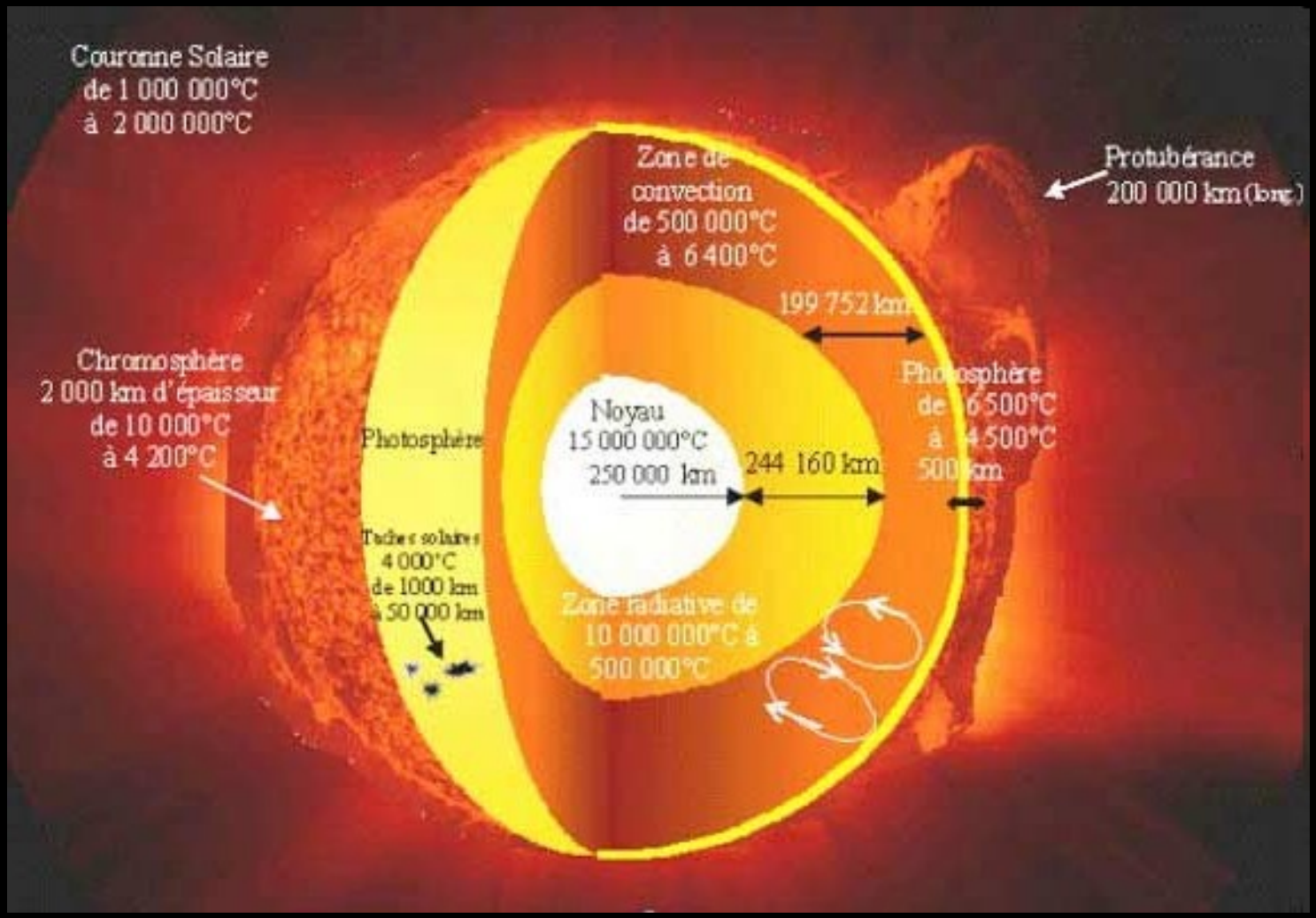
# La couronne solaire



# La chromosphère solaire

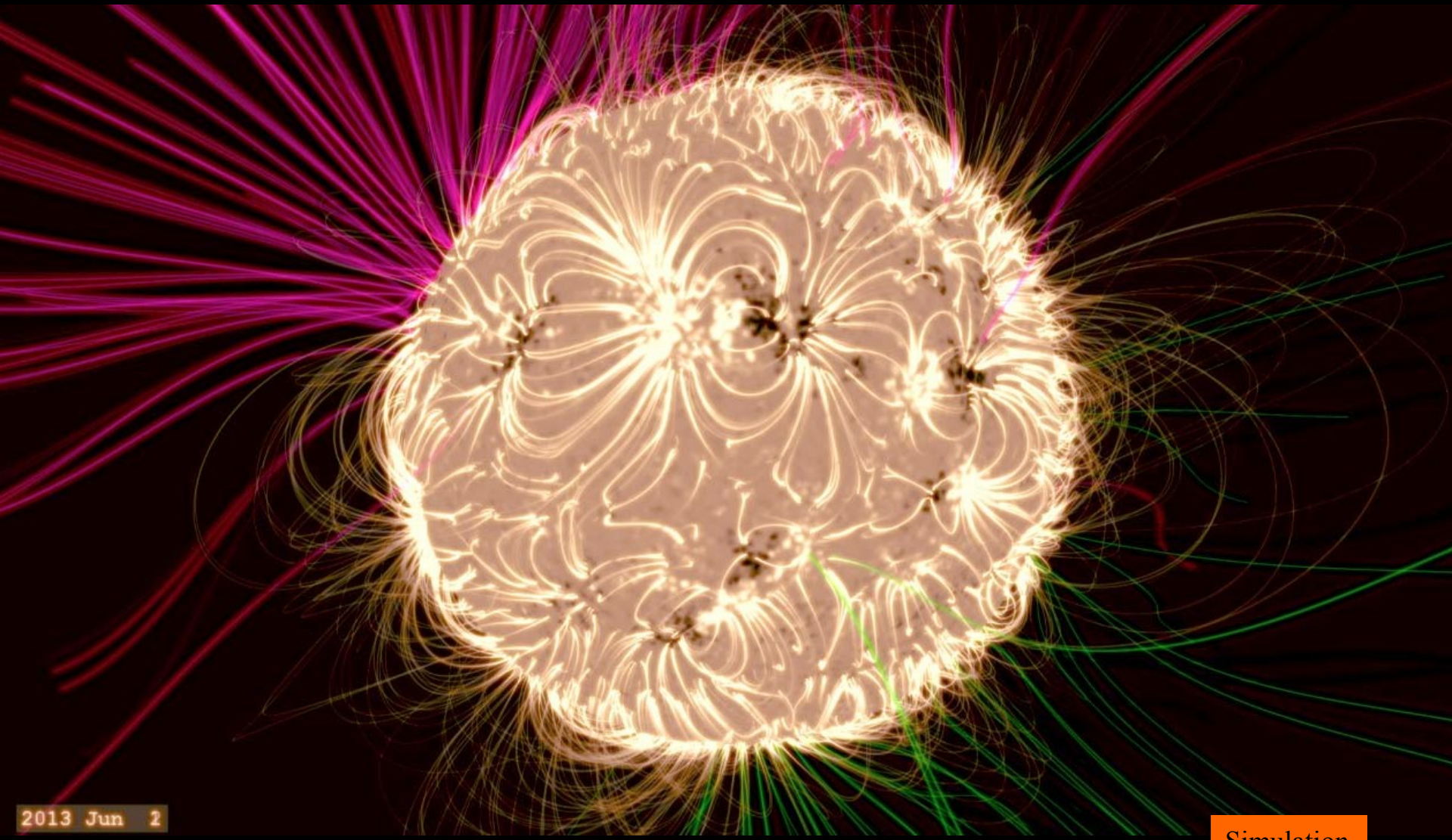


# modèle physique solaire 1/2




STEREO

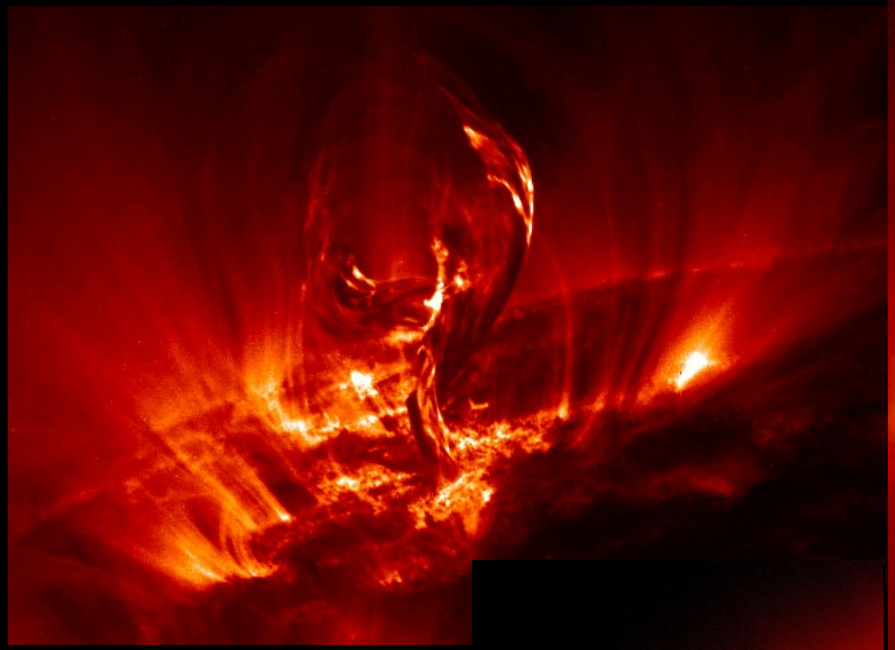
# modèle physique du soleil 2/2

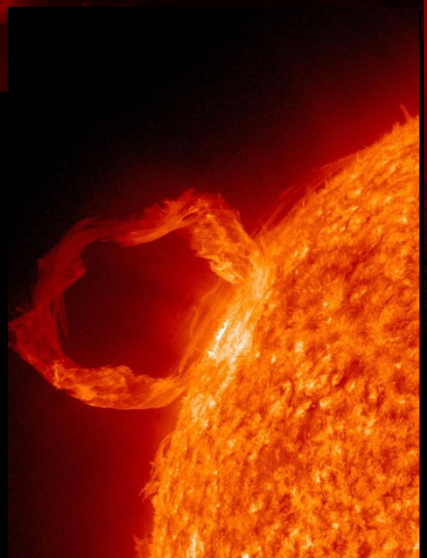


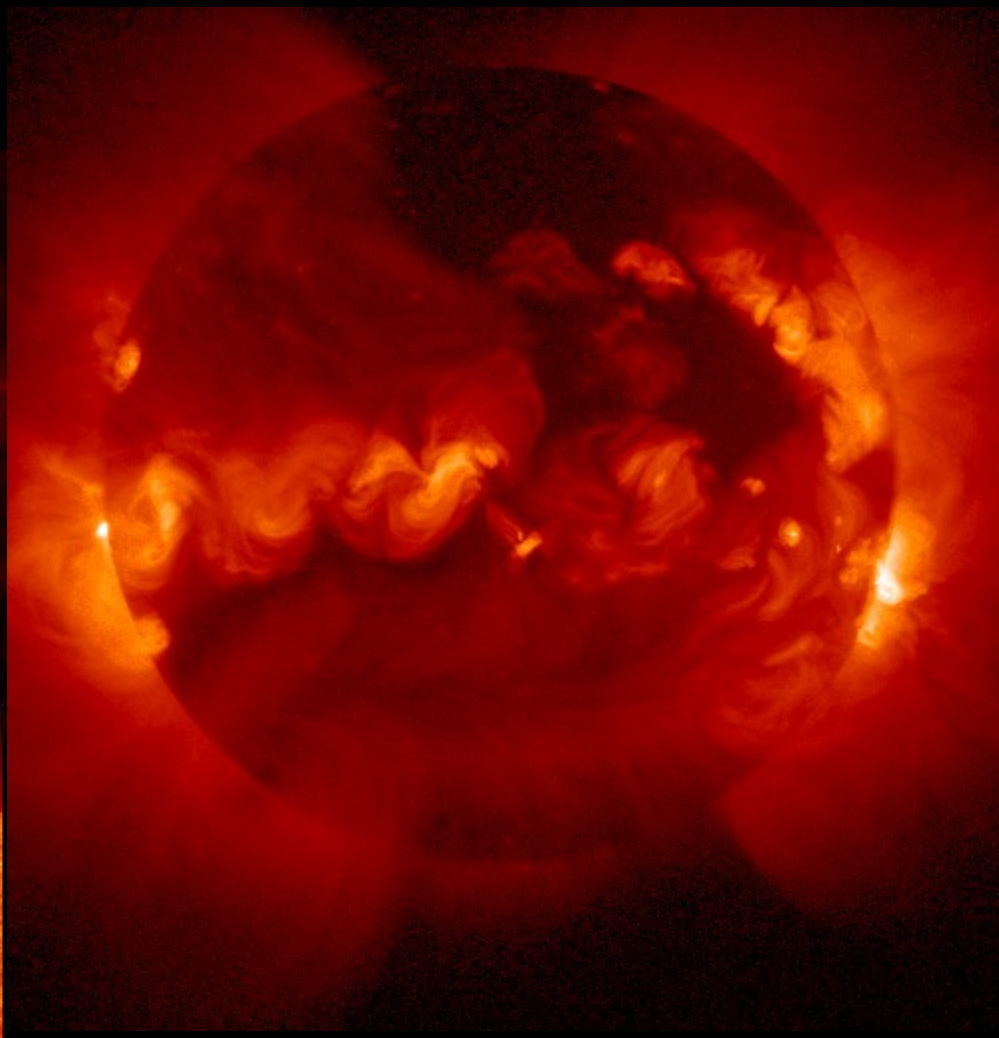

Simulation

# Vent solaire

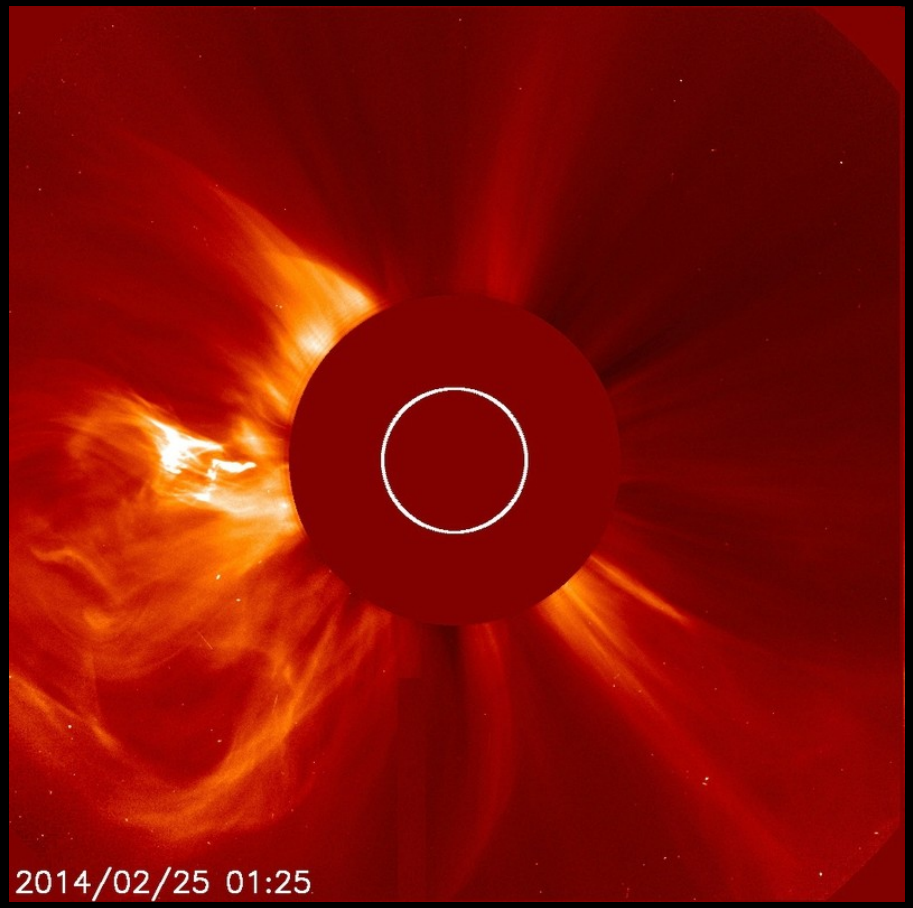
# Eruptions solaires

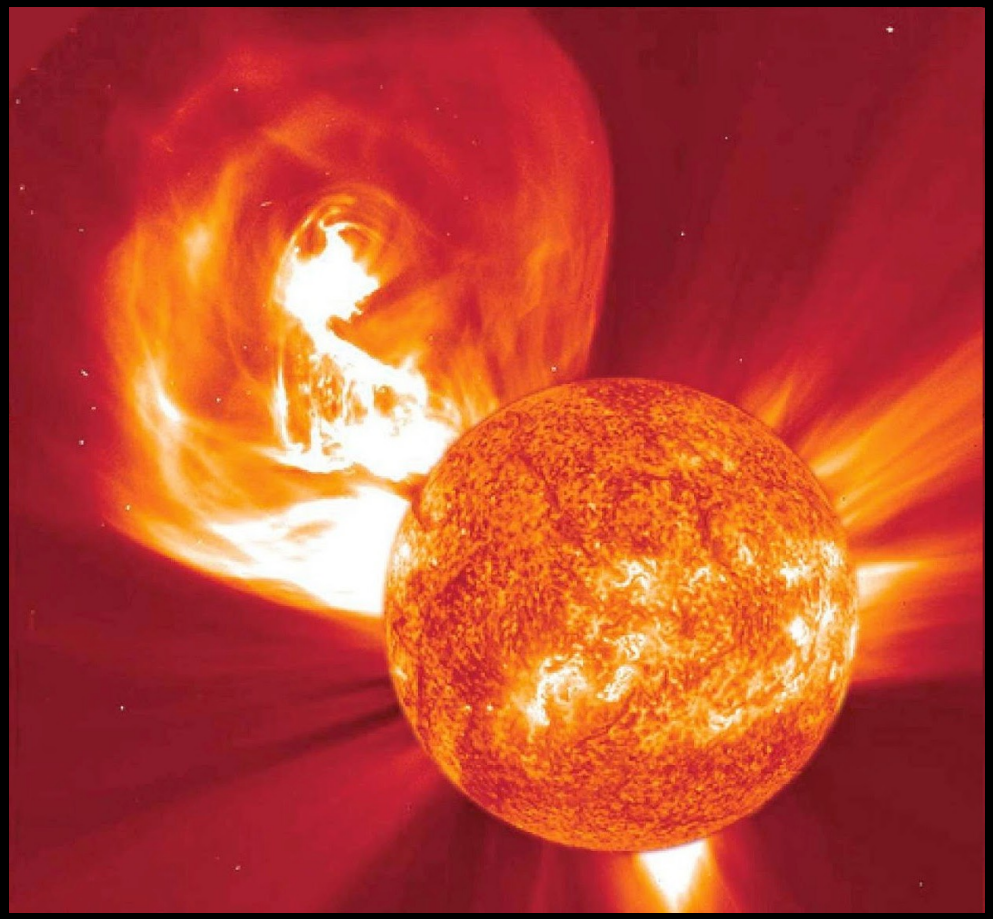




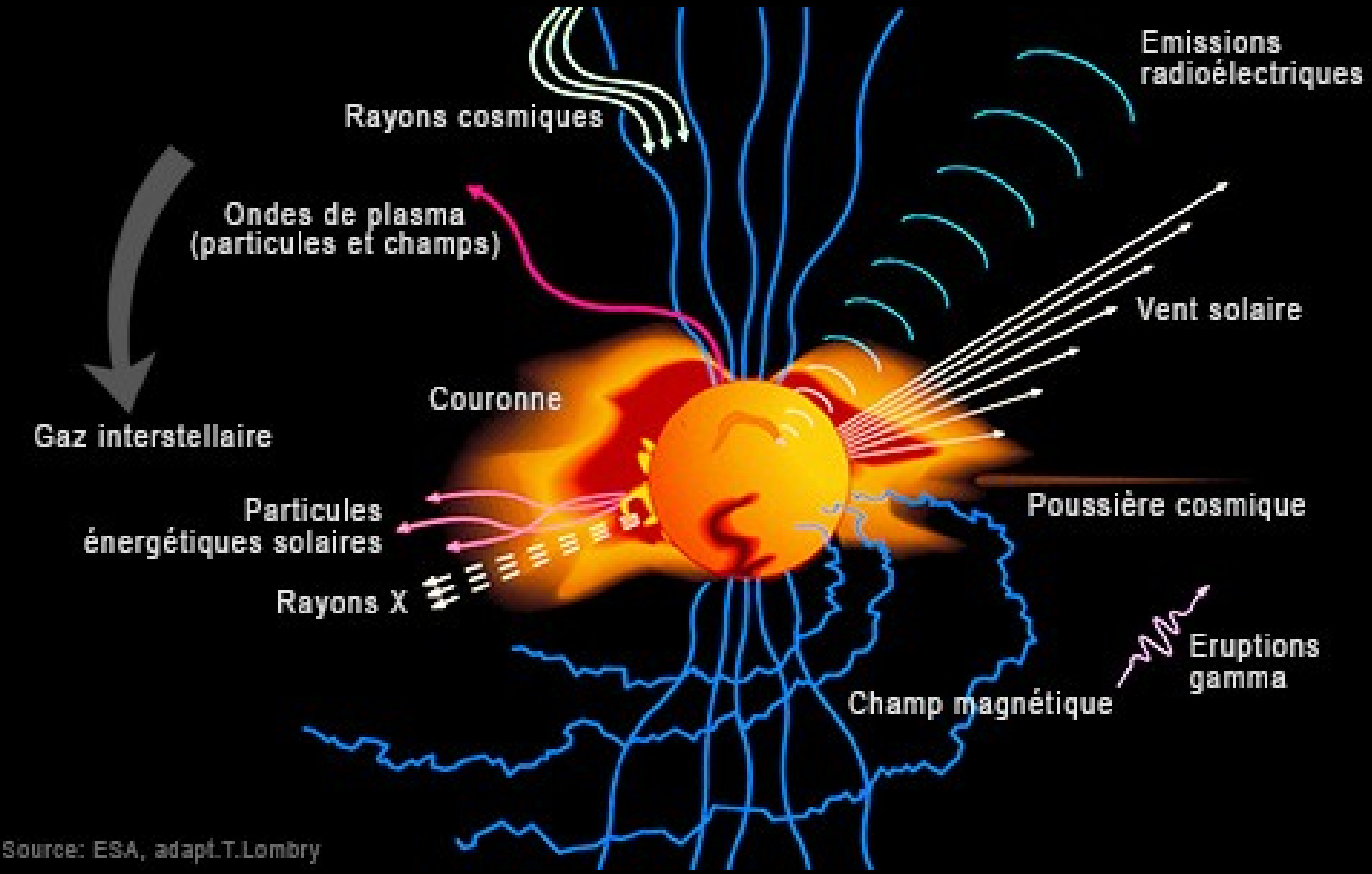


# Ejections de masse coronnale



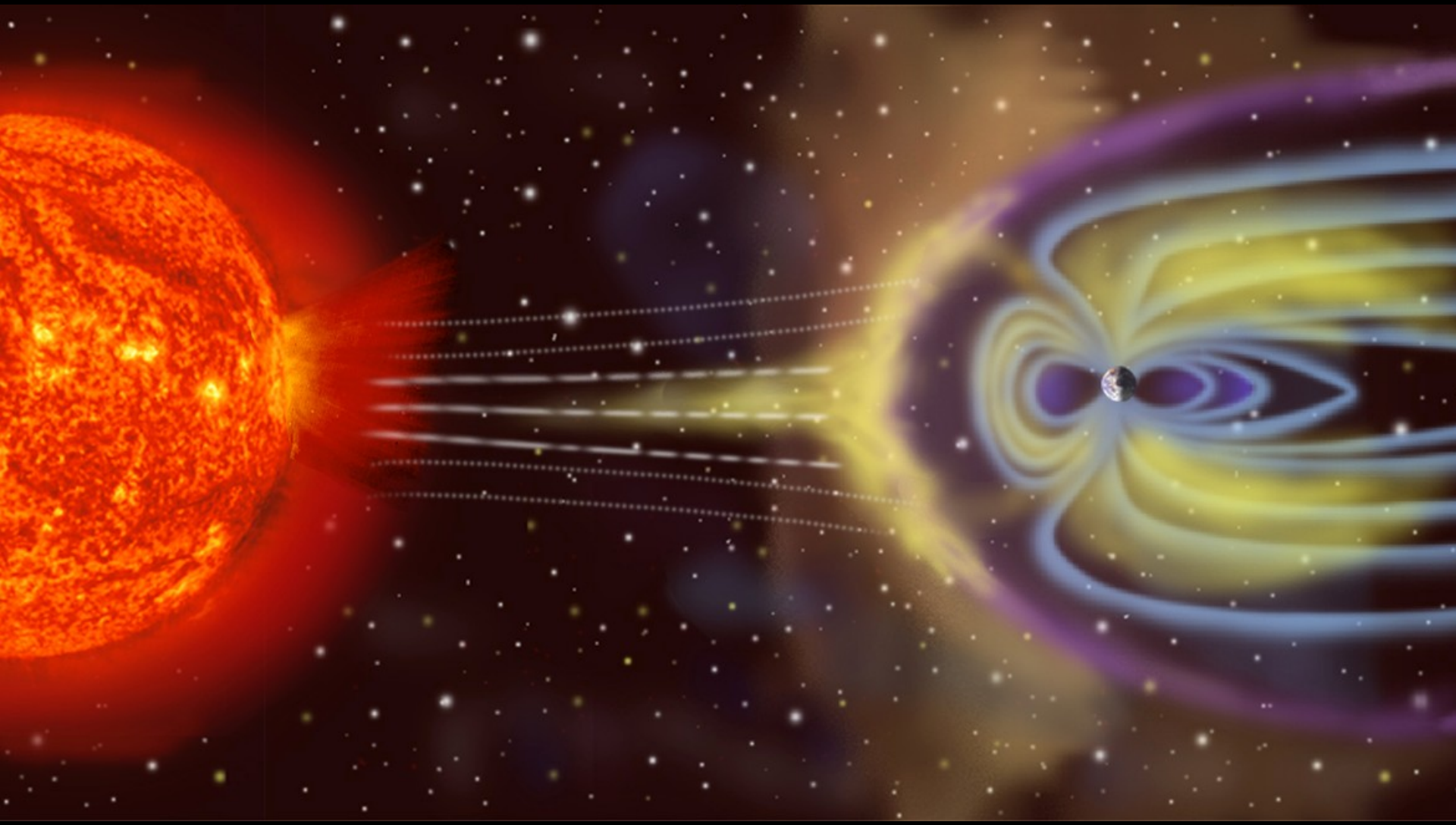



# Récapitulons

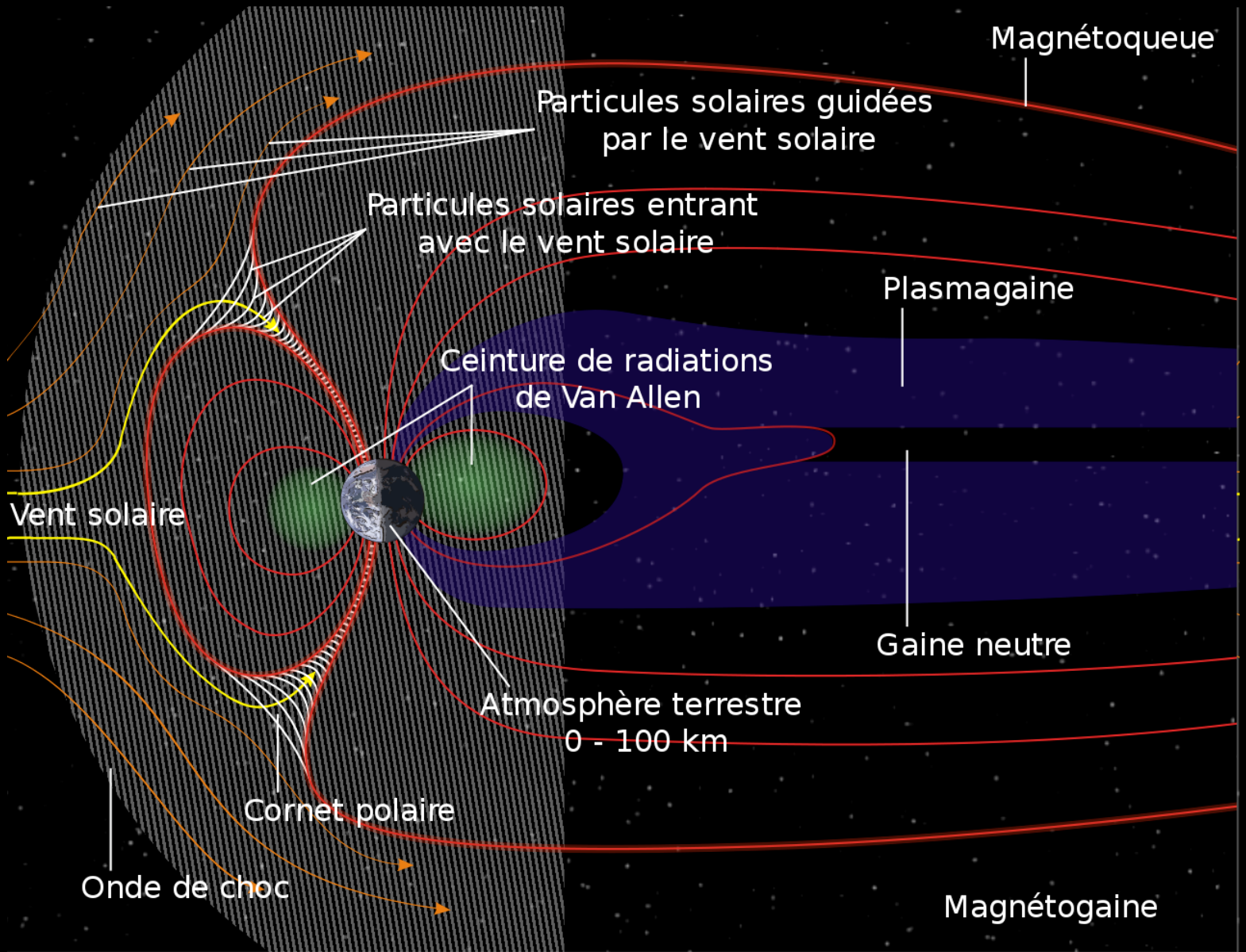


# Soleil-Terre

## quelle interaction ?



# La Magnétosphère

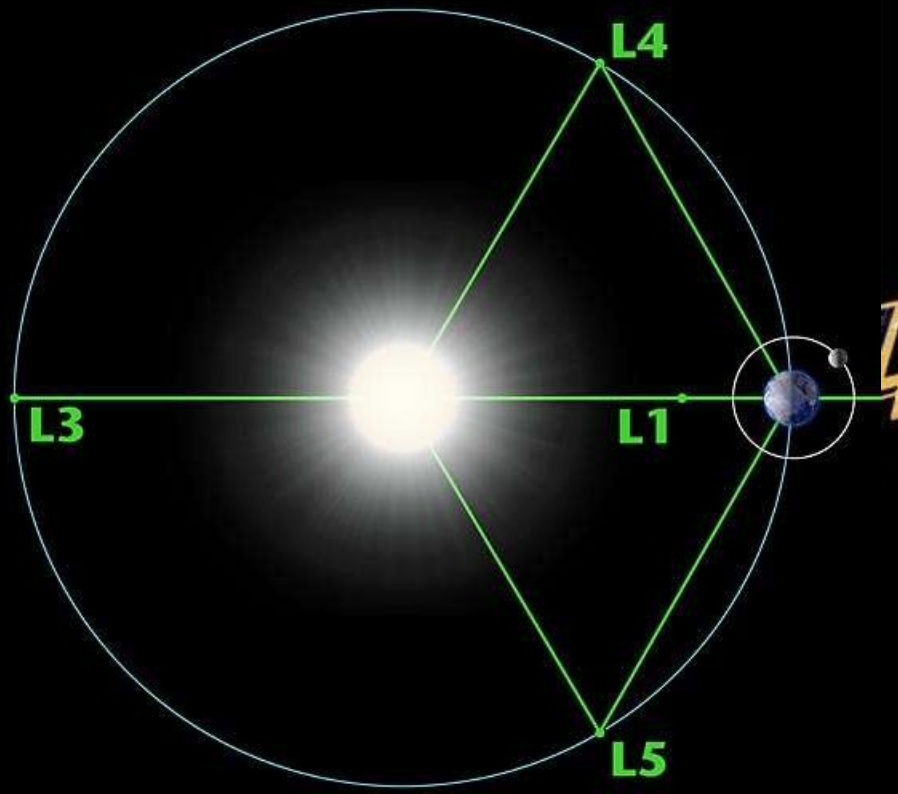


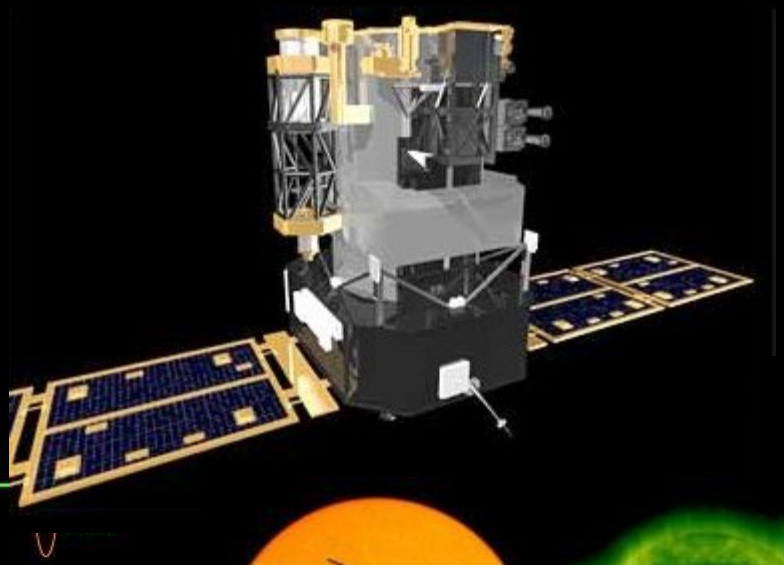
# Impact des évènements solaires

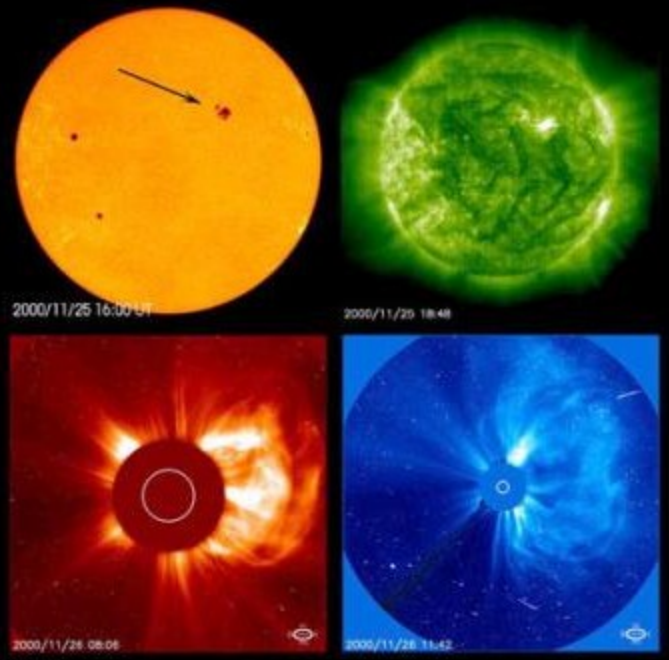
- Satellites
- Aviation
- Navigation
- Réseaux électriques
- Communications

Récapitulons

# Satellites d'observation du soleil






IONO, NASA/ESA

# Webographie


- https://apod.nasa.gov/apod/archivepix.html
- https://fr.wikipedia.org/wiki/Météorologie_de_l'espace
- http://www.spaceweather.org
- https://www.swpc.noaa.gov/
- http://swe.ssa.esa.int/
- https://www.sws.bom.gov.au/
- https://www.spaceweatherlive.com/fr


(à suivre)

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