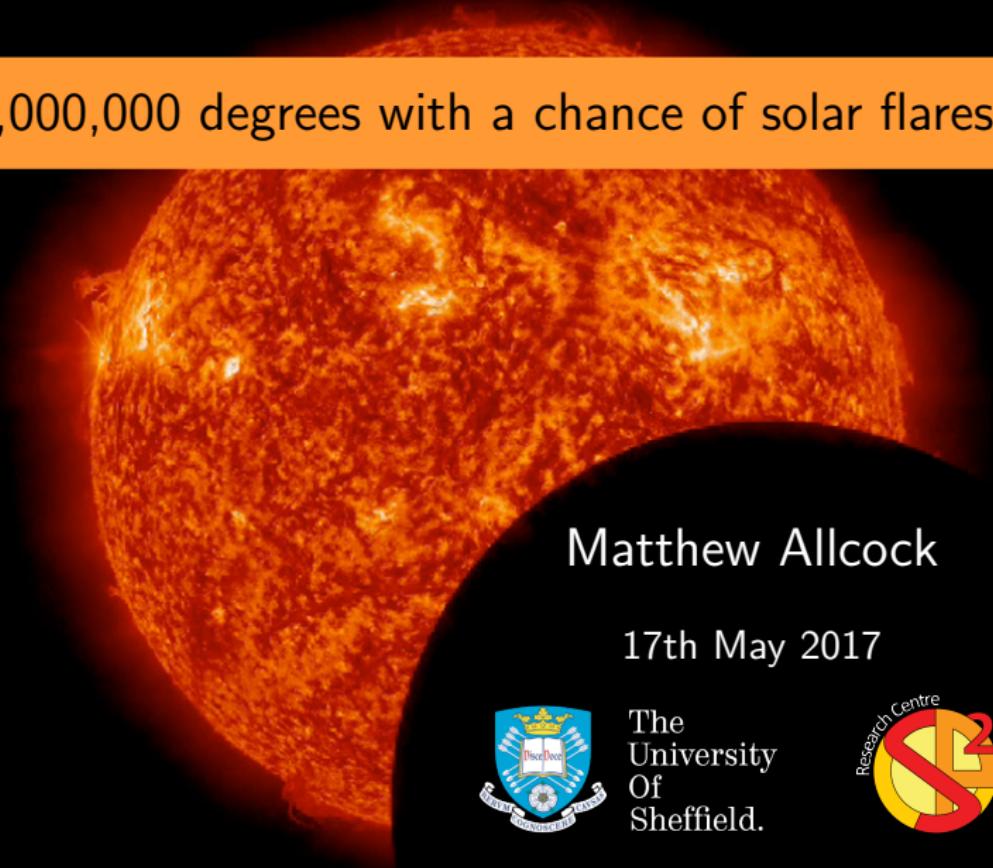


1,000,000 degrees with a chance of solar flares



Matthew Allcock

17th May 2017



The
University
Of
Sheffield.





Cabinet Office

National Risk Register of Civil Emergencies

2015 edition

National Risk Register of Civil Emergencies

Is it on the list?

YES

NO

National Risk Register of Civil Emergencies

Is it on the list?

Terrorism

YES

NO

National Risk Register of Civil Emergencies

Is it on the list?

Terrorism

YES

NO

- Terrorism

National Risk Register of Civil Emergencies

Is it on the list?

Asteroid impact

YES

NO

- Terrorism

National Risk Register of Civil Emergencies

Is it on the list?

Asteroid impact

YES

- Terrorism

NO

- Asteroid impact

National Risk Register of Civil Emergencies

Is it on the list?

Pandemic influenza

YES

- Terrorism

NO

- Asteroid impact

National Risk Register of Civil Emergencies

Is it on the list?

Pandemic influenza

YES

- Terrorism
- Pandemic influenza

NO

- Asteroid impact

National Risk Register of Civil Emergencies

Is it on the list?

Beer shortage

YES

- Terrorism
- Pandemic influenza

NO

- Asteroid impact

National Risk Register of Civil Emergencies

Is it on the list?

Beer shortage

YES

- Terrorism
- Pandemic influenza

NO

- Asteroid impact
- Beer shortage

National Risk Register of Civil Emergencies

Is it on the list?

Earthquake

YES

- Terrorism
- Pandemic influenza

NO

- Asteroid impact
- Beer shortage

National Risk Register of Civil Emergencies

Is it on the list?

Earthquake

YES

- Terrorism
- Pandemic influenza

NO

- Asteroid impact
- Beer shortage
- Earthquake

National Risk Register of Civil Emergencies

Is it on the list?

Heatwave

YES

- Terrorism
- Pandemic influenza

NO

- Asteroid impact
- Beer shortage
- Earthquake

National Risk Register of Civil Emergencies

Is it on the list?

Heatwave

YES

- Terrorism
- Pandemic influenza
- Heatwave

NO

- Asteroid impact
- Beer shortage
- Earthquake

National Risk Register of Civil Emergencies

Is it on the list?

Public disorder

YES

- Terrorism
- Pandemic influenza
- Heatwave

NO

- Asteroid impact
- Beer shortage
- Earthquake

National Risk Register of Civil Emergencies

Is it on the list?

Public disorder

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake

National Risk Register of Civil Emergencies

Is it on the list?

Alien contact

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake

National Risk Register of Civil Emergencies

Is it on the list?

Alien contact

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact

National Risk Register of Civil Emergencies

Is it on the list?

Nuclear war

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact

National Risk Register of Civil Emergencies

Is it on the list?

Nuclear war

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact
- Nuclear war

National Risk Register of Civil Emergencies

Is it on the list?

Artificial super-intelligence

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact
- Nuclear war

National Risk Register of Civil Emergencies

Is it on the list?

Artificial super-intelligence

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact
- Nuclear war
- Artificial super-intelligence

National Risk Register of Civil Emergencies

Is it on the list?

Flooding

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact
- Nuclear war
- Artificial super-intelligence

National Risk Register of Civil Emergencies

Is it on the list?

Flooding

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder
- Flooding

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact
- Nuclear war
- Artificial super-intelligence

National Risk Register of Civil Emergencies

Is it on the list?

Space weather

YES

- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder
- Flooding

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact
- Nuclear war
- Artificial super-intelligence

National Risk Register of Civil Emergencies

Is it on the list?

Space weather

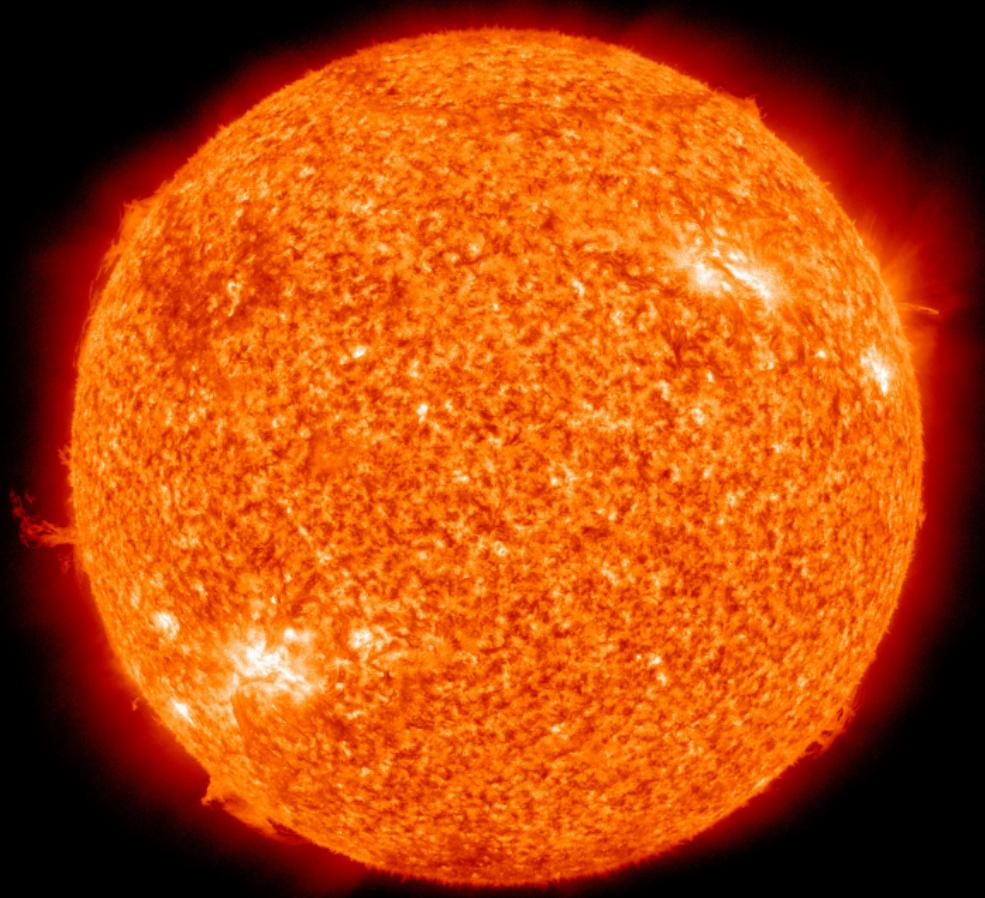
YES

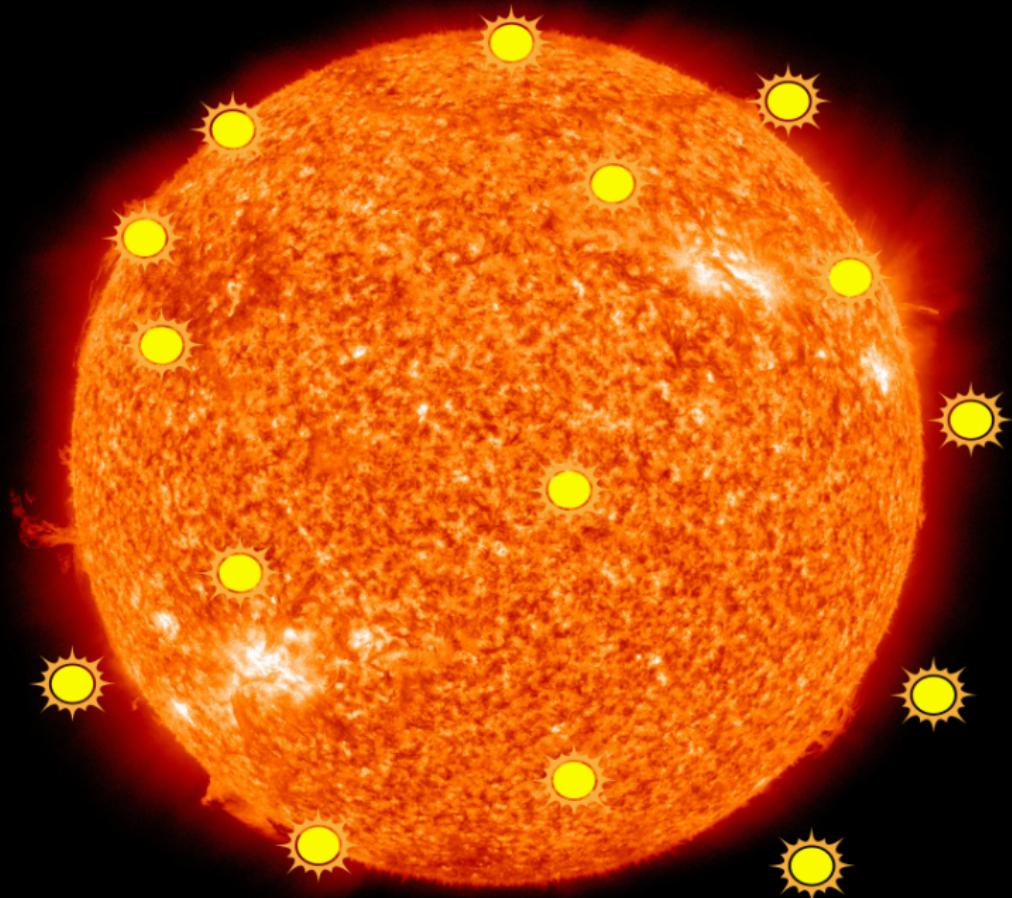
- Terrorism
- Pandemic influenza
- Heatwave
- Public disorder
- Flooding
- **Space weather**

NO

- Asteroid impact
- Beer shortage
- Earthquake
- Alien contact
- Nuclear war
- Artificial super-intelligence



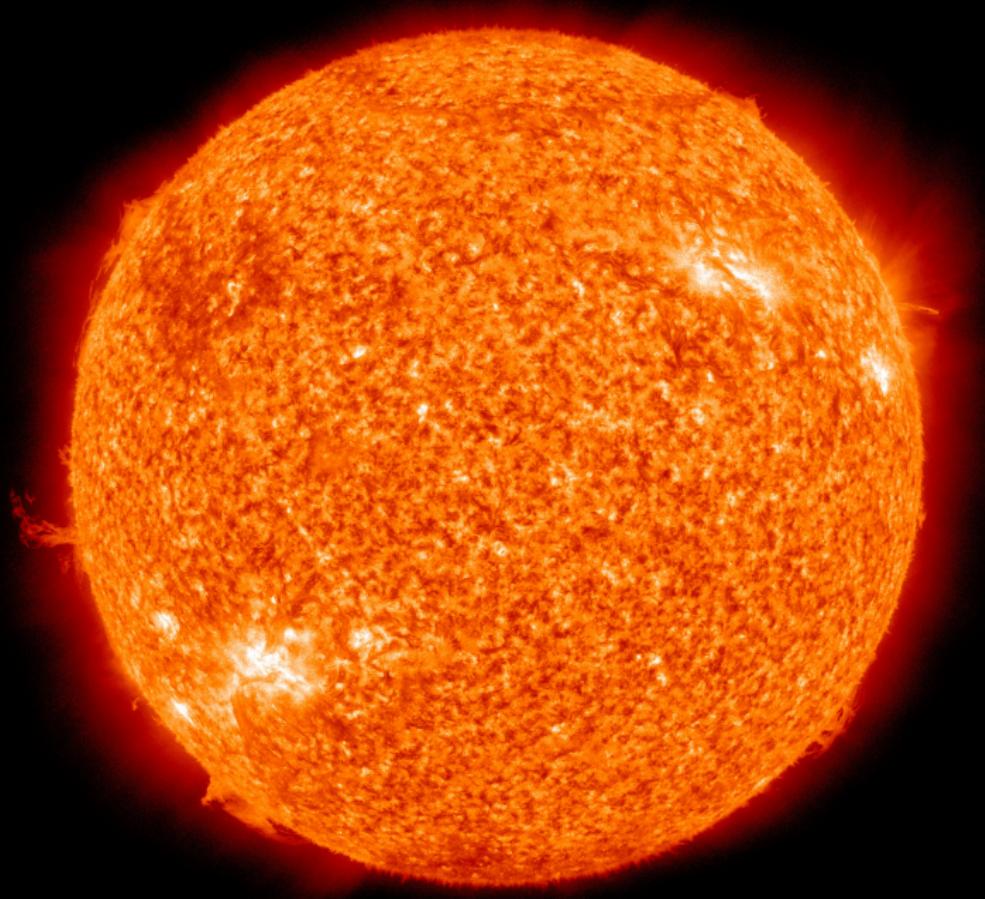


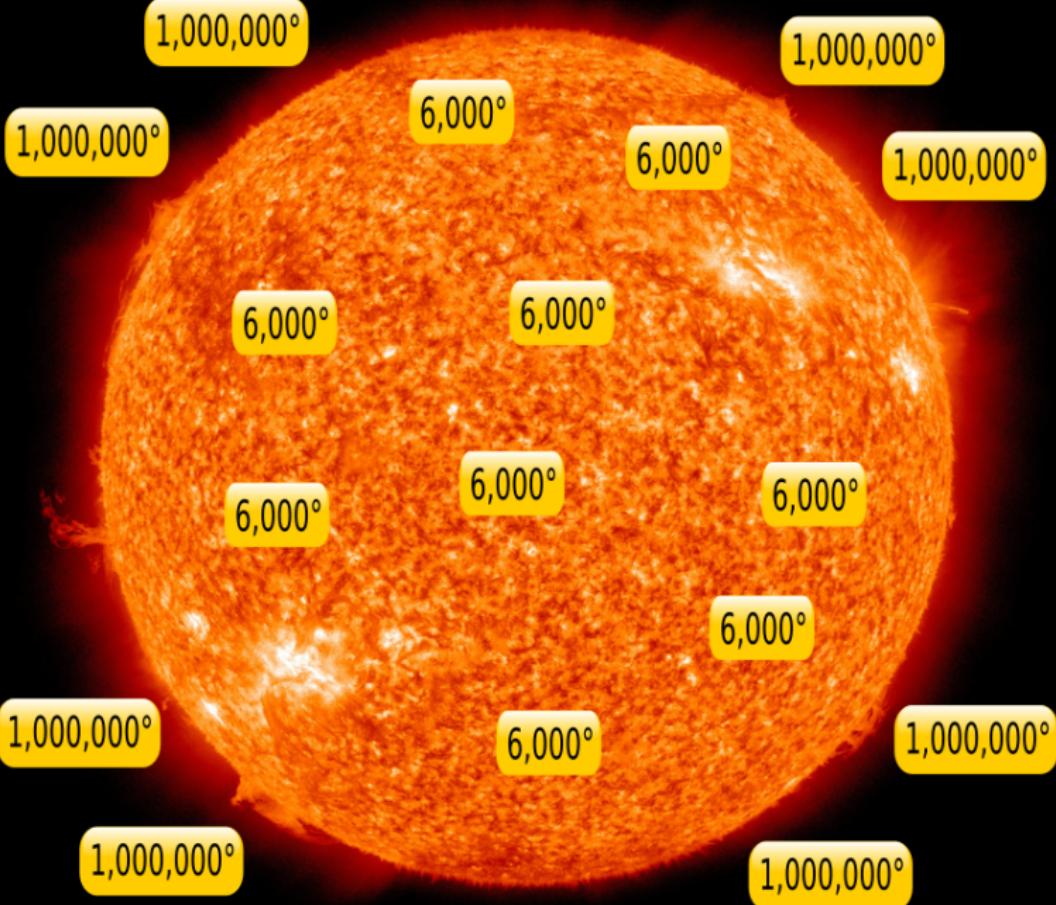


Coronal rain



Credit: NASA, SDO

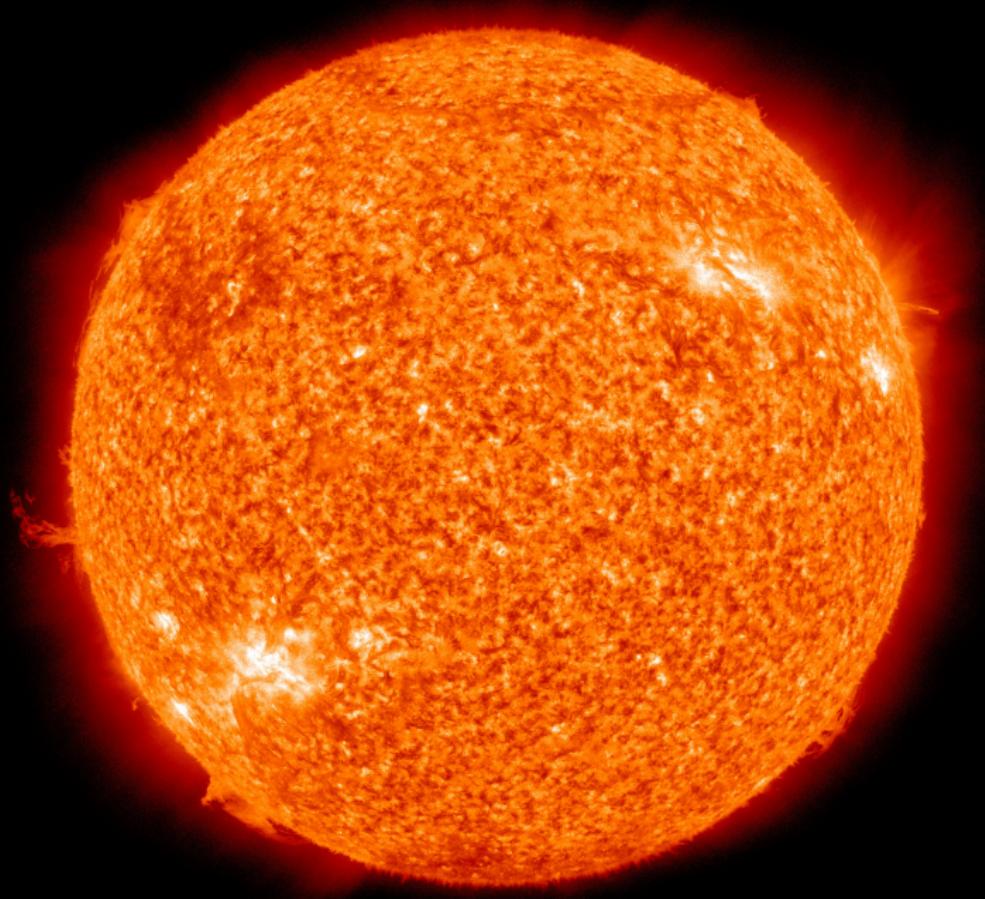


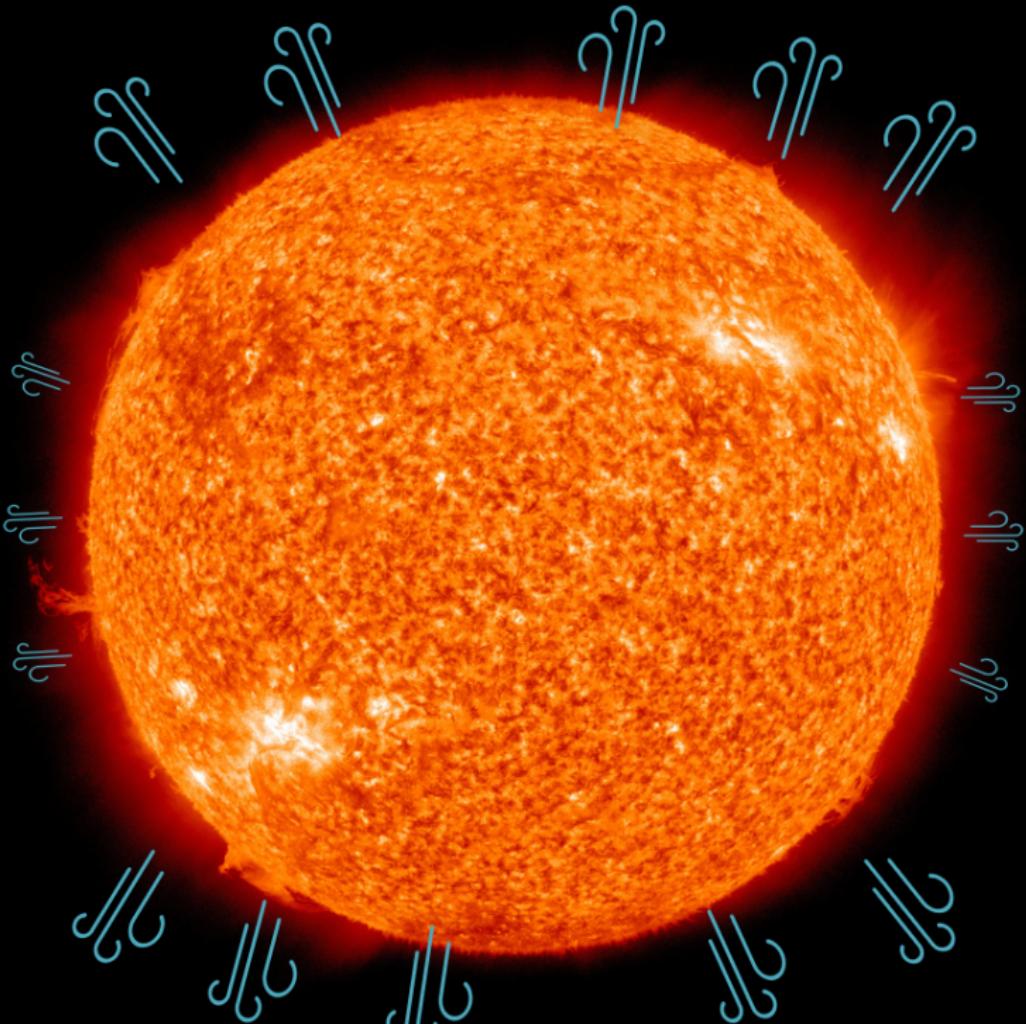


Magnetohydrodynamic waves



Credit: NASA, SDO





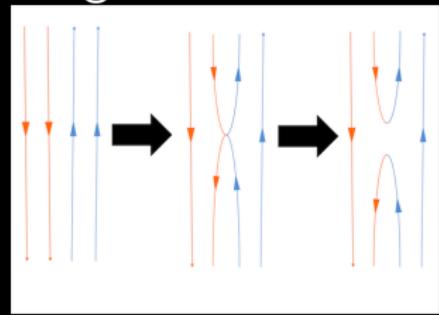
Solar wind



Credit: NASA, SDO

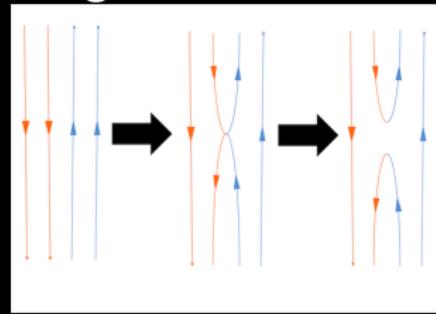
Coronal Mass Ejection

Magnetic reconnection



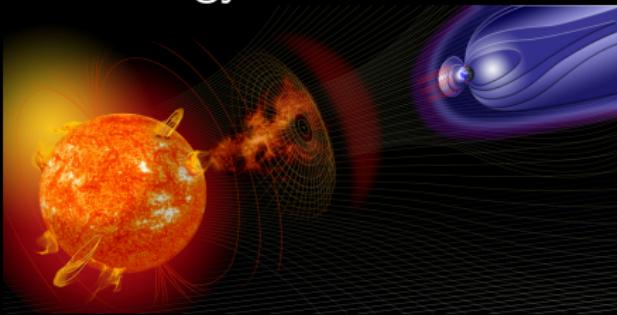
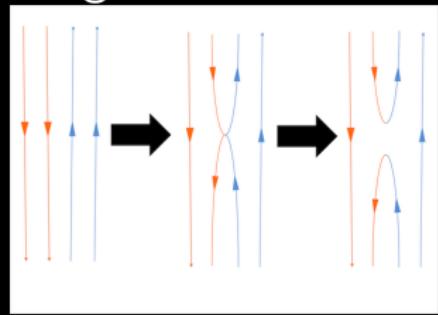
Coronal Mass Ejection

Magnetic reconnection → Energy release



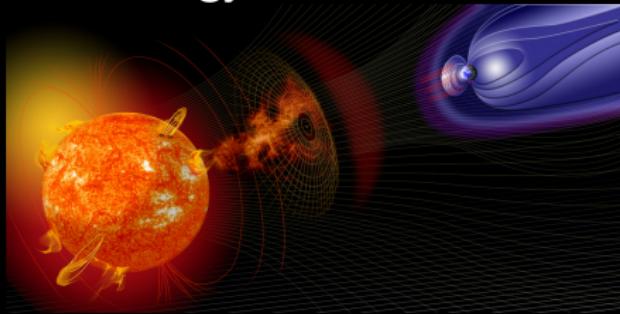
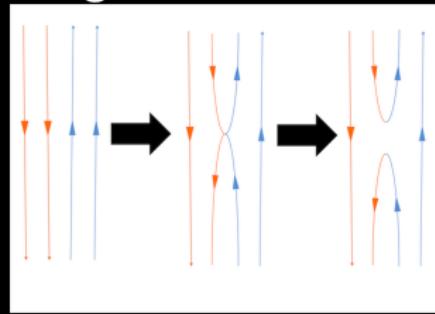
Coronal Mass Ejection

Magnetic reconnection → Energy release → CME



Coronal Mass Ejection

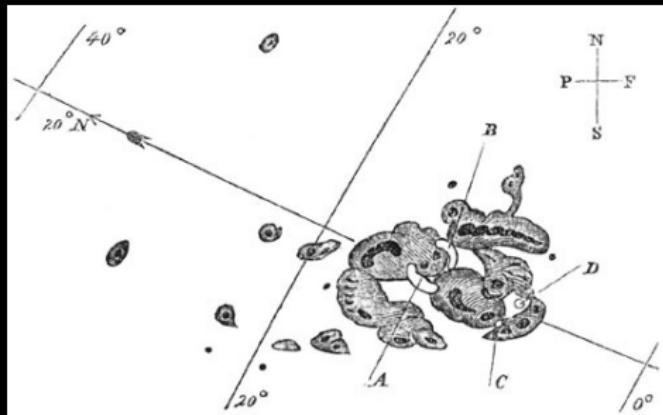
Magnetic reconnection → Energy release → CME



CME directed towards Earth → **Space weather**

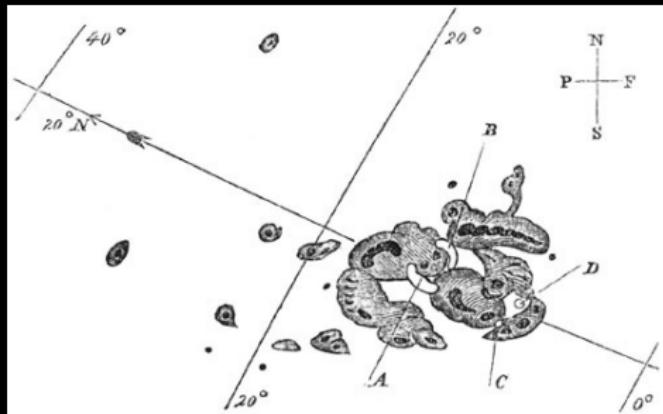
Early observations

- 1859: Richard Carrington observes the first (and largest) CME.



Early observations

- 1859: Richard Carrington observes the first (and largest) CME.
- 2017: What damage would this CME cause today?



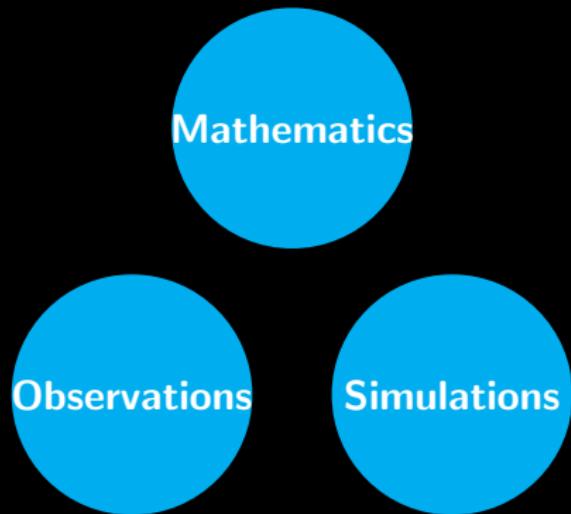
Current research

Observations

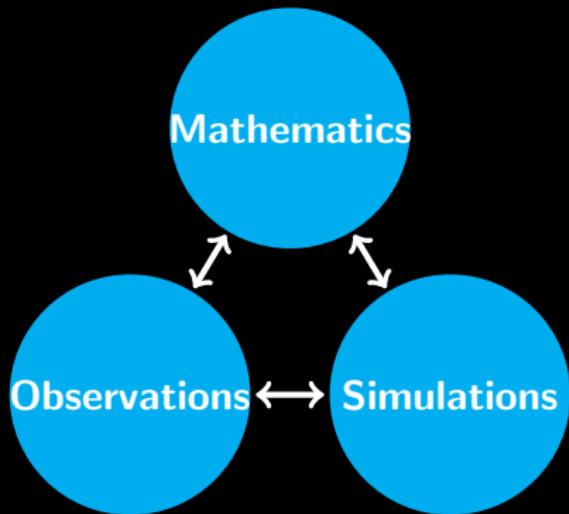
Current research



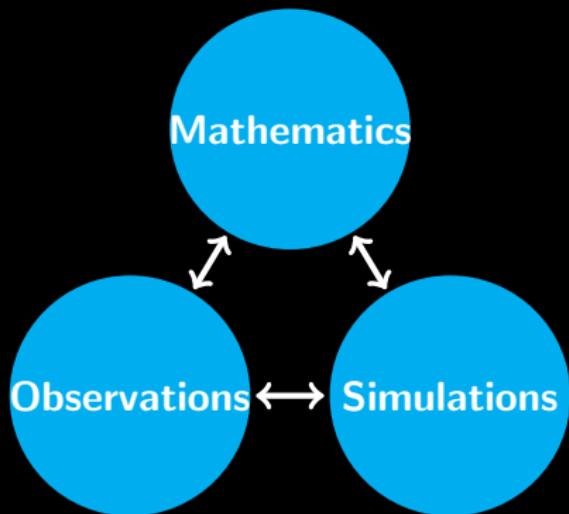
Current research



Current research



Current research



- Can waves heat the sun's atmosphere?
- Can we predict solar flares and CMEs?
- What maintains the Sun's magnetic field?

Space weather

Beautiful...

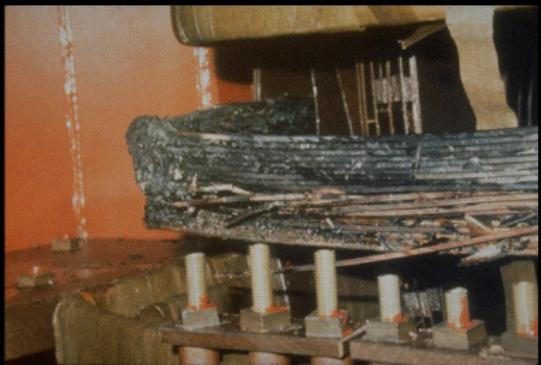


Space weather

Beautiful...



but **terrifying!**



Thank you,
Any questions?

Matthew Allcock



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@matthew_allcock



The
University
Of
Sheffield.

