

Space weather & the impact of geomagnetic induction on submarine cable systems

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Aurora australis

Dancing in the sky over Cape Schanck Lighthouse in Melbourne Victoria

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Introduction to Space Weather

Artist's impression of solar wind. Credit: K. Endo

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Monitoring Space Weather Events

Satellites:

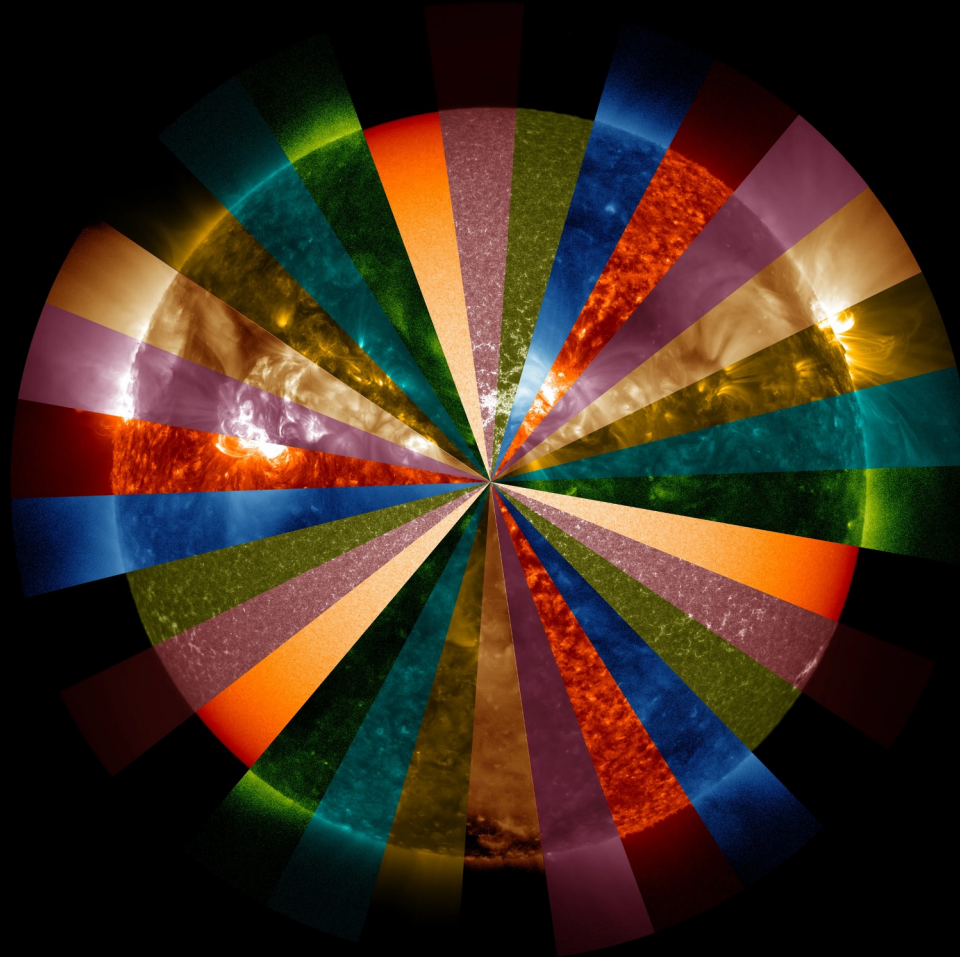
- NASA Solar Dynamics Observatory.
- NOAA Geostationary Operational Environmental Satellites
- European Space Agency Solar and Heliospheric Observatory

Ground-Based Observations:

- Radio telescopes
- Solar observatories

Data Collection:

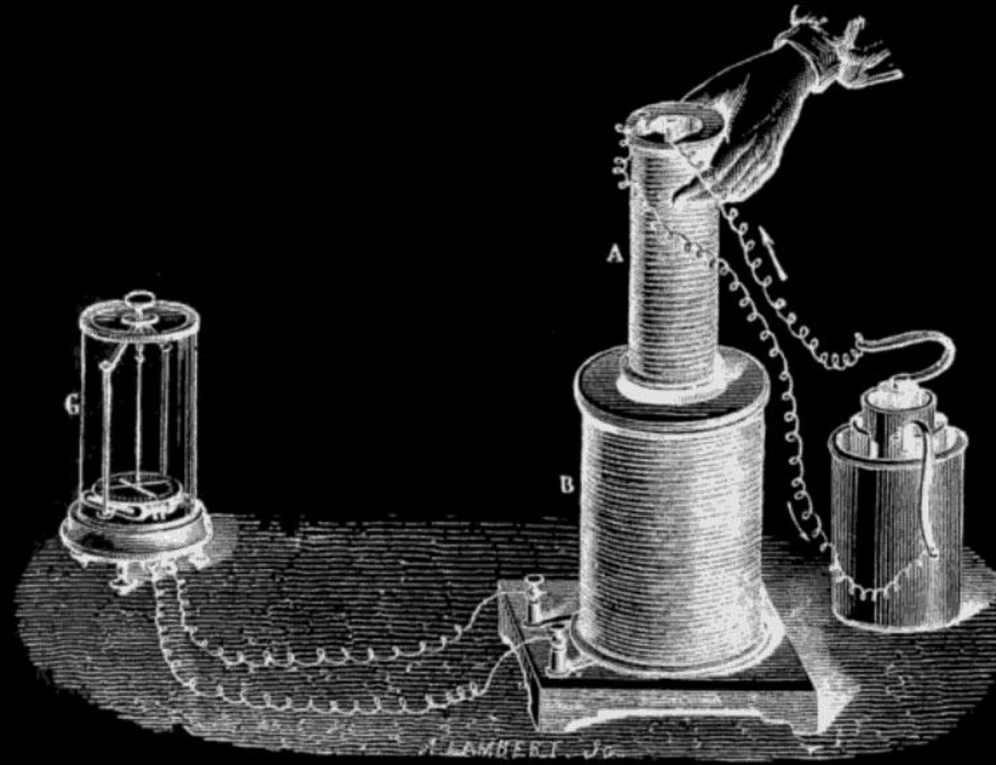
- Solar imaging
- Magnetic field measurements
- Particle detections



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Faraday's law

A variable magnetic field will cause a variable electric field.



The Carrington Event

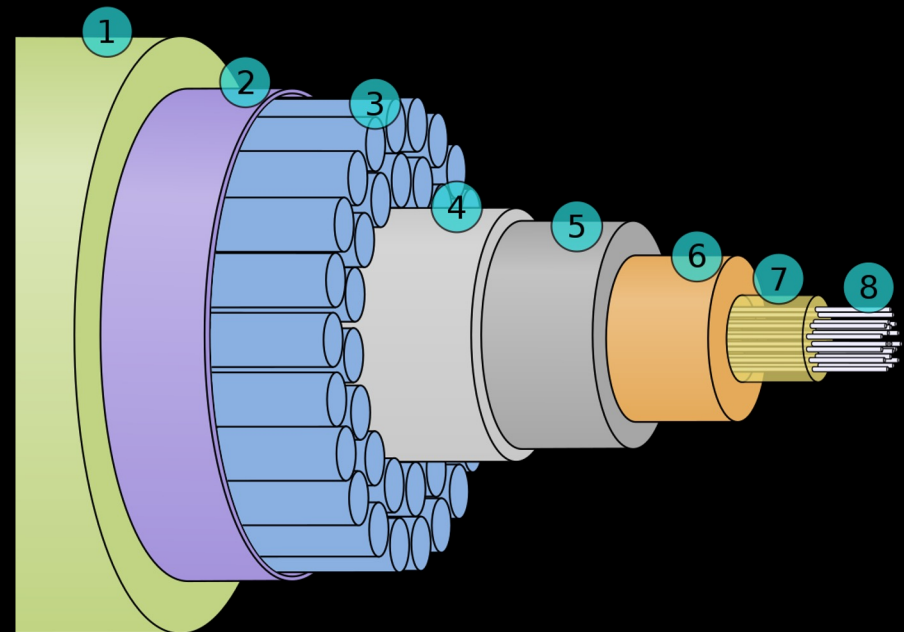
1859 severe solar storm



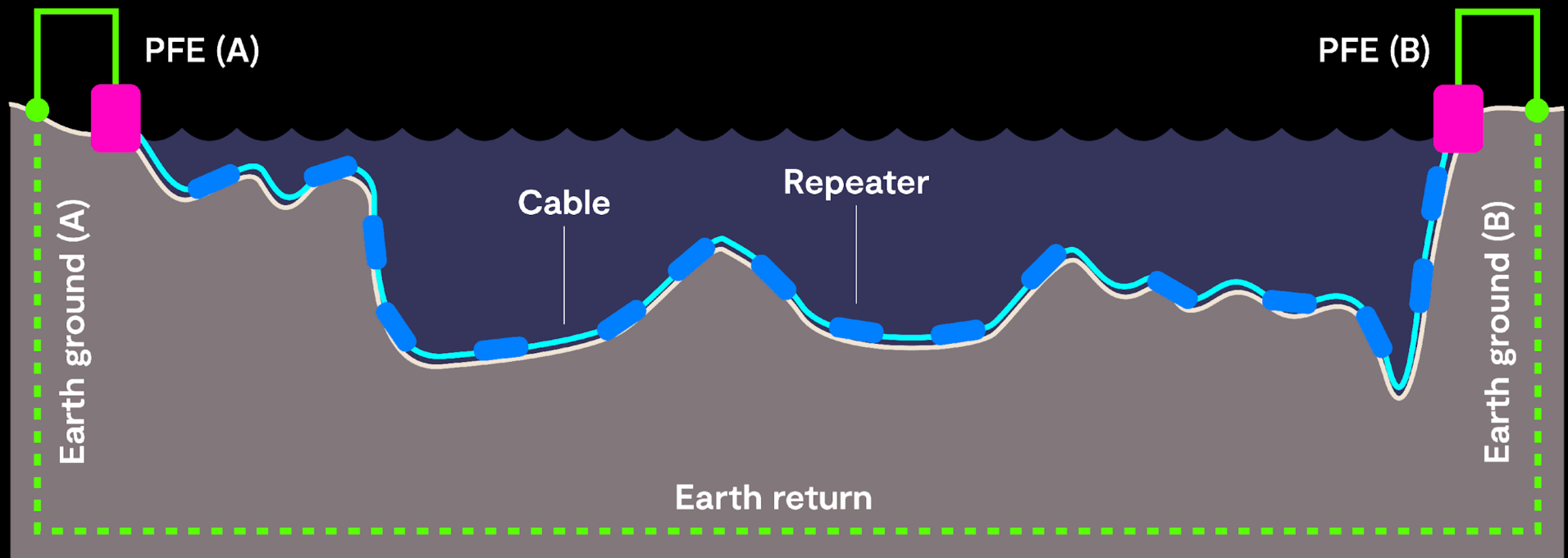
But what about submarine cables?

The modern-day telegraph network

1. Polyethylene
2. Mylar tape
3. Stranded steel wires
4. Aluminum water barrier
5. Polycarbonate
6. Copper Power tube
7. Petroleum jelly
8. Optical fibers



A Simple Submarine System

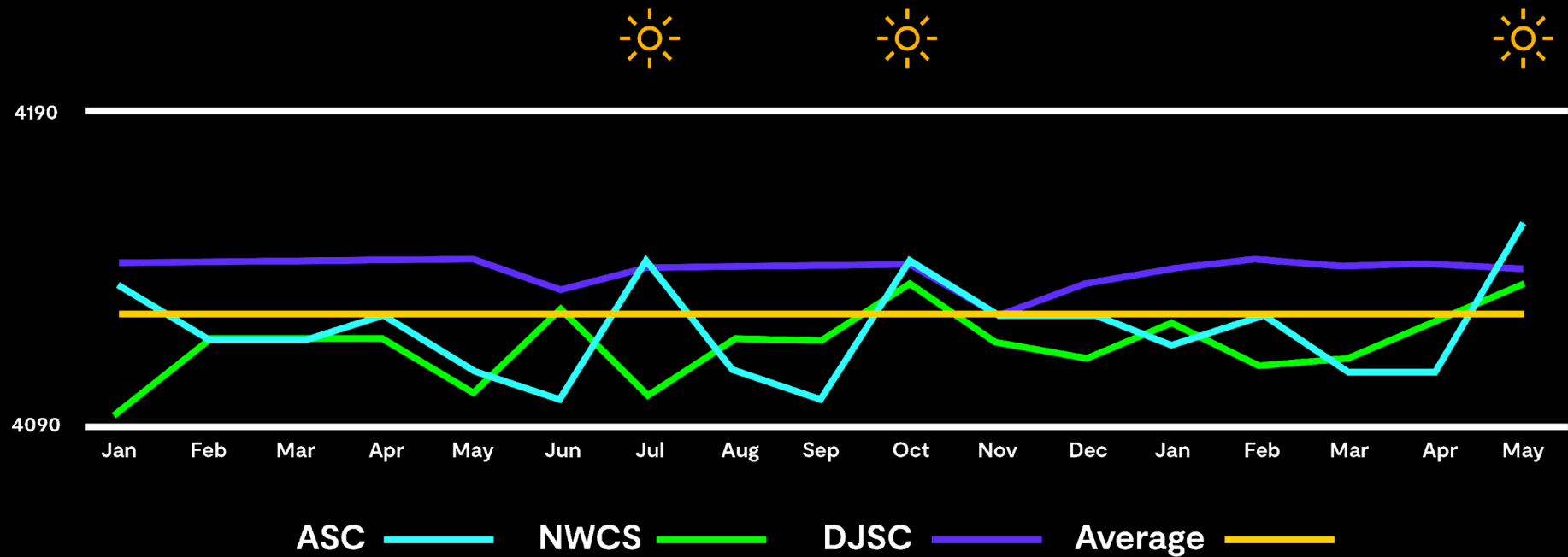


Overloading the system...

How much voltage would a large solar storm add to a very long copper wire under the ocean?

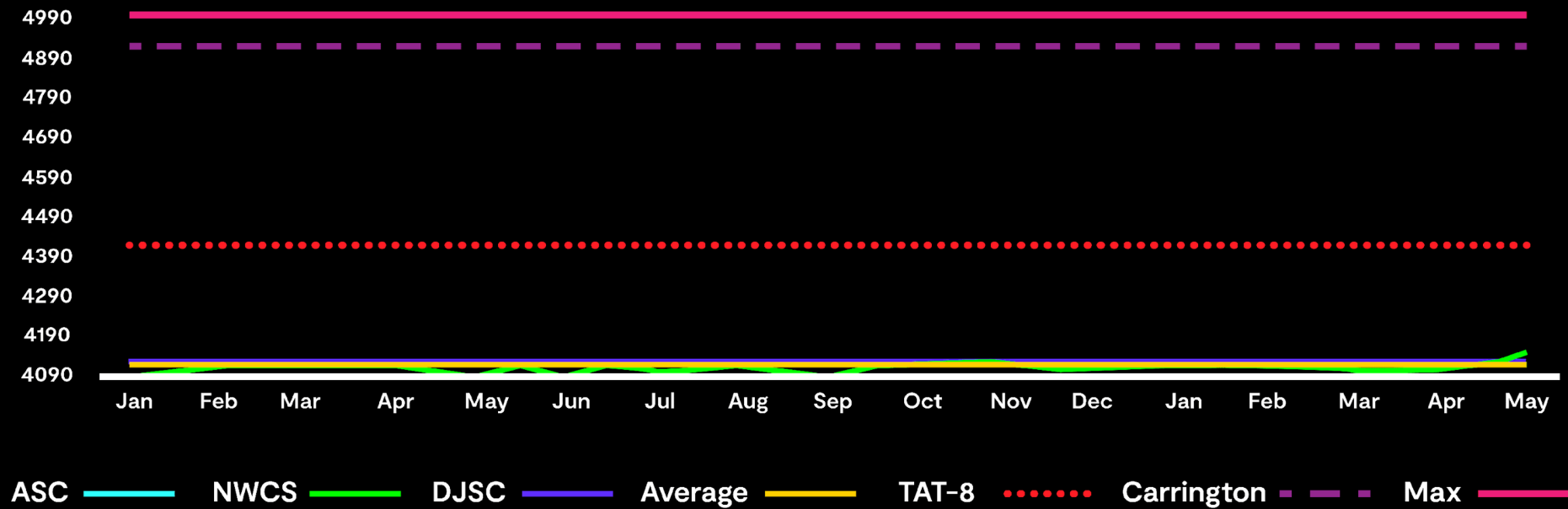
What does the data show?

Submarine power voltages



What does the data show?

Submarine power voltages



Resilience of submarine systems

Aurora Australis viewed from Phillip Island

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