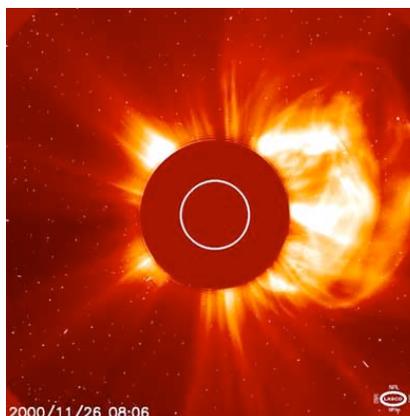


## Solar storm speeds

The sun often ejects clouds of gases into space. Some of these fast-moving clouds can be directed at Earth. Astronomers call them Coronal Mass Ejections (or CMEs). When these CMEs arrive, they can cause spectacular aurora, damage satellites, or cause electrical blackouts.

In this exercise, you will learn how scientists use the speeds of these clouds to predict when they will arrive at Earth.



The Sun ejects clouds of gas into space carrying billions of tons of matter.

**Scientists need to know how fast things move in order to study where they come from and what causes them.**

- The speed of an object is defined as the distance it travels divided by the time it takes.

**Now you try!**

### Here's how to do it!

The ACE satellite measures the speed of the solar wind and clouds of gas from the Sun. Its sensor detects a cloud moving at 980 kilometers per second. How long will it take for it to travel from the spacecraft to Earth, if the distance is 1.5 million kilometers?

$$\begin{aligned} \text{Answer: Time} &= (1,500,000 \text{ km}) / (980 \text{ km/sec}) \\ &= 1,530 \text{ seconds} \end{aligned}$$

### Cloud Speeds

Date	Speed
5-10-02	423.0
5-18-02	497.0
5-23-02	897.0
7-12-02	548.0
7-20-02	931.0
7-23-02	516.0
9-19-02	756.0
1-11-02	647.0
1-19-02	455.0
3-05-02	705.0
3-18-02	480.0
3-29-02	379.0
4-01-02	795.0
8-10-02	469.0

The table shows cloud speeds measured in kilometers per second. Assume that the clouds detected by the ACE satellite were the CMEs produced on the Sun.

- 1) What was the fastest speed measured?
- 2) What was the slowest speed measured?
- 3) What was the average speed measured?
- 4) What is the fastest speed in miles per hour?
- 5) If the Sun is 150 million kilometers from Earth, how many hours would it take the fastest and the slowest CMEs to reach Earth?

More about CMEs:

<http://sunearth.gsfc.nasa.gov/sechtml/litho5.html>