

# Tracking Sunspots

Using real data from SOHO

A teacher-led classroom exercise for pairs of students



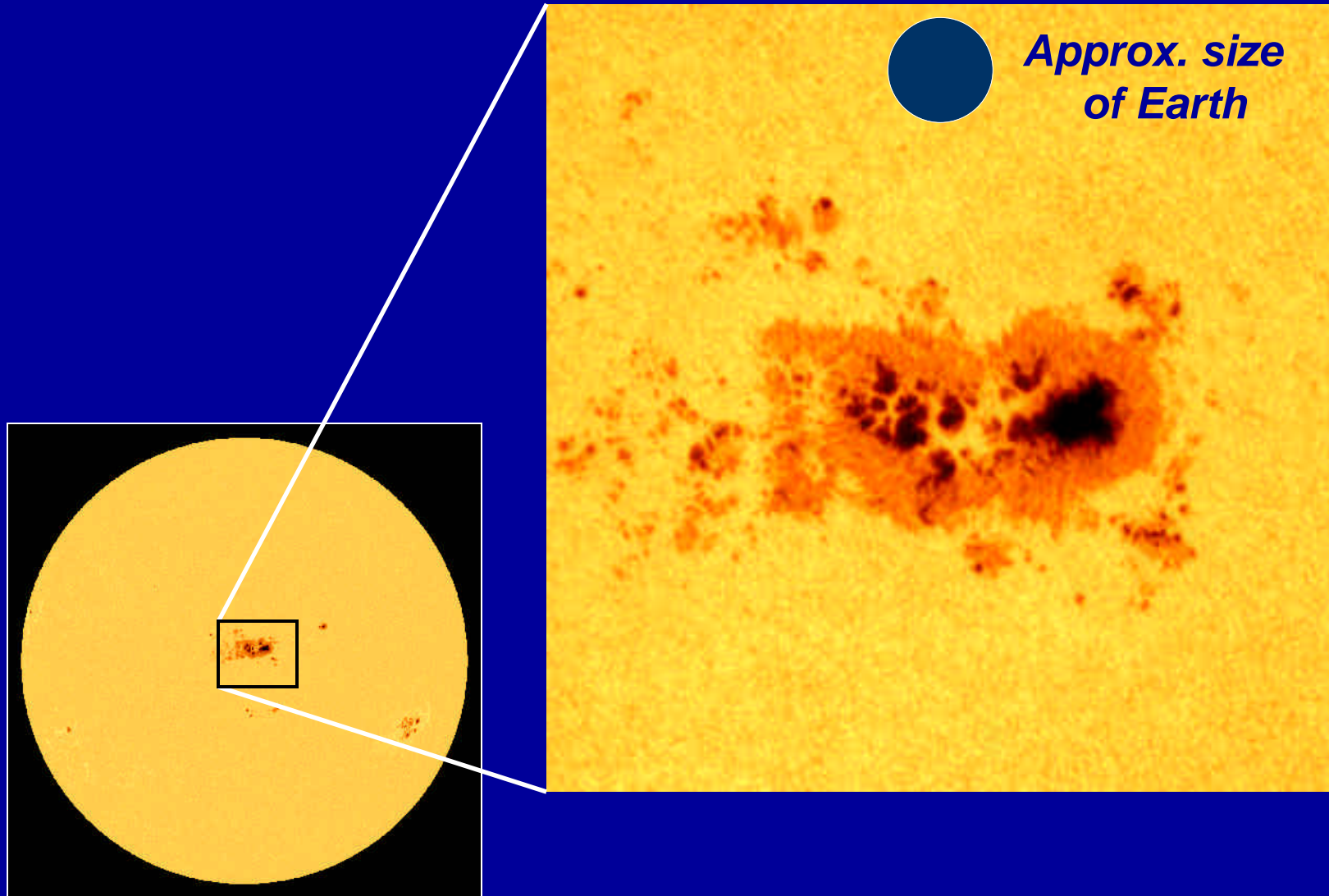
You are about ready to start observing and tracking sunspots across the Sun using real images. You can then use this information to determine the rate of the Sun's rotation.

## Some sunspot facts:

- Sunspots are dark, cooler areas on the Sun's surface that indicate areas of strong magnetic activity
- They appear dark only because they are not as hot or bright as the area surrounding them (4,000 degrees C. vs. 6,000 degrees C.)
- Sunspots extend down into the Sun as well as above where loops of magnetic field lines carry charged particles
- They can last from just hours to several months

How **BIG** are they? Next page...

Sunspots, which usually appear in groups, can grow to many times the size of Earth



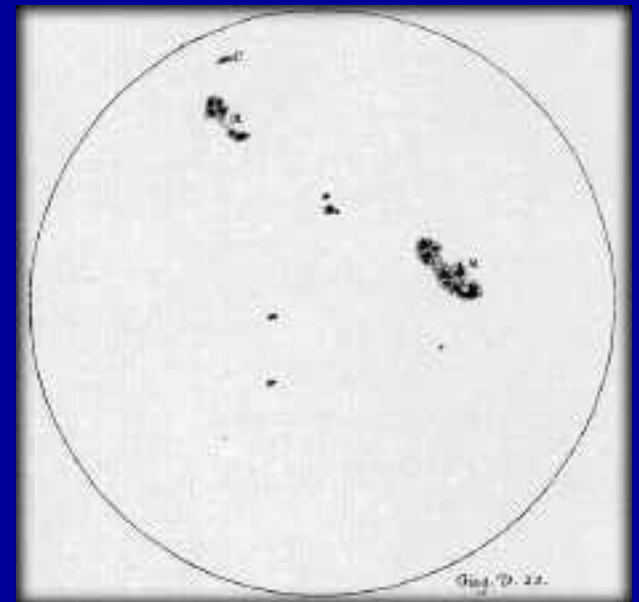
# How and when did scientists discover that there were spots on the Sun?

The first telescope was made in Europe in 1608. Galileo, who first performed scientific observations in the early 1613, concluded that the Sun did indeed have spots. If, as others suggested, these spots are planets passing in front of the Sun, they'd be the same in the center as near the edges. He noted changes in size and shape. Other scientists came to similar conclusions.



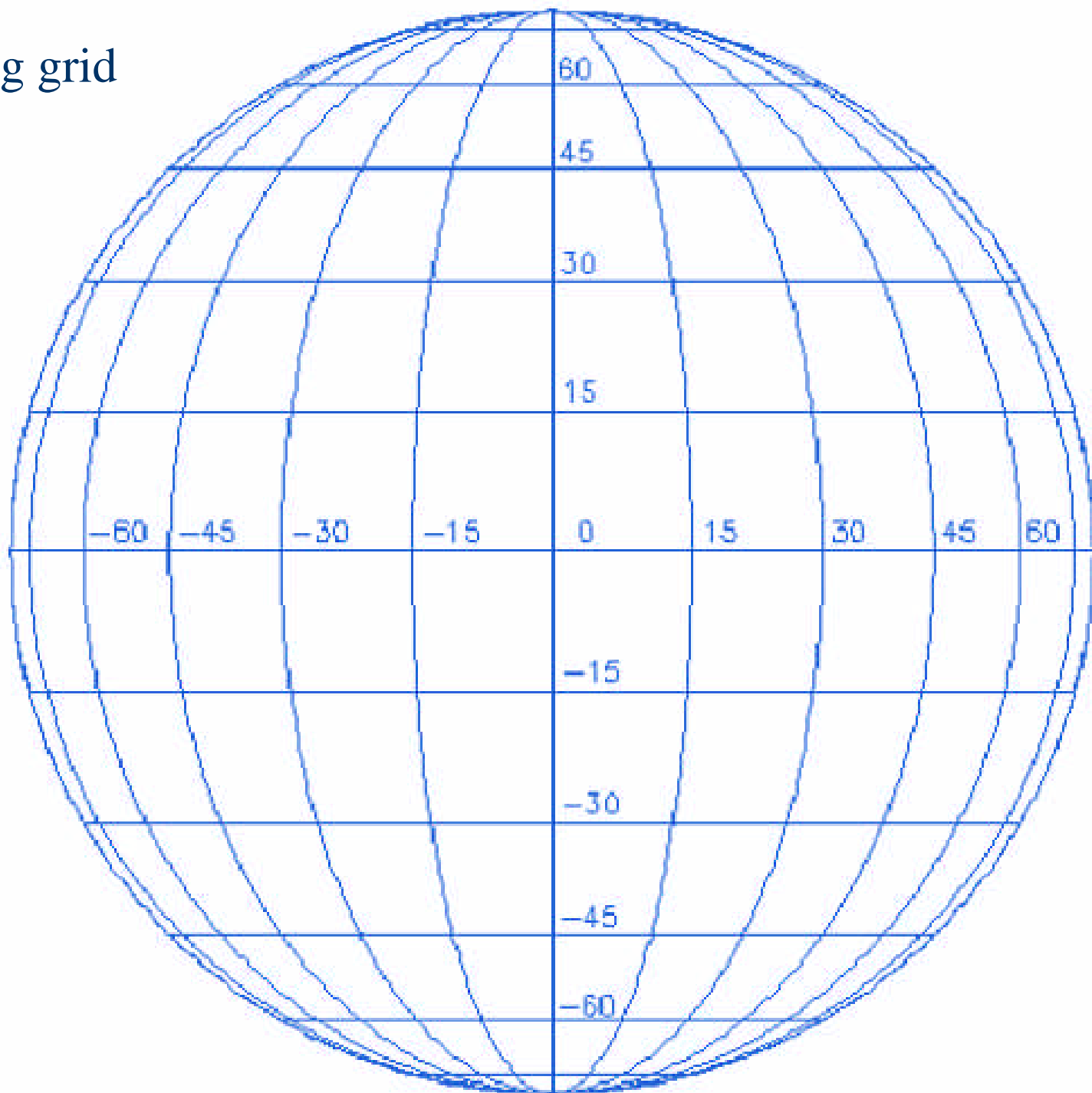
Galileo portrait in crayon by Leoni.

*Galileo and one of his  
original sunspot  
drawings*



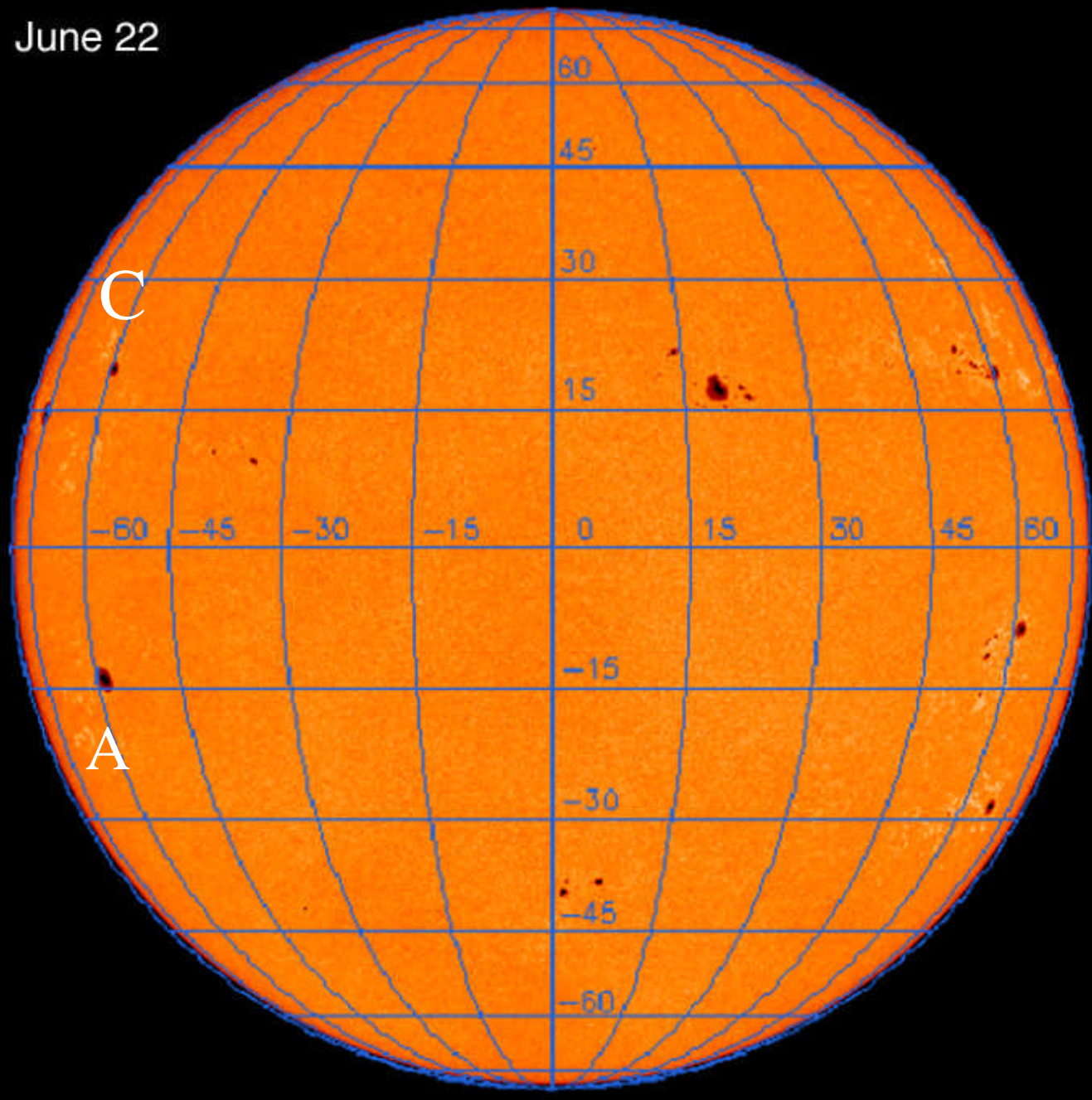
To begin, first print out the mapping grid on the following page -- each two-person team will need one

# Mapping grid



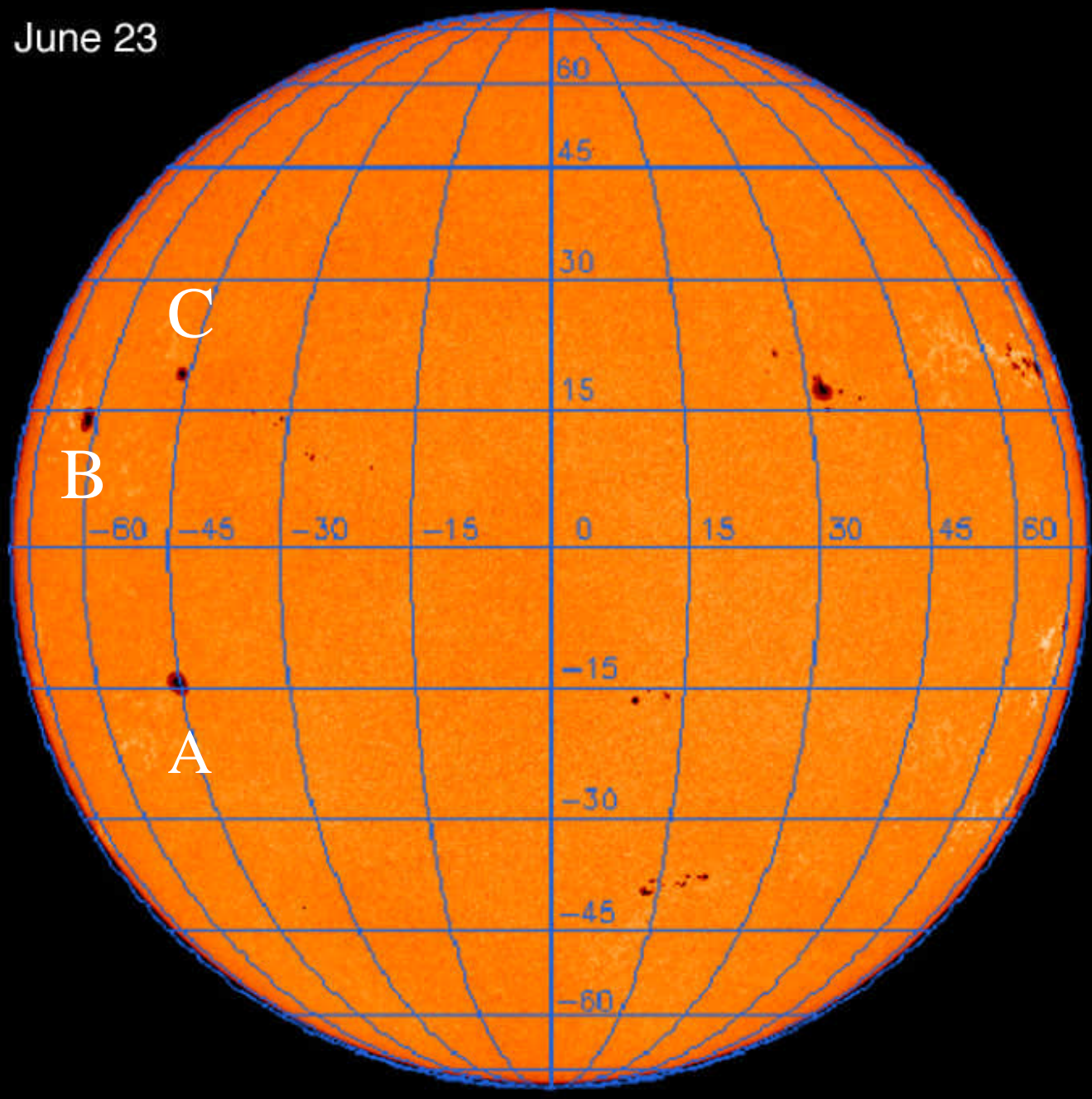


June 22



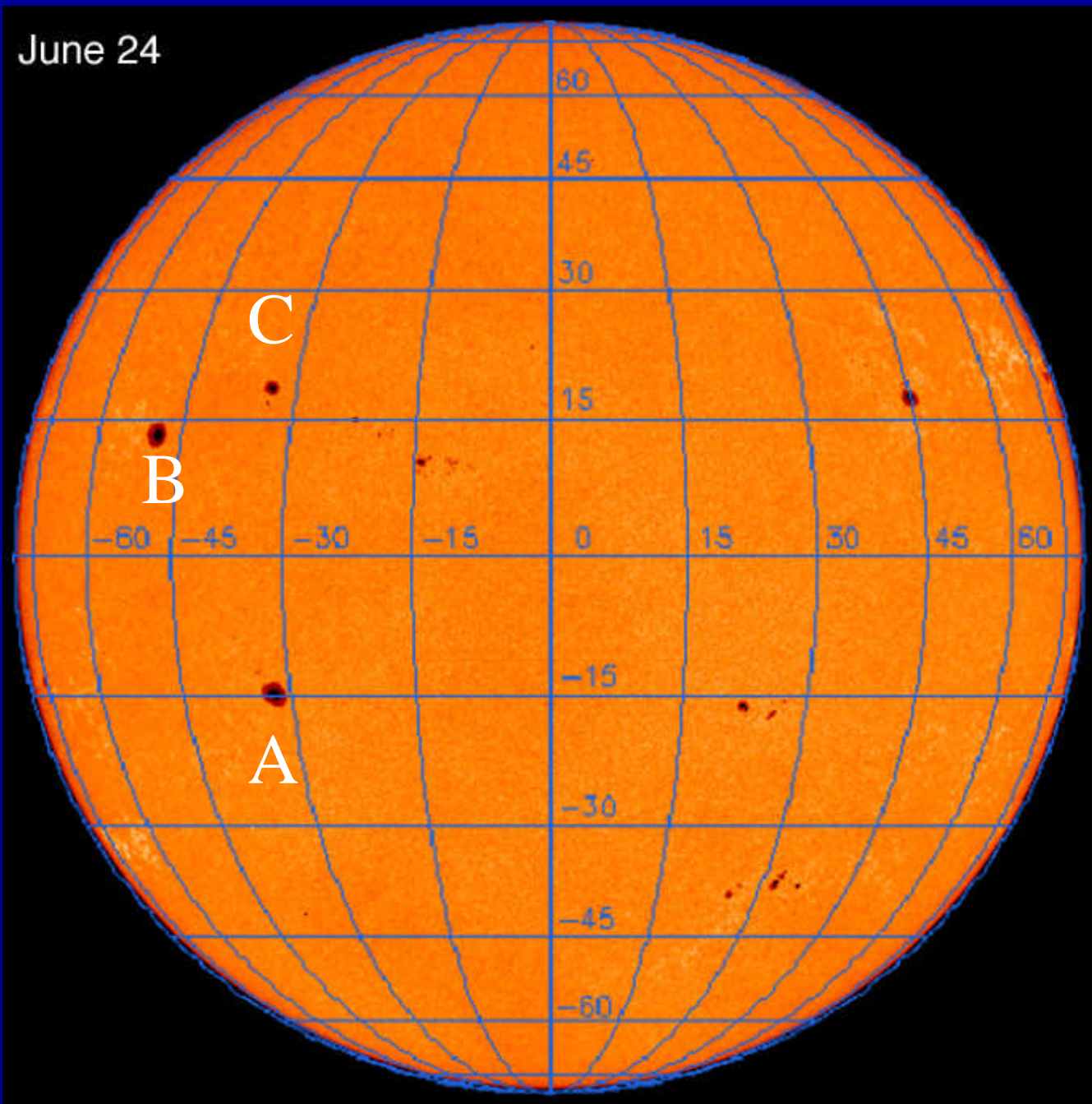
June 23

June 23



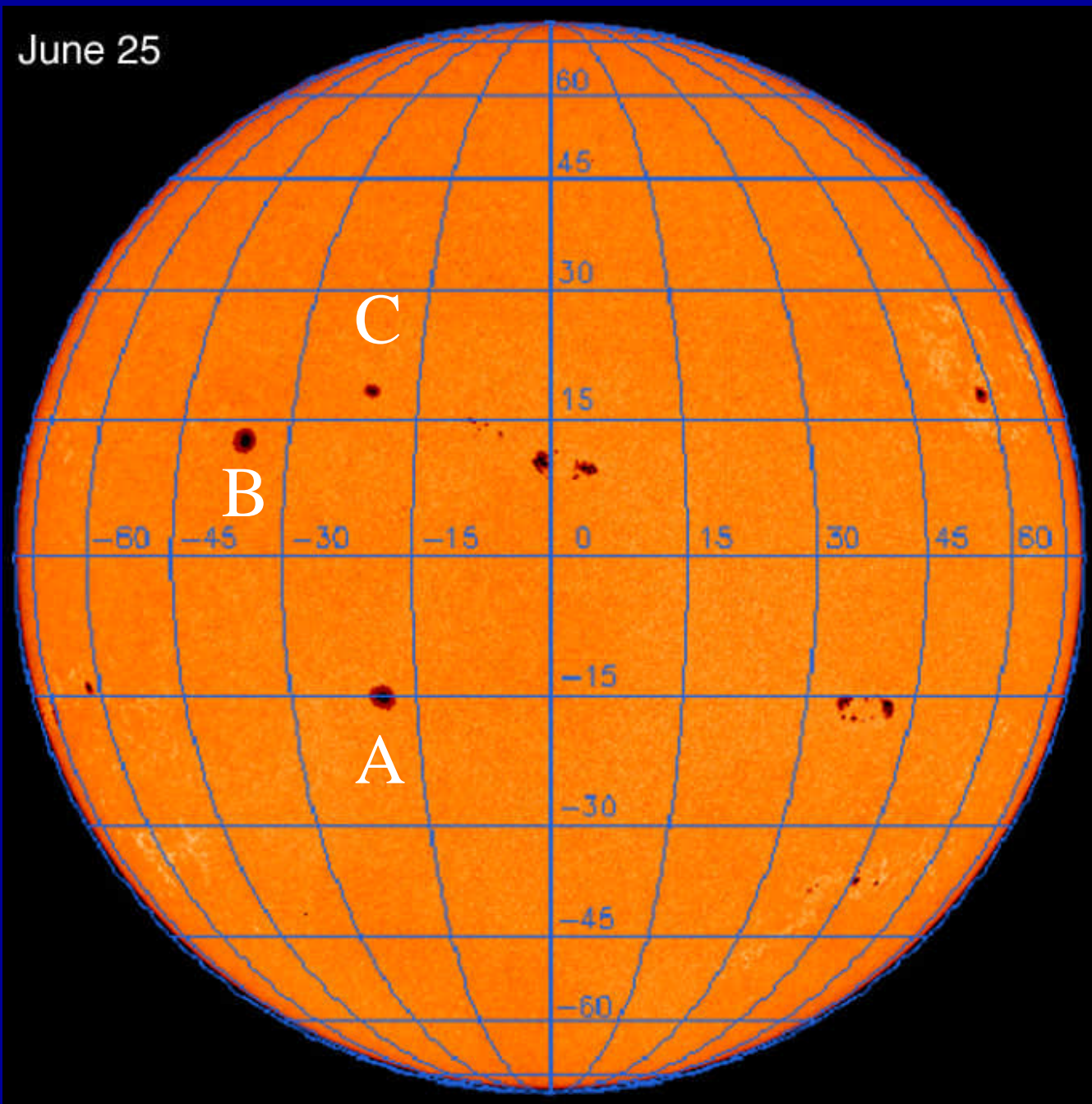
June 24

June 24



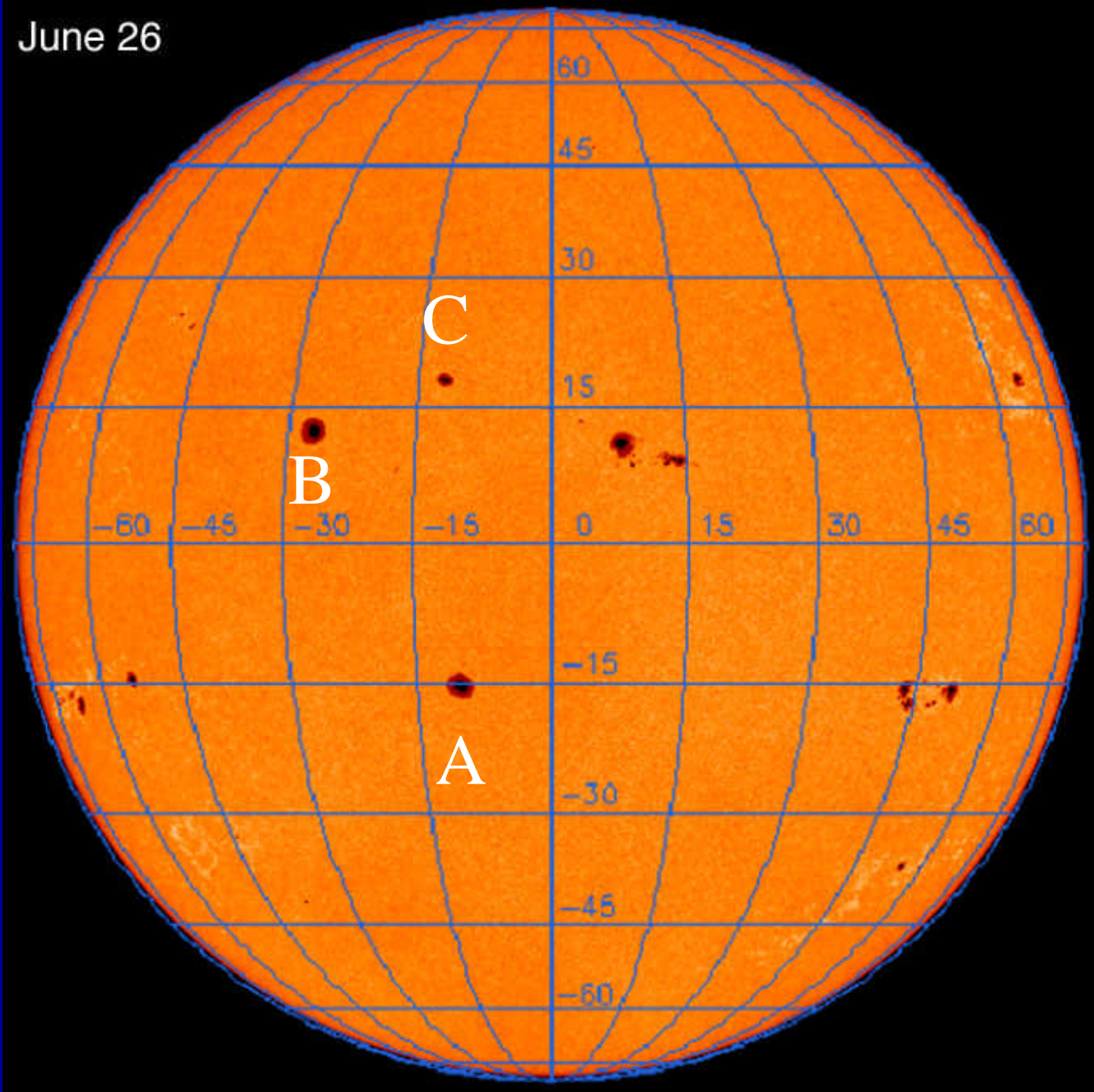
June 25

June 25



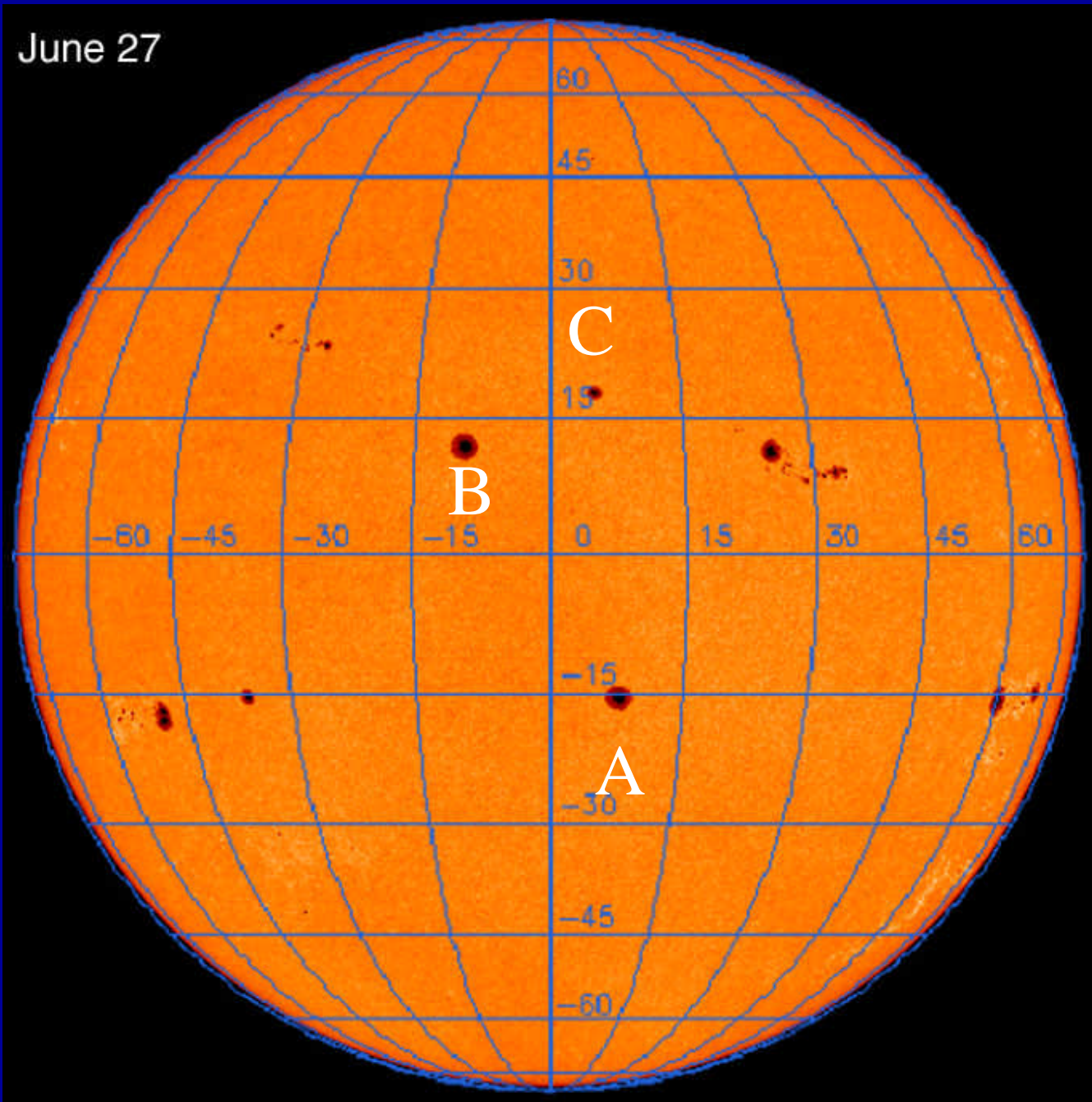
June 26

June 26



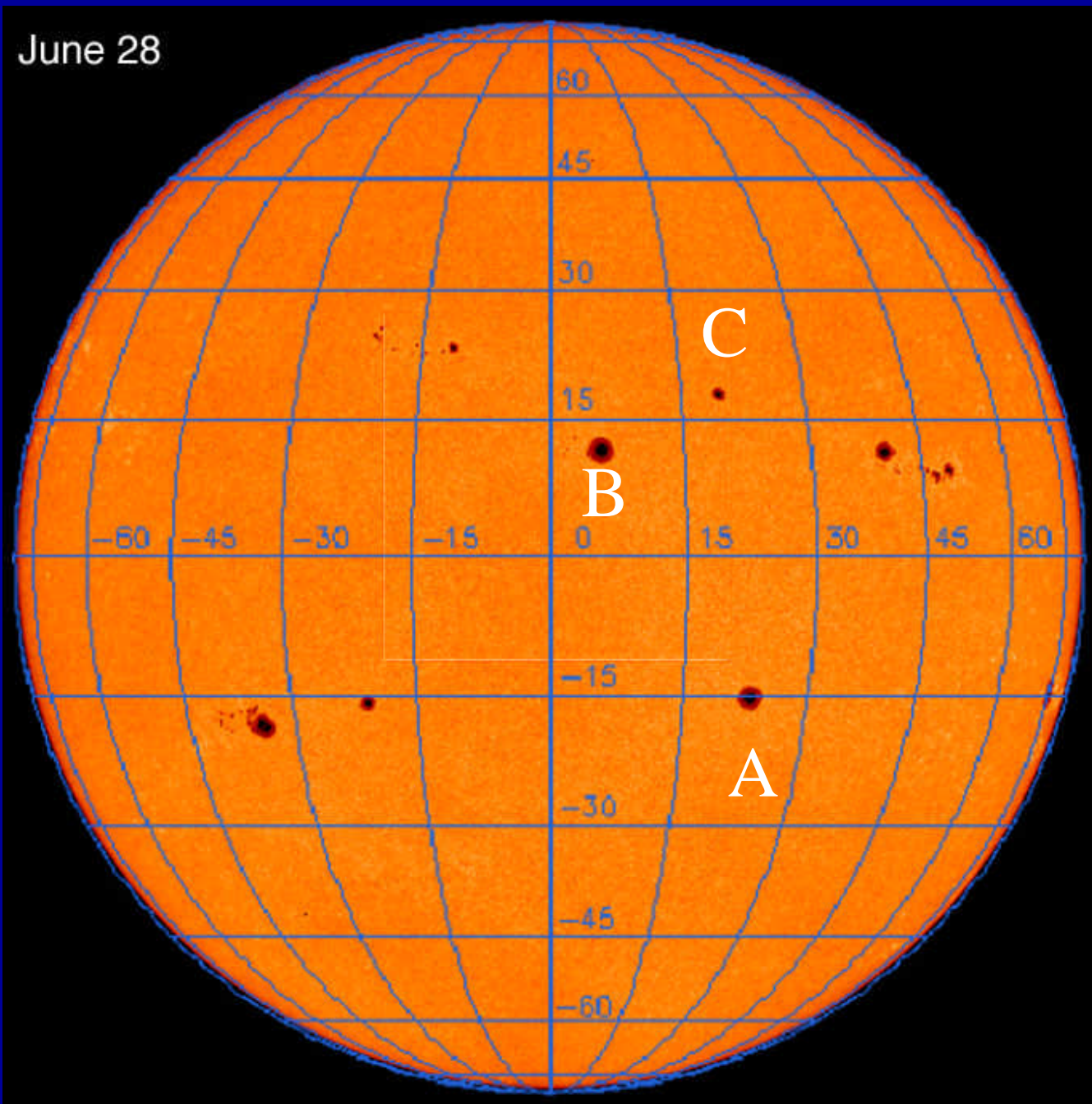
June 27

June 27



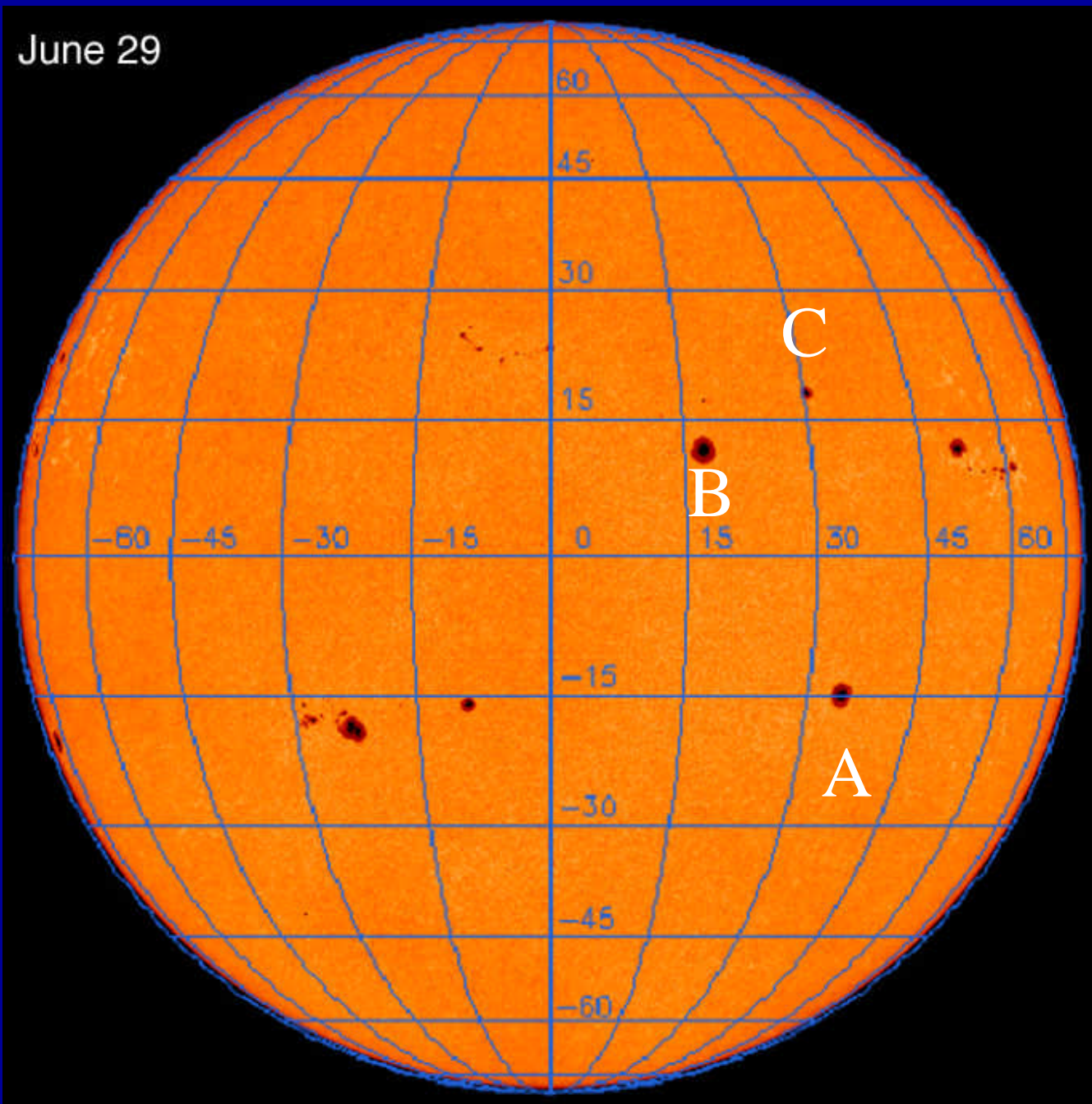
June 28

June 28



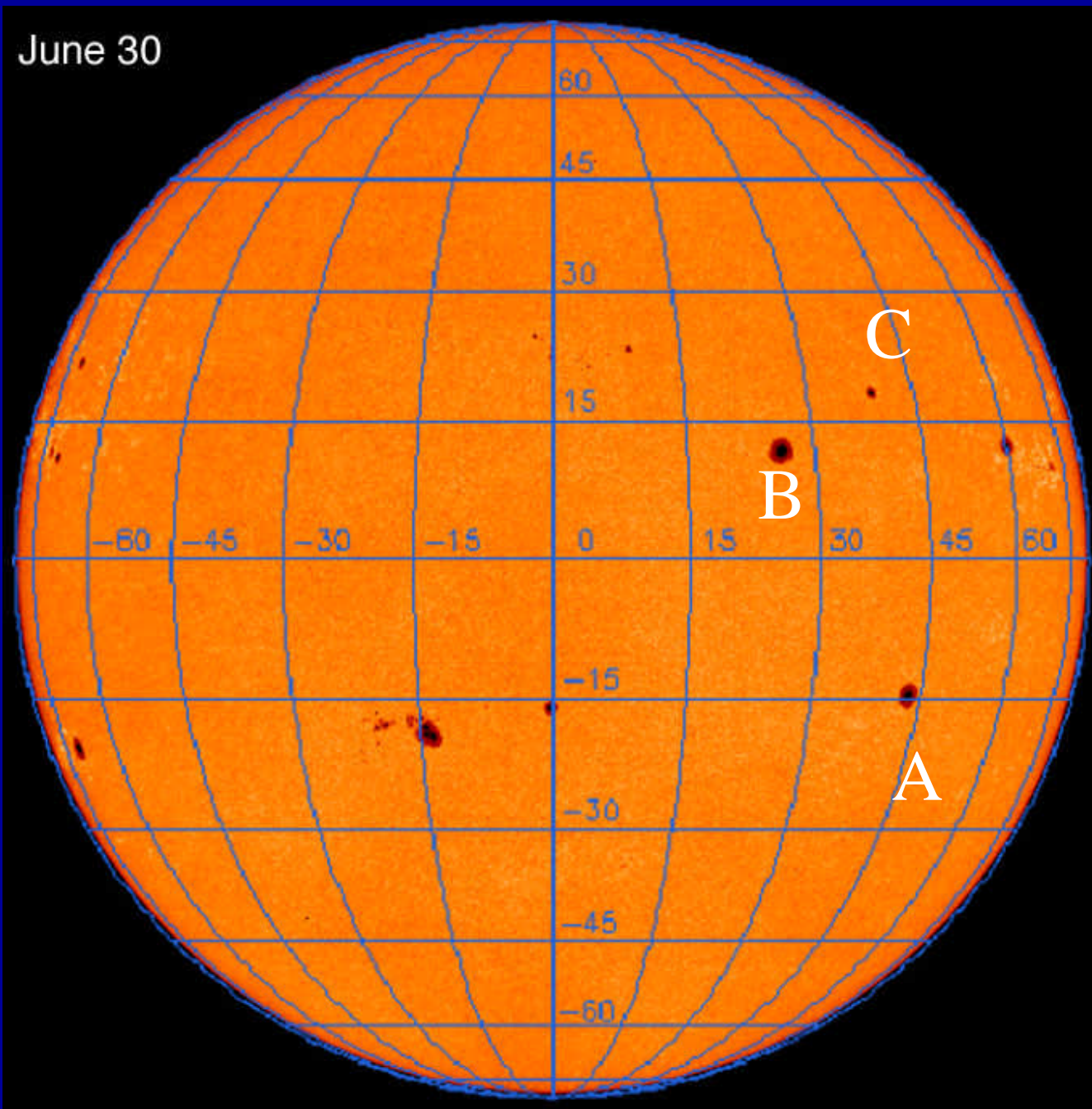
June 29

June 29



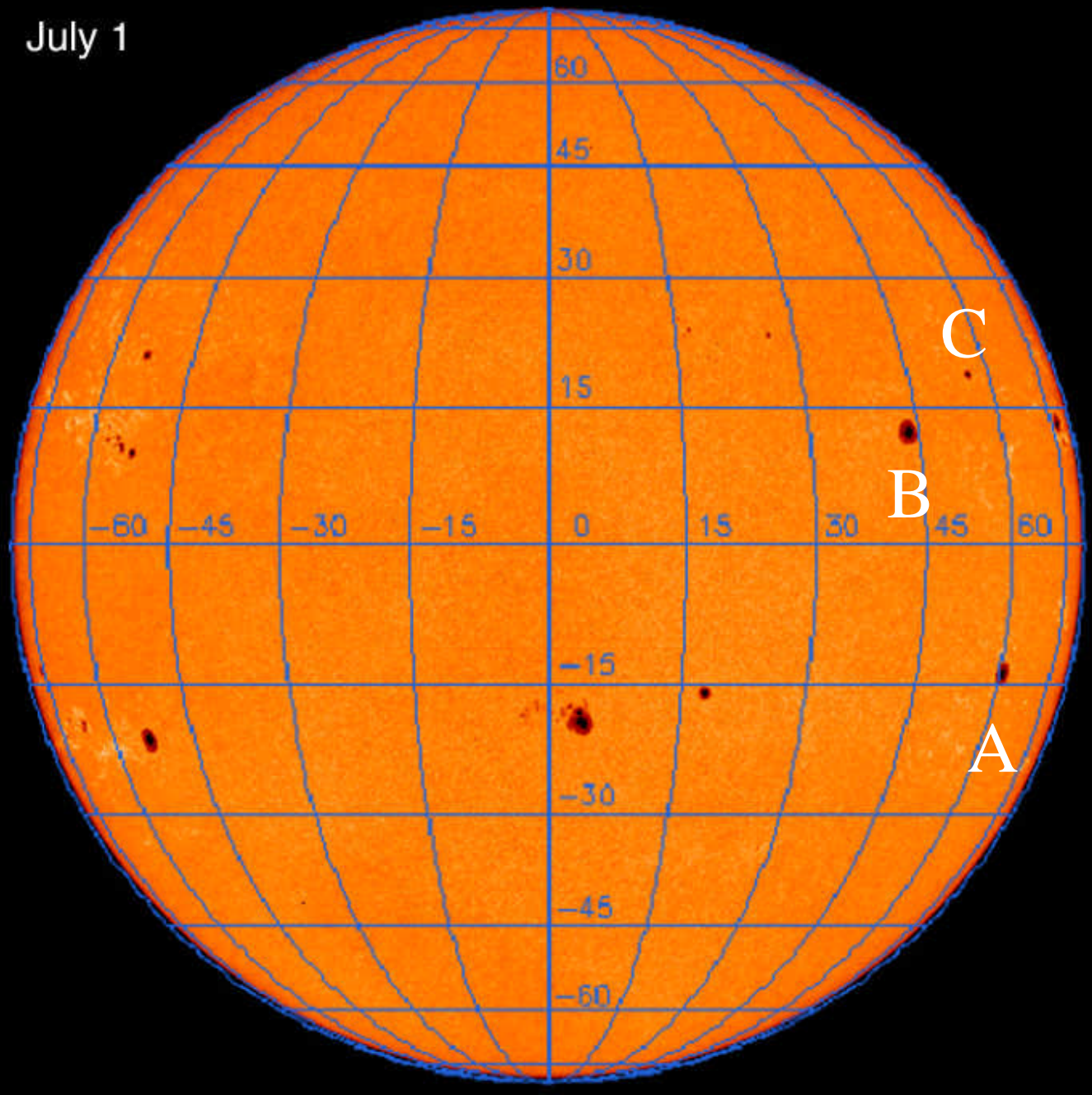
June 30

June 30



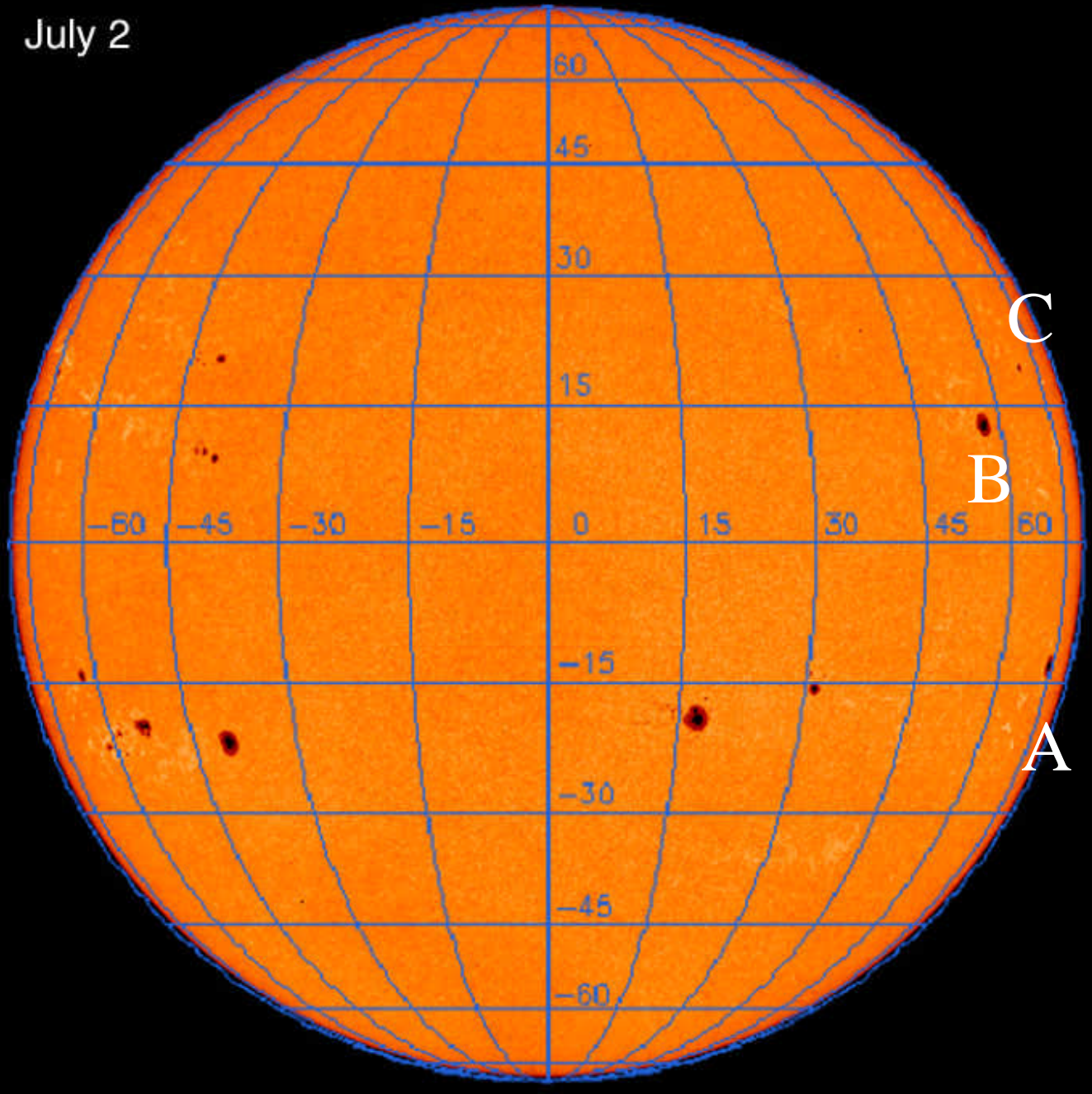
July 1

July 1



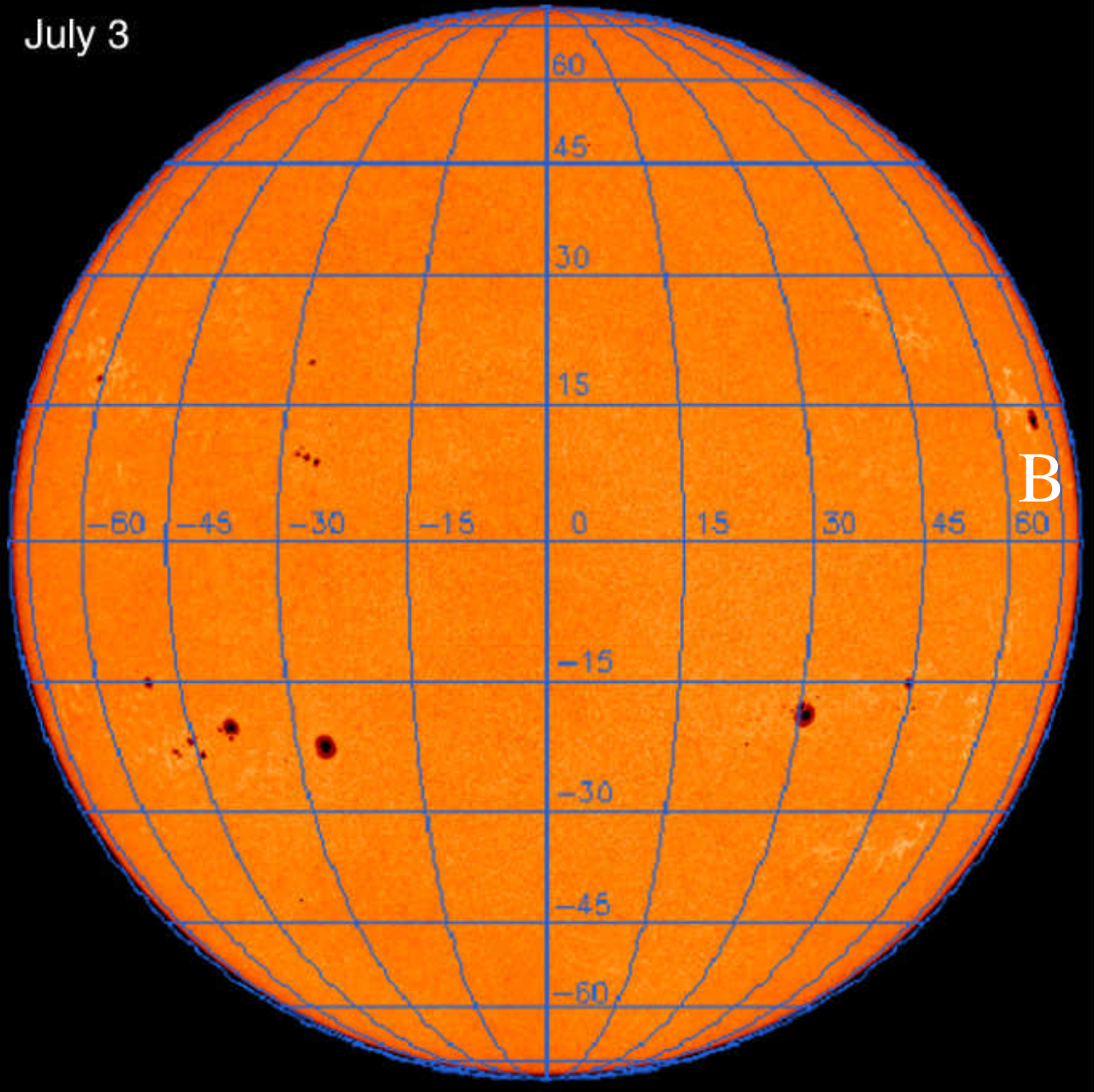
July 2

July 2

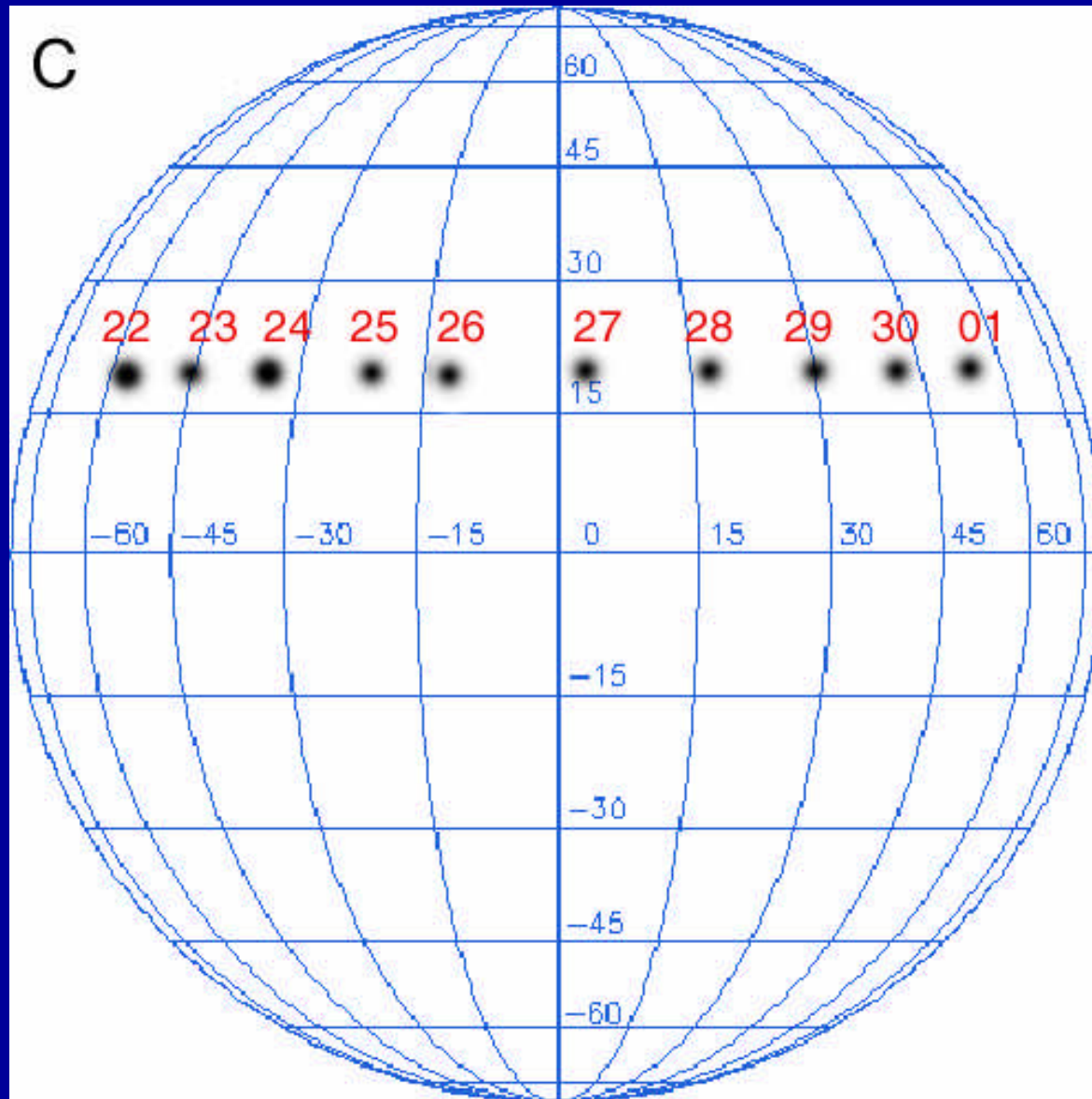


July 3

July 3



# Sample mapping worksheet







# What can we conclude?

- The sunspots seem to be moving at about 12 degrees per day. Now we are ready to answer the BIG question: How long does it seem to take the Sun to make a full rotation of 360 degrees?
- But remember, because the Earth is moving around the Sun in the same direction at about 1 degree per day (almost 365 days to circle the Sun in a year), we need to add one degree per day to the apparent movement to allow for this (Earth's movement makes it seem like the Sun is rotating less than it really is).

# How long does it take to rotate?

- Congratulations! Your basic calculations are correct: the Sun does rotate every **27** days at its middle, about where the spots we observed appeared.

*Note: The Sun, being a gaseous body - not a solid object - does not rotate at the same speed all over its surface: thus, it rotates about every 35 days near its poles.*

# Watch the frames be put into motion!

*Click on image to start movie*

Remember that you can see daily images of sunspots on the SOHO web site at  
[soho.nascom.nasa.gov](http://soho.nascom.nasa.gov)

For more sunspot information, go to  
<http://cse.ssl.berkeley.edu/segwayed/lessons/sunspots/index.html>