SCIENTIFIC CASE: SUN ROTATION[1]

Team members:

Writer: ____

Equipment manager: ____________________________________

Reader: ____

Spokesperson: ____

Ambassador (shares the work with other teams): ___________________

Introduction

The Sun is our closest star. Without the Sun there would be no light or warmth on our world, it would just be a frozen planet. Our Sun is not a big star, but it is still bigger than every planet in the Solar System: more than one million Earths could fit inside it. From our perspective, we see the Sun as big as our Moon, but this is just because the former lies about 150 million km away from us. It looks like a huge ball of fire, but it is actually made of neither fire, nor gas, nor liquid, not even solid: that sphere is made of plasma! A plasma has properties unlike those of the other states (solid, liquid and gas)

1 Educational material manufacturated by "Asociación Planeta Ciencias" under the initiative and coordination of the European Space Agency inside the CESAR program framework.

and it may sound uncommon to our daily lives, although you can find plasma on Earth: aurorae, fluorescent lights, welding arcs, and the Earth's ionosphere, among others.

We cannot observe the Sun by looking at it directly, we need special instruments, like SOHO: a satellite mission operated by ESA and NASA. Among other tasks, SOHO sends images of the surface of the Sun at different times, in order to know how it changes through time.

On the surface of the Sun we can see some black spots, which we call sunspots. If we look close, each time they appear different in, and sometimes there are none. Each sunspot lasts several weeks, but they travel along the surface of the Sun - or so it would seem to us, because the Sun is rotating!

More education materials:

CESAR project: http://cesar.esa.int/

CESAR Solar Observation: https://www.cosmos.esa.int/web/cesar/esac-solar-observatory

SOHO classroom: https://www.cosmos.esa.int/web/soho

ESA Kids: http://www.esa.int/kids/en/home

CESAR booklets: http://cesar.esa.int/index.php?Section=Booklets&ChangeLang=en

Scientific case: Movement of the Sun

SOHO is a satellite whose objective is to detect changes that might occur on the Sun. It takes pictures of it at various points in time to see if there is any difference.

On the surface of the Sun we can see some black spots, which we call *sunspots*. If we look close, each time they appear different in, and sometimes there are none.

Each sunspot lasts several weeks, but they travel along the surface of the Sun - or so it would seem to us, because the Sun is rotating!

There are two missions we have to accomplish:

1. **- Mission 1: Find out the Sun's rotational period**
2. **- Mission 2: How does the Sun look now?**

Mission 1: Find out the Sun's rotational period

How long does it take for the Sun to rotate once? What's your hypothesis?

METHOD 1

You have three stapled sheets:

Sheet 1: Look at one of the sunspots on the left and the date. (*hint: the date goes year first, then month, then day)*

Sheet 2: Look at where the spots are, and what the date is.

Sheet 3: Look again: where is it now? What's the date?

It is now time to make observations and calculations - you can use a draft page. (*hint: find out how long it takes for a spot to travel one quarter of the Sun's surface).*

Result:

Conclusion. Do you think the Sun rotates the same in all of its surface? What other research would you suggest after this?

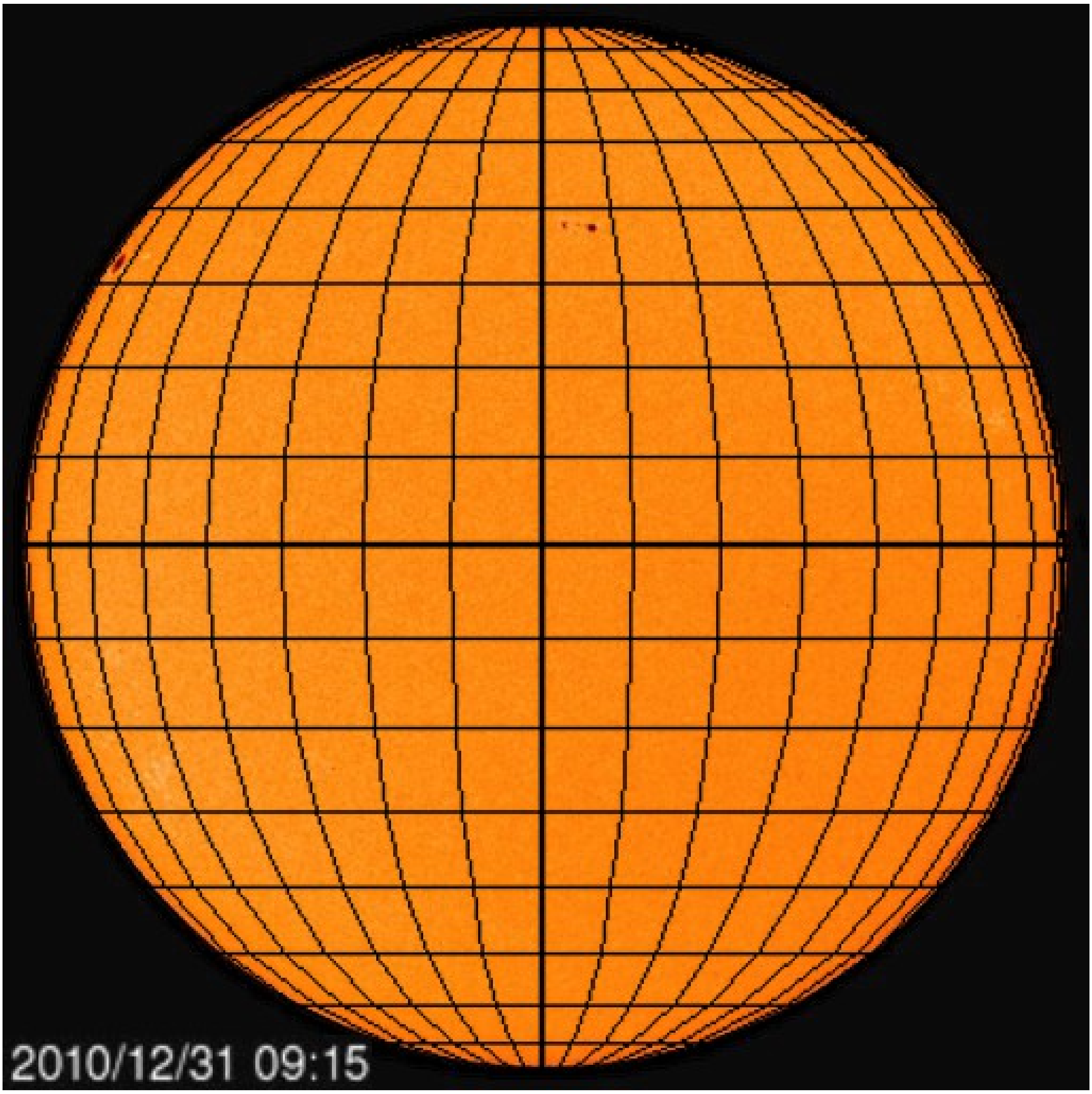
METHOD 2

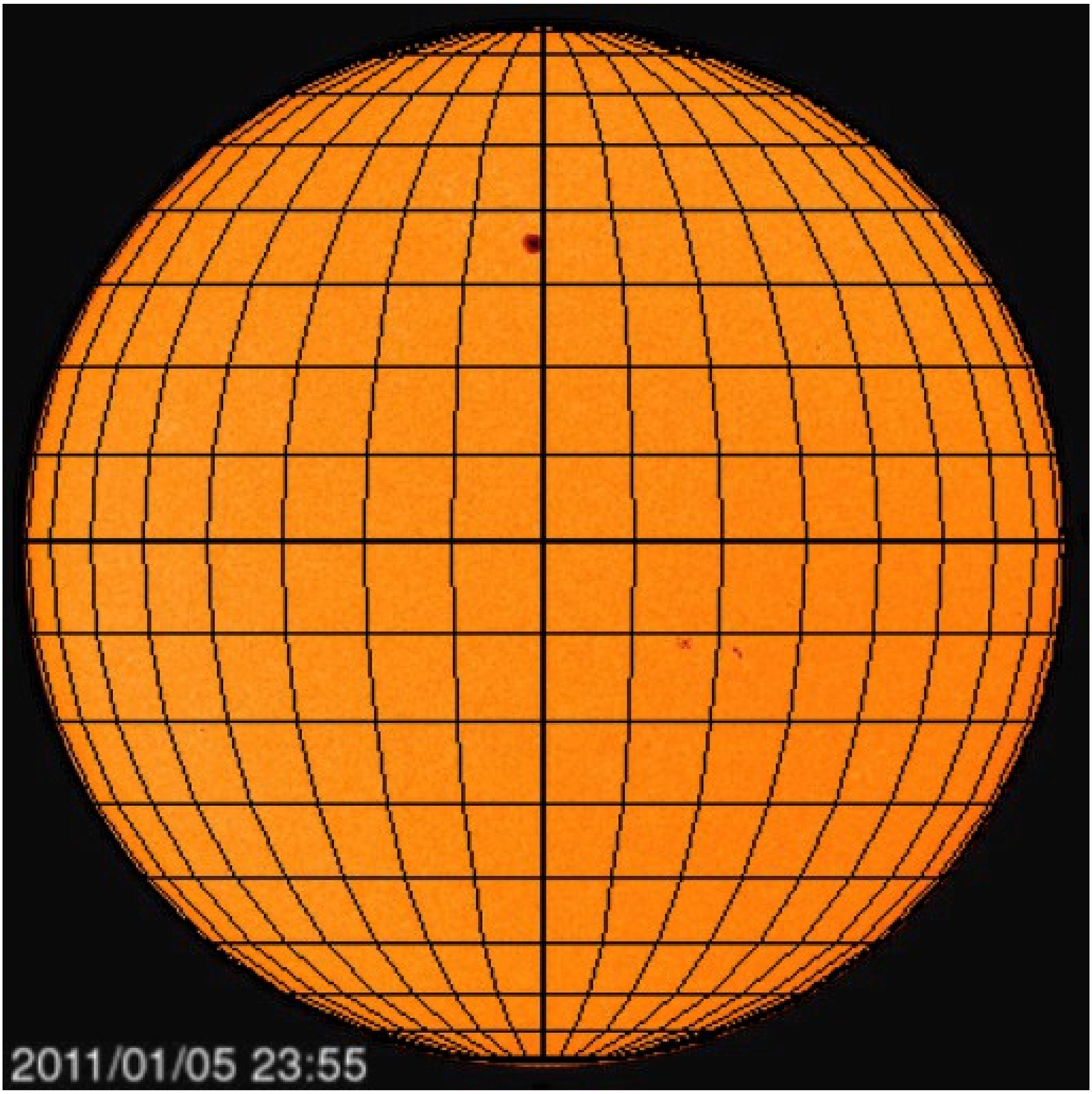
You can follow the same steps through the following online application:

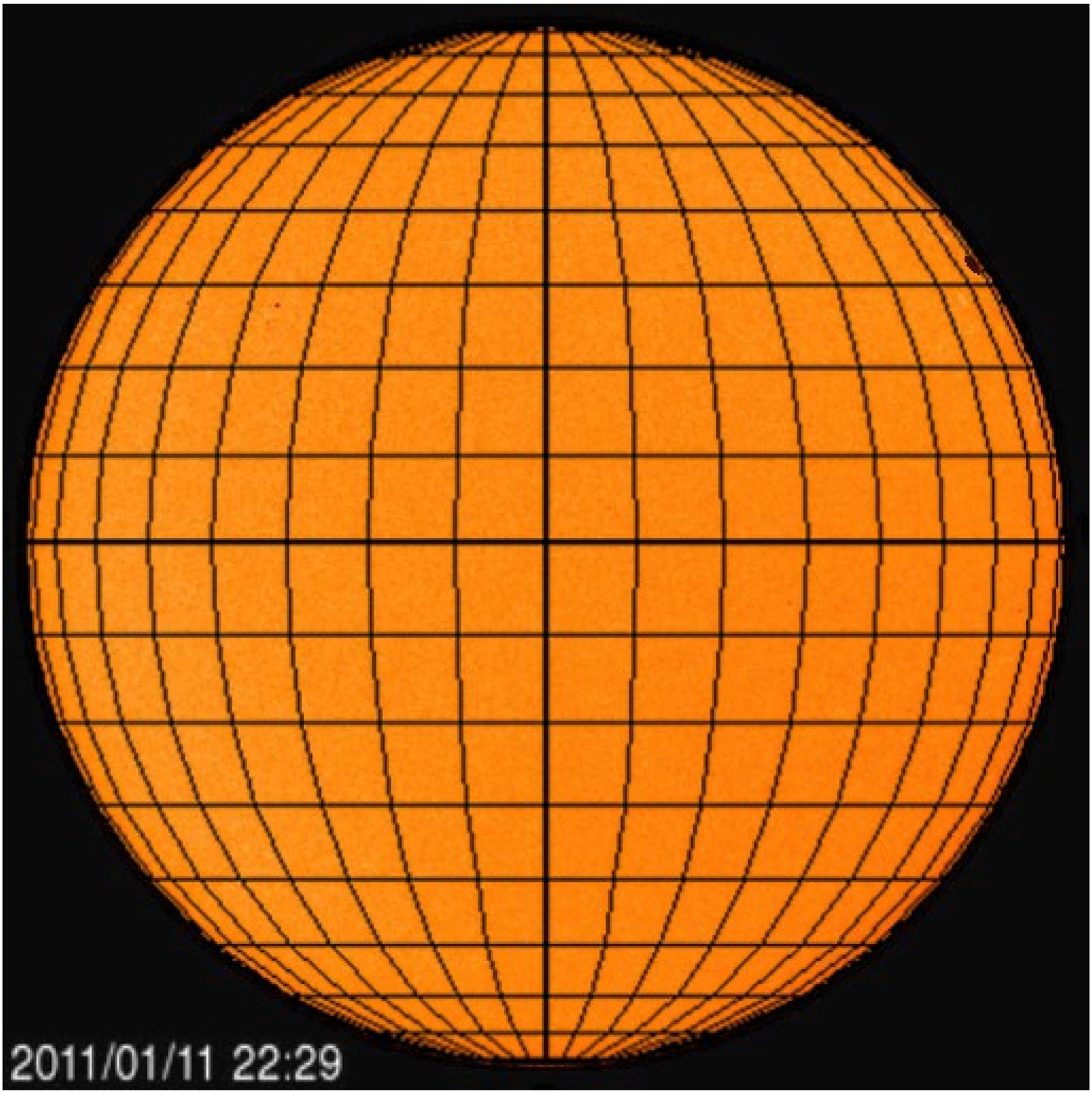
http://cesar.esa.int/tools/14.differential_rotation/index.php

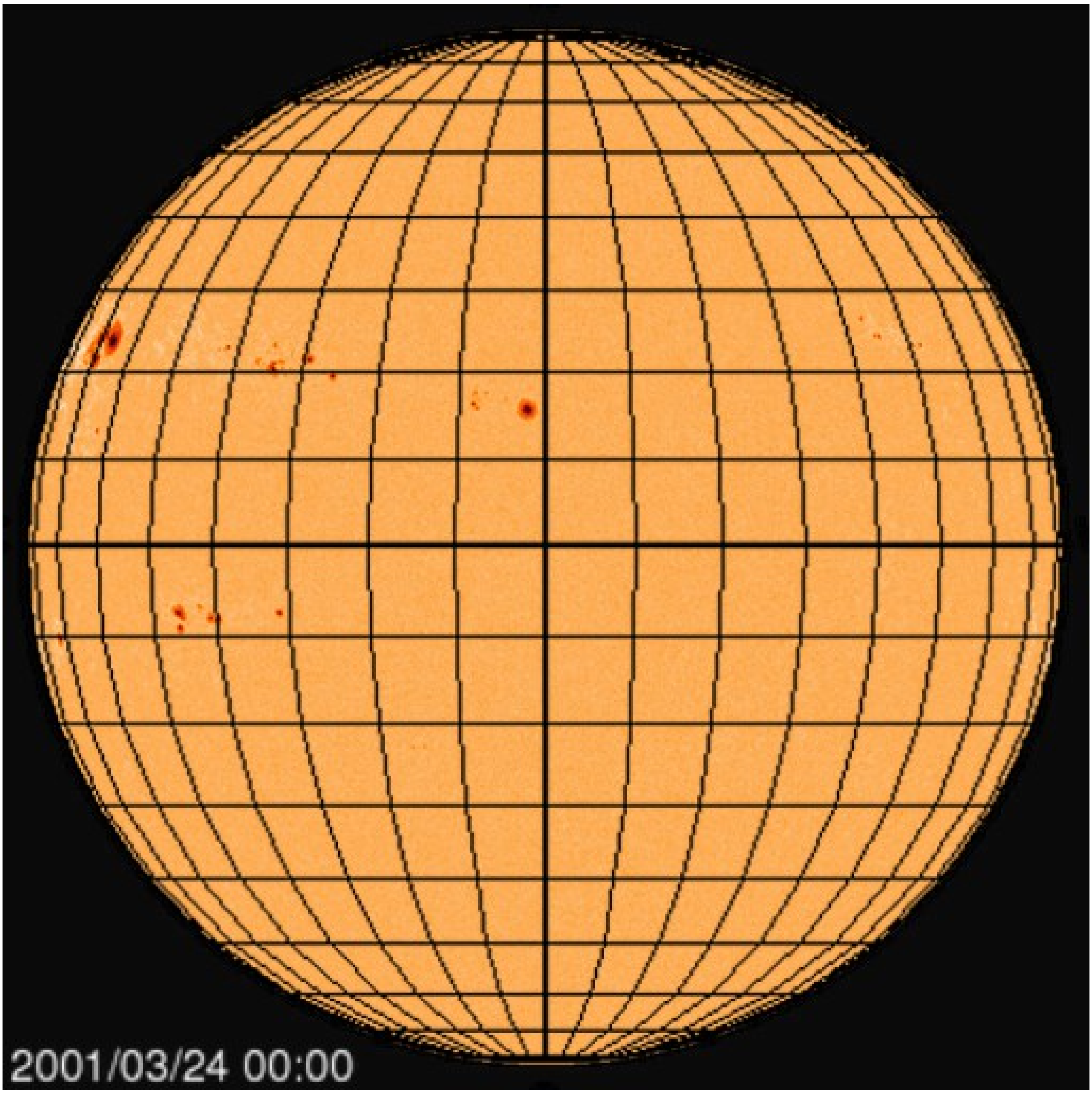
Result:

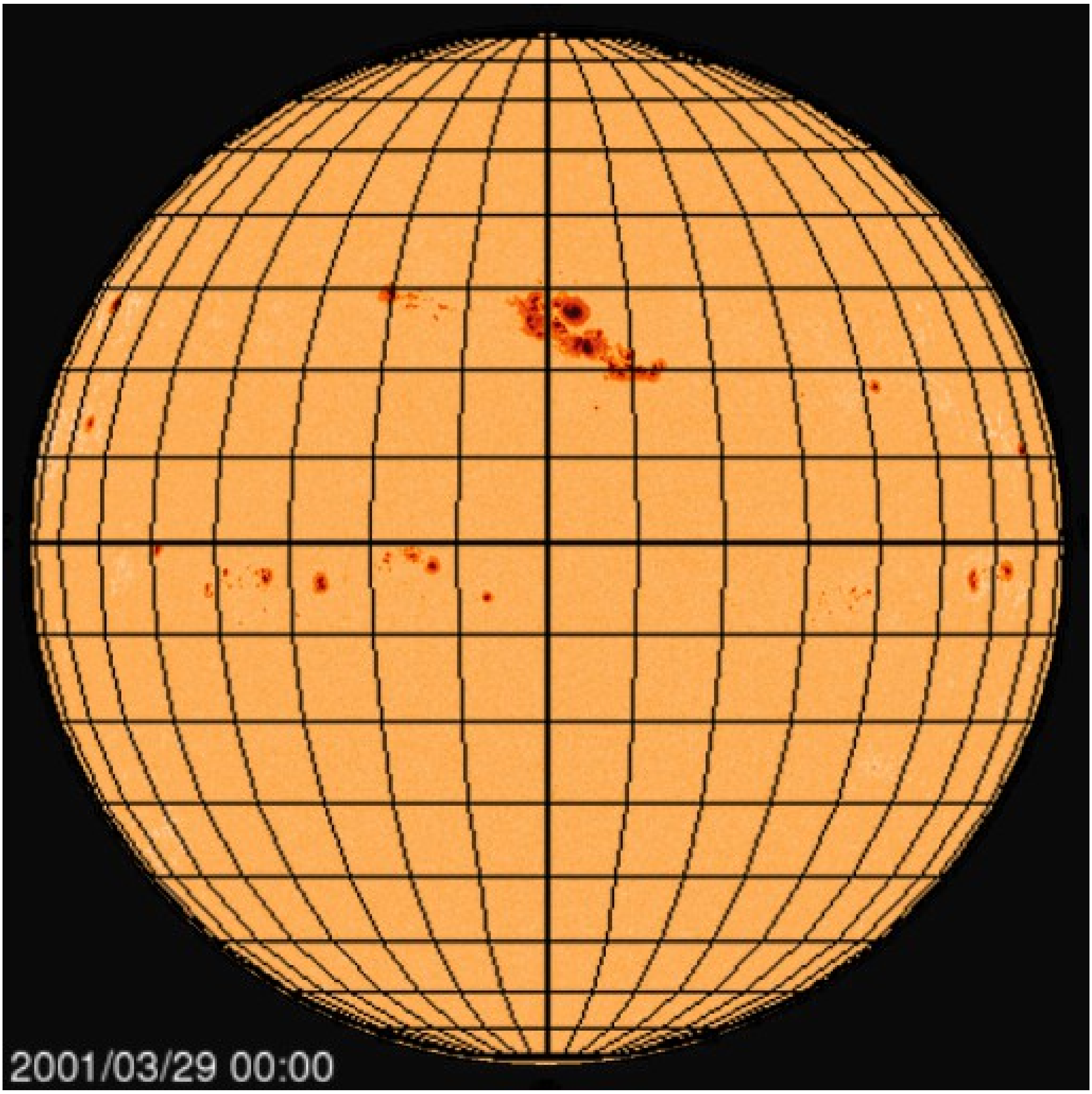
Conclusion. Do you think the Sun rotates the same in all of its surface? What other research would you suggest after this?

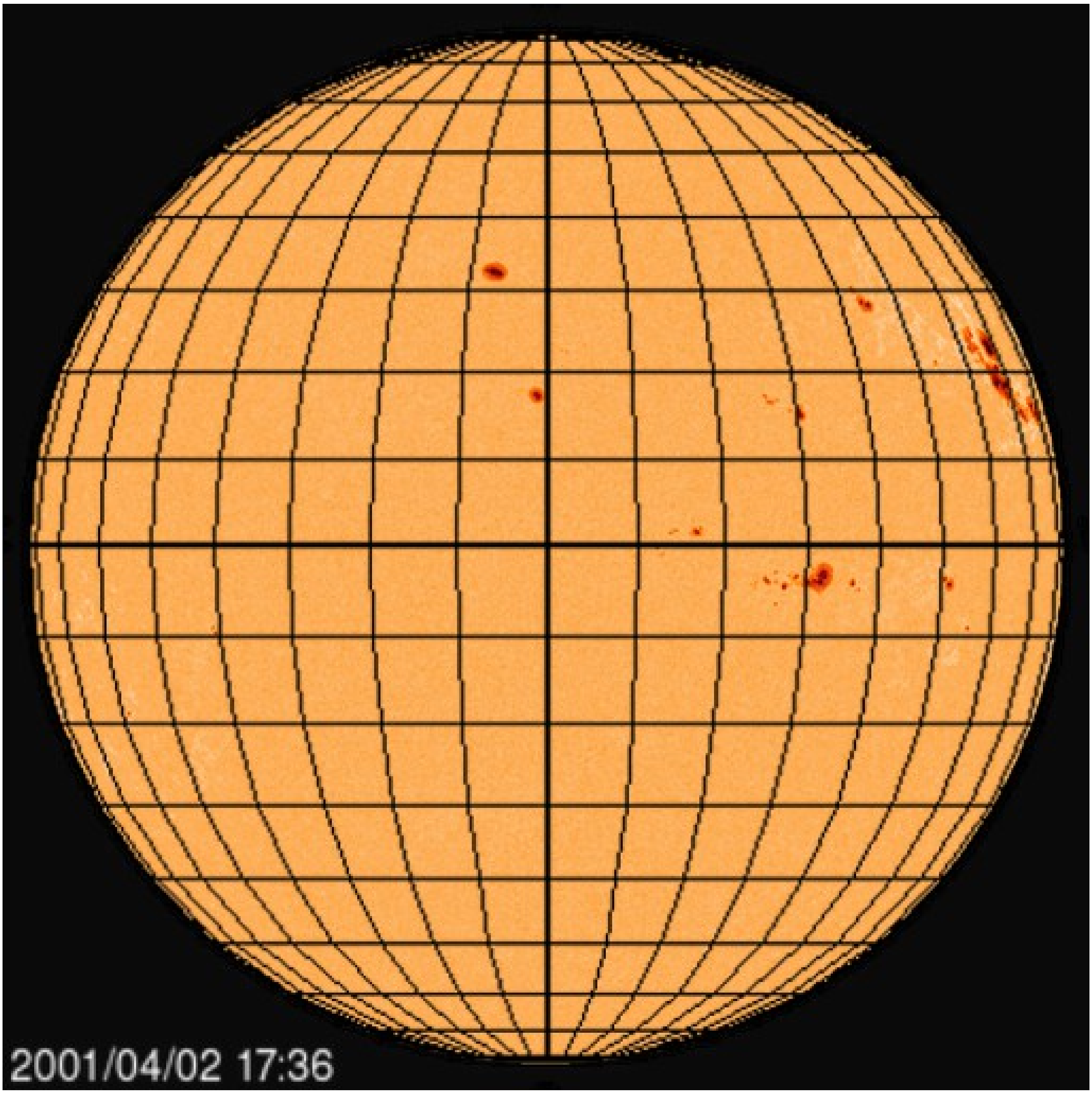

2010/12/31 09:15


2011/01/05 23:55


2011/01/11 22:29


2001/03/24 00:00


2001/03/29 00:00


2001/04/02 17:36

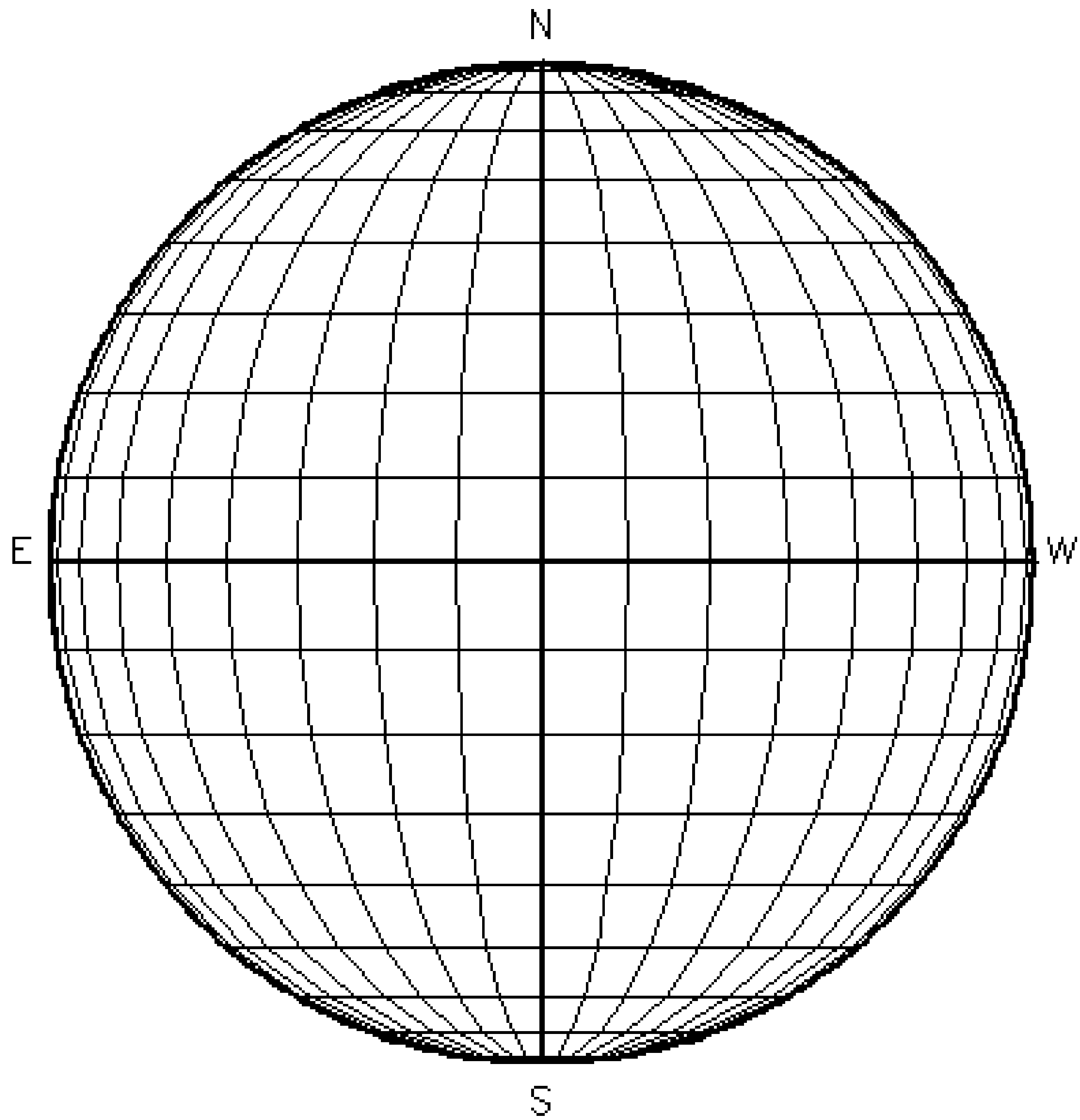
Mission 2: How does the Sun look now?

SOHO has sent us an image of the Sun taken right now:

https://sohowww.nascom.nasa.gov/data/realtime/hmi_igr/1024/latest.html
(In case you do not see sunspots, you can consult another date *here*, or use the image at the end of this document).

If your calculation about the Sun's rotation was right, then we can predict how the spots will move in the next seven days.

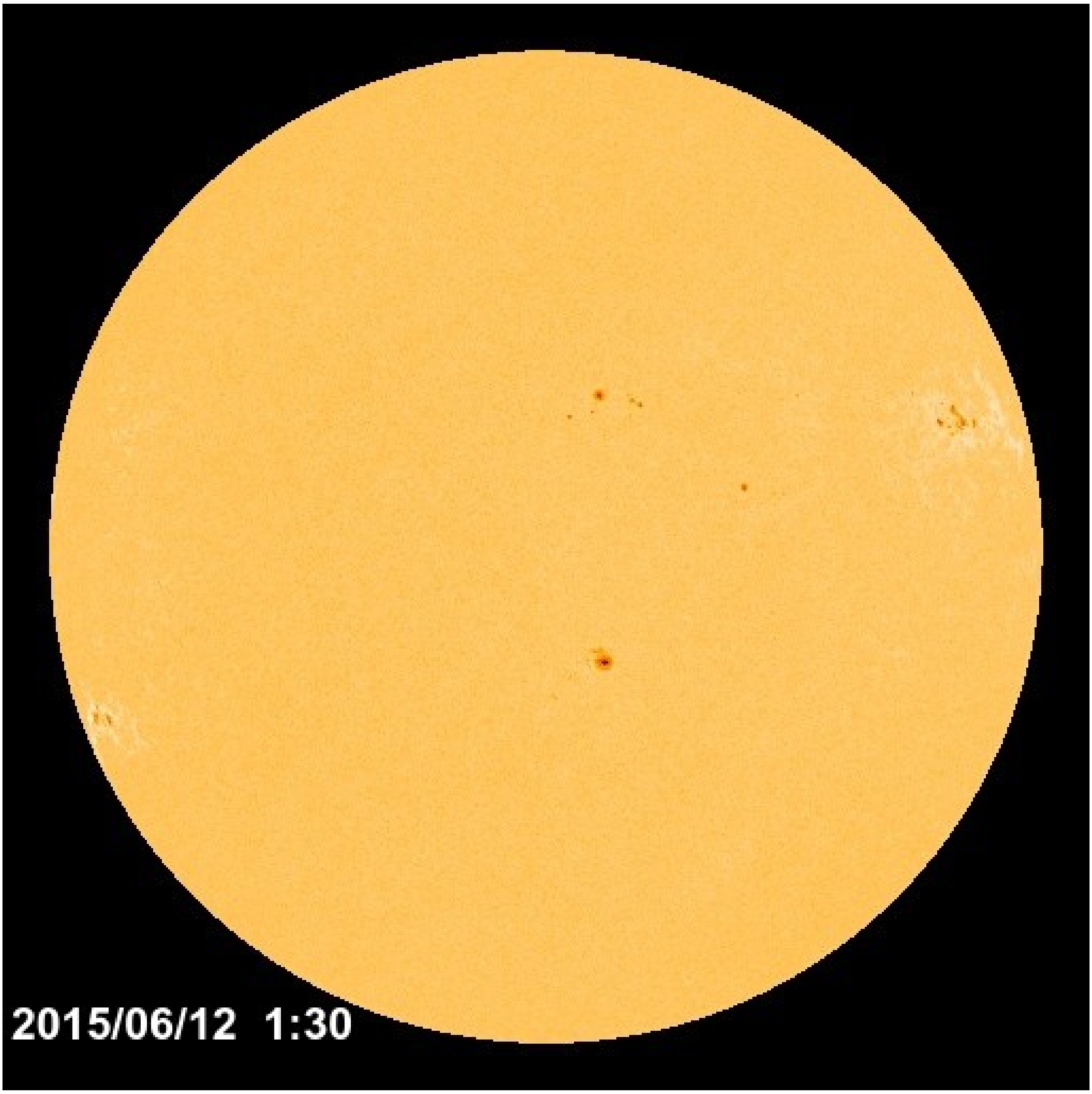
Where do you think the sunspots will be then? Draw them on the corresponding sheet (it is the one with an empty circle without a picture of the Sun).



Prediction for:

Date: ___________________

Time: ____________________


2015/06/12 1:30