



# Looking Back and Ahead: An Update On Solar Cycle 24

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In May 2009, the Solar Cycle 24 Prediction Panel (a group of solar scientists organized and chaired by NOAA and funded by NASA) made two predictions: that solar minimum between Cycle 23 and Cycle 24 occurred in December 2008, and that the maximum smoothed sunspot number of Cycle 24 would be around 90 in early 2013.

This month's column assesses these predictions – did solar minimum occur in December 2008, and is Cycle 24 ascending per the prediction?

Figure 1 shows the monthly mean Brussels sunspot number for January 2006 through January 2010.

The red vertical bars are the monthly mean sunspot numbers for Cycle 23 sunspots and the blue vertical bars are the monthly mean sunspot numbers for Cycle 24.

Note that Cycle 23 and Cycle 24 sunspots overlapped for 16 months (January 2008 through April 2009). This overlap is a common characteristic of a solar minimum period.

More importantly, visually the data of Figure 1 suggests that solar minimum occurred around the end of 2008 or in early 2009. To better see what happened, Figure 2 plots the recent smoothed sunspot numbers (the smoothed values being the official measure of a solar cycle).

Figure 2 indicates that in December 2008 the smoothed sunspot number mathematically minimized. This actual data nicely supports the prediction. Thus we appear to have good news – that the solar minimum prediction is a good one, and solar minimum is behind us.

I should point out that a minimum smoothed sunspot number does not necessarily define "official" solar minimum. The month and year of "official" solar minimum will be determined by solar scientists, and will include consideration of other issues.

For example, one such issue could be how the number of Cycle 23 and Cycle

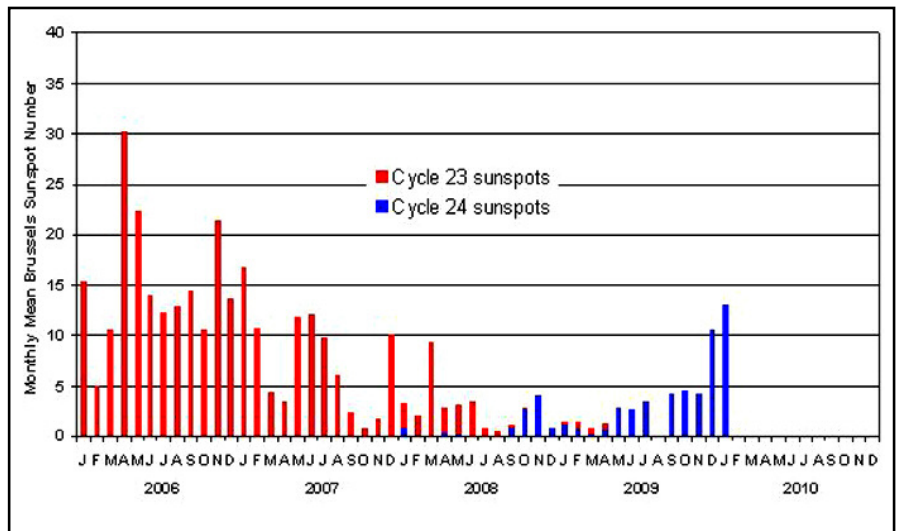


Figure 1 – Solar Minimum Between Cycle 23 and Cycle 24

24 sunspots is distributed about the mathematical minimum. This was a problem for determining solar minimum between Cycle 22 and 23 – although the mathematical minimum was in early 1996, there weren't any new Cycle 23 sunspots yet. Thus the "official" solar minimum was

declared to be later in 1996 when Cycle 23 sunspots were seen.

If you go back to Figure 1, an eyeball estimate indicates approximately the same number of Cycle 24 sunspots before December 2008 as the number of Cycle 23 sunspots after December 2008. This

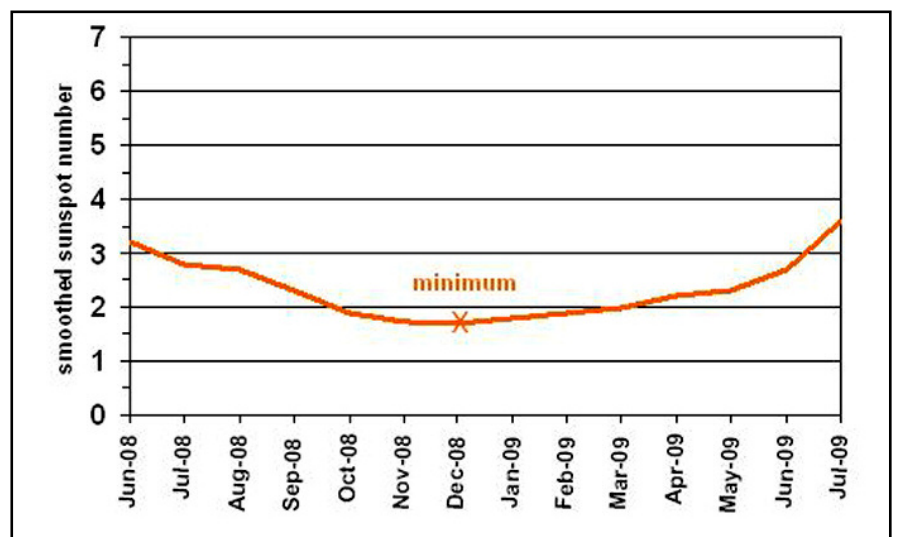


Figure 2 – Recent Smoothed Sunspot Numbers

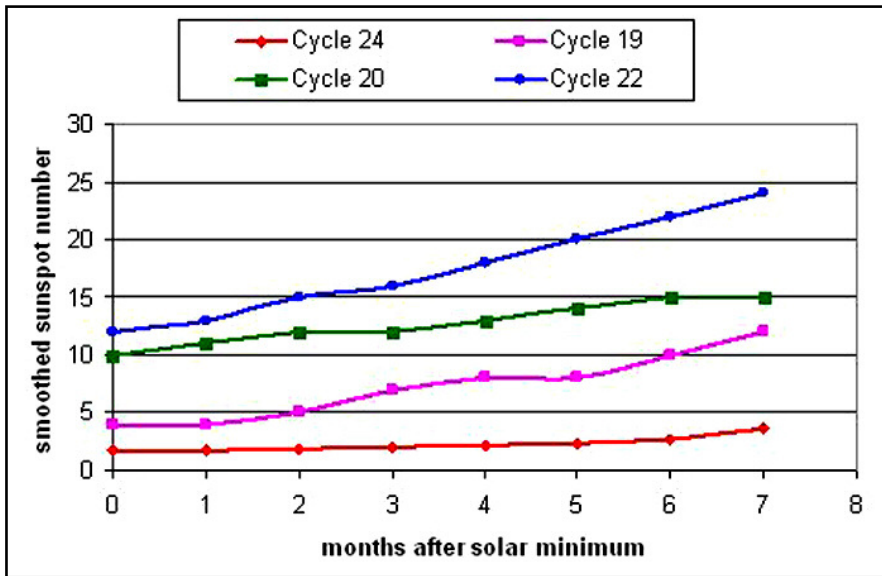


Figure 3 – Cycle 24 Ascent Compared To Other Solar Cycles

cycle	percent increase after 7 months	maximum smoothed sunspot number
19	200	201
24	112	TBA
22	100	158
20	50	111

Table 1 – Percent Increases

will be a strong case for December 2008 as the official minimum.

Now let's look at the prediction for a slightly-below-average maximum smoothed sunspot number of 90. We'll do this by comparing the ascent of Cycle 24 so far to the ascent of previous solar cycles. For the record, the average maximum smoothed sunspot number of all 23 cycles is 113.5.

The solar cycles to which we'll compare Cycle 24 are Cycle 20 (maximum smoothed sunspot number of 111 – about average), Cycle 19 (maximum smoothed sunspot number of 201 – the largest we've recorded), and Cycle 22 (maximum smoothed sunspot number of 158 – the last big one). Figure 3 shows this data.

The most obvious observation from the Figure 3 data is that Cycle 24 is starting from the lowest smoothed sunspot number of those four cycles. But that apparently doesn't mean much, as Cycle 19 started lower than Cycle 20 and Cycle 22, but eventually surpassed both of them for

the highest smoothed sunspot number in recorded history.

Since we got nowhere looking at how low a cycle started, let's look at the rate of ascent of these four cycles. There is some precedence for this in that a bigger cycle generally rises more quickly than a smaller cycle. Let's use the Figure 3 data to compare the percent increase after 7 months. Admittedly we have a limited amount of data so far, but Table 1 summarizes this percent increase.

Indeed, a faster rate of ascent appears to suggest a bigger cycle. So far Cycle 24 is rising faster than Cycle 20 (which was about average), and in fact is on par with Cycle 22 (the last big one).

Does this mean Cycle 24 may rival Cycle 22's maximum smoothed sunspot number of 158? Not necessarily, but it sure bears watching as it ascends.

In summary, solar minimum is likely behind us. Additionally, it's too early to tell where Cycle 24 is headed – hopefully we'll have a clearer picture by the end of the year.

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