Feature Story: ALPO Solar Section

A Brief Report on Carrington Rotation 2163

By Theo Ramakers,
Acting Assistant Coordinator,
ALPO Solar Section
theo@ceastronomy.org
http://ceastronomy.org/tramakers

Carrington Rotation 2163 commenced on March 4, 2015 at 24.2072 UT and ended with the beginning of CR2164, on May 5, 2015 at 21.438 UT.

This rotation began with six active sunspot regions of which the two largest, AR2325 and AR2331, were relatively small and of about equal size (approximately 150-160 millionths), while the total sunspot area for the Sun stayed under 600 millionths for several days. Seven days into the cycle, activity dropped considerably, as these two active regions rotated to the far side of the Sun.

Two new areas, AR2334 and AR2335 appeared but occupied an area of only 20 and 10 millionths respectively, with a total of six spots, for a Wolf number of 36.

With CR2164 starting on May 5, a new sunspot area turned towards the Earth-side of the Sun, AR2339, which produced an X2.7-class flare and three M-Class flares. Four regions with a total of 49 spots gave a Wolf Number of 89. Within two days, AR2339 occupied 500, and within four days 900 millionths, and the activity really increased.

This became the dominant active region for 14 days, until it rotated to the far side. Total flare activity for the period between May 5 and May 14 was one X-class, four M-class and 70 C-class flares. Interestingly during this period, no B-class flares were recorded. A more detailed report on CR2164 will be published in an upcoming ALPO Journal.

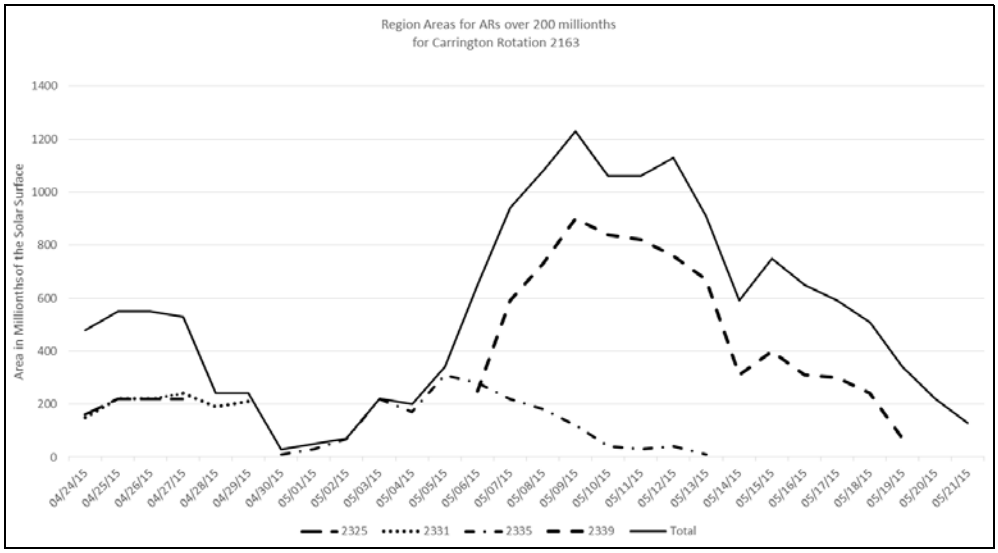

Figure 1. A graph of the areas in millionths of the solar surface, occupied by the active regions during CR2163. The solid black line shows the total for the Sun at any time during the rotation.

How Are Sunspot Measured

Astronomers measure the sizes of sunspots as fractions of the Sun's visible area. Their favorite units are "millionth's." A sunspot that registers 1 millionth has a surface area equal to 0.000001 times the area of the Sun's Earth-facing hemisphere. Typically, a big sunspot measures 300 to 500 millionths. The entire surface area of the Earth is only 169 millionths of the solar disk. Source: *http://www.space-weather.com/sunspots/history.html*

What Are Wolf Numbers?

A "Wolf number" is a quantity that measures the number of sunspots and groups of sunspots present on the surface of the sun. The combination of sunspots and their grouping is used because it compensates for variations in observing small sunspots. It was named for the Swiss astronomer Johann Rudolf Wolf (7 July 1816 – 6 December 1893) who, in 1848, devised a way of quantifying sunspot activity. The Wolf number is 10 times the number of spot groups added to the total number of individual spots. Source: *https://en.wikipedia.org/wiki/Rudolf_Wolf*

Additional images and observation charts can be viewed at the ALPO *Solar Section observing page* as well as in the ALPO Online Solar Archive at *http://www.alpo-astronomy.org/gallery/main.php?g2_itemId=7945*

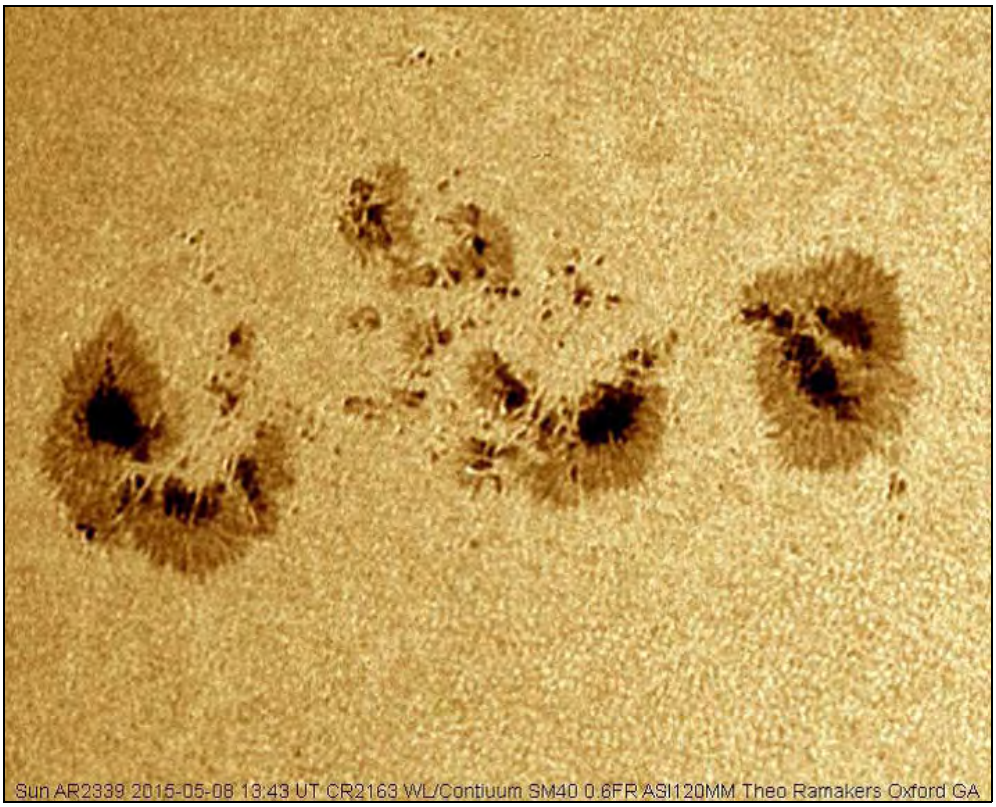

Figure 2. Close-up image by the author of Active Region 2339 in white light during CR2163. Image taken May 8, 2015, 13:43 UT, Oxford (near Atlanta), Georgia. Coronado SolarMax 40 H-alpha telescope.

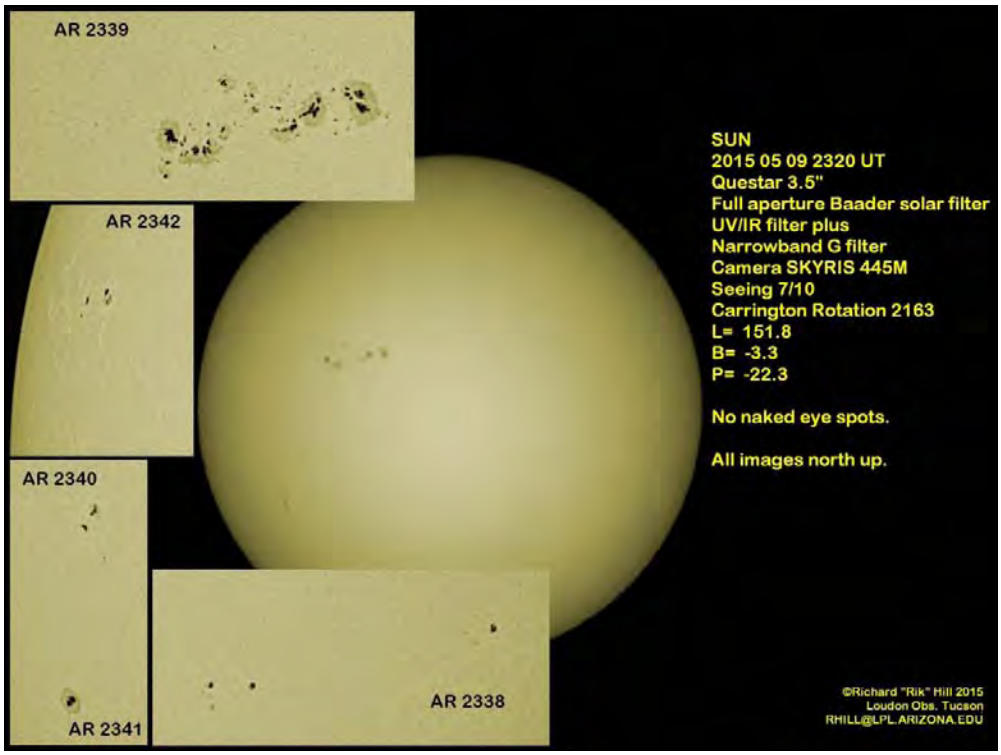

Figure 3. Full-disk solar image by Rik Hill with insets of active regions. Equipment and other data on image.

	CR2163																														
AR	04/24/15	04/25/15	04/26/15	04/27/15	04/28/15	04/29/15	04/30/15	05/01/15	05/02/15	05/03/15	05/04/15	05/05/15	05/06/15	05/07/15	05/08/15	05/09/15	05/10/15	05/11/15	05/12/15	05/13/15	05/14/15	05/15/15	05/16/15	05/17/15	05/18/15	05/19/15	05/20/15	05/21/
2324	40	10	10																												
2325	160	220	220	220																											
2326	10																														
2327	90	80	80	60	40	20																									
2331	150	220	220	240	190	210																									
2333	30	20	20	10	10	10																									
2334							20	20																							
2335							10	30	70	220	170	310	280	220	180	120	40	30	40	10											
2336											10	10	40	30	10	10															
2337											10	10	10	10	30	10	20	30													
2338											10	10	70	90	40	50	20														
2339													250	590	730	900	840	820	760	670	310	400	310	300	240	70					
2340															30	50	40	20	20	10	0										
2341															60	90	70	80	100	70	80	80	70	60	60	70	10				
2342																	30	30	50	30	60	60	70	60	80	70	90	10			
2343																		20	20	10		10									
2344																		30	60	40	50	40	60	30	20	20	10	10			
2345																			10	10	20										
2346																			50	50	60	50	30	20	10			10			
2347																			20	10	10	10	0	10							
2348																						100	110	110	100	90	80	80			
2349																										10	10				
2350																										10	10				
2351																											10	20			
Total	480	550	550	530	240	240	30	50	70	220	200	340	650	940	1080	1230	1060	1060	1130	910	590	750	650	590	510	340	220	130			

Figure 4. The table used by the author to document the daily size of the active regions. Note the maximum for the Rotation on May 9 at 1,230 millionths.