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A new polar storm and a long-lived equatorial disturbance in Saturn's post-Cassini era

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Abstract

We report on a new bright spot discovered by amateur astronomers on Saturn's atmosphere on March 29, 2018 at planetographic latitude +66.8°N. The spot moved with a mean velocity of +60.9 ms^{-1} and showed brightening episodes during the observing period. Eastward and westward of it smaller spots were seen allowing the measurement of the wind speeds in the area that differs from the mean wind velocity profile determined at this latitude [1] [2]. We also report on the continuing observation of the bright spot at latitude +6°N [3] that holds the longevity record for a feature in Saturn's Equator (> 4 years). Its mean velocity of 449 ms^{-1} has remained stable during this period within ± 3 ms^{-1}.

1. Introduction

Besides the Great White Spots (GWS), huge planetary-scale storms that represent rare and exceptional cases, with only 6 events reported from 1876 to date [4], the presence in Saturn's atmosphere of high albedo spots that are observable with small telescopes is an unusual phenomenon. The study of these bright spots allows characterizing both the properties of the most significant storms and the cycles of activity at different latitudes in the planet. Here we report a study of two bright spots observed at two different latitudes of Saturn after the end of the Cassini mission in mid-September 2017. One is a new spot observed in the northern polar area, in the region of a singular double-jet (50°N to 70°N) that has no a symmetric counterpart in the south [1]. The second is a long-lived equatorial storm that shows a remarkable stability in size and velocity [3].

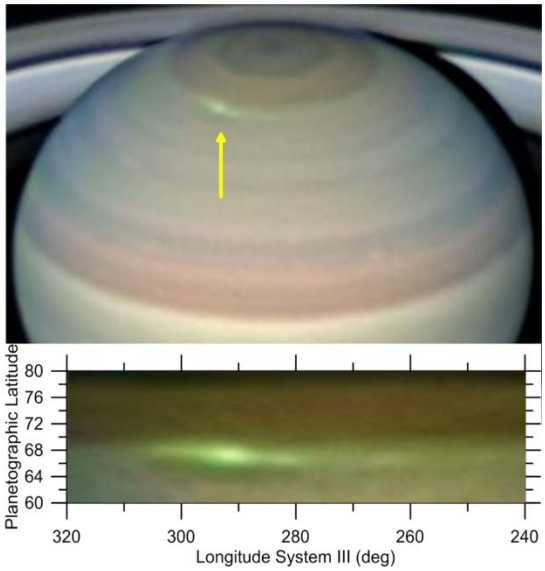

Figure 1: The polar spot in expansion as observed by Damian Peach on April 1, 2018.

2. The polar storm

On March 29th, 2018, a high albedo spot (WS) was observed in the northern polar area (Figure 1, 3). It emerged in the latitude of a double jet where a system of three coupled vortices (ACA) had been reported previously, and where a disturbance took place in 2015 [5]. We tracked WS from 29 March to 2 May on 57 selected images obtained by 20 observers and submitted to PVOL [6] and ALPO Japan [7] image repositories. WS mean longitude drift was -11.6°/day in System III and its mean planetographic latitude +66.8°±0.5°N resulting in a mean zonal velocity of +60.9 ms^{-1}. The tracking of this longitudinal drift back

in time shows that a good correlation exists with the position of a cyclone seen in the Cassini epoch north of the ACA system, suggesting that WS could have originated inside that cyclone. In our measurements, WS had an extent of ~ 10° (zonal) and 4° (meridional), acquiring in the first days an S-shape with a pattern of nearby spots (Fig. 1) suggestive of the development of a disturbance. The velocity of these features reveals differences with the wind profile at this latitude (Fig. 2) [1, 2]. Numerical simulations of the storm dynamics are being developed.

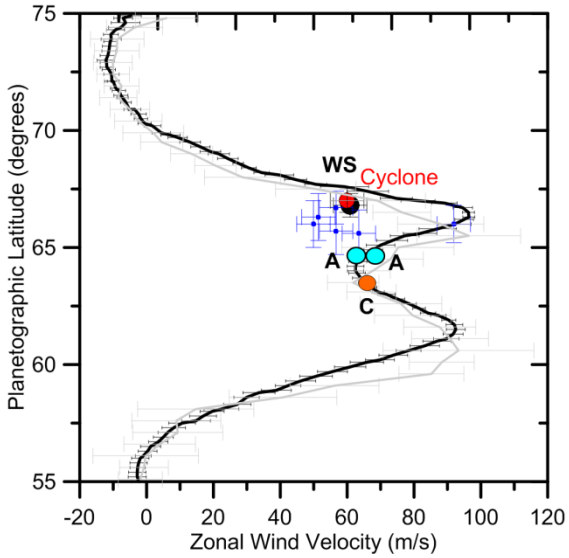

Figure 2: Velocities in the double jet. Continuous profiles: black from Cassini ISS [1], gray from Voyager 1-2 [2]. The WS (bright polar spot) is the back dot and the blue dots are from related features in 2018. The cyclone and ACA velocities are from Cassini ISS [4].

3. The long-lived Equatorial Storm

The storm at latitude +6°N reported in [3] has been observed recurrently during the Saturn oppositions in 2016, 2017 and 2018 (Figure 3), thus becoming the feature with the longest lifetime ever observed in Saturn's Equator. Tracking of the feature during this period resulted in a wind speed ranging from 446.3 ms^{-1} to 451.8 ms^{-1}. In images with high enough resolution, the feature is seen to be double, with a northern and southern components moving coherently. No explanation exists yet for the nature of this unusual feature.

New observations of Saturn are planned for June 6, 2018 within the OPAL program of Hubble Space Telescope. Those new images will provide additional information on both phenomena.

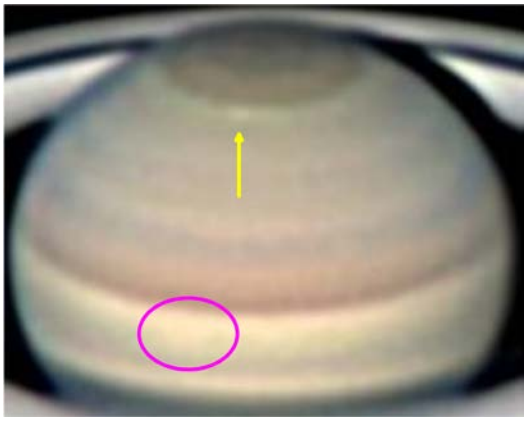

Figure 3: The arrow shows the polar spot (WS) and the ellipse encloses the long-lived storm in the Equatorial Zone as imaged by A. Wesley on April 5, 2018.

Acknowledgements

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