EPSC Abstracts
Vol. 11, EPSC2017-115, 2017
European Planetary Science Congress 2017

Bright features on Uranus and Neptune

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1. Abstract

In the past 10 years, we have studied the atmospheres of Uranus and Neptune using telescopes with apertures ranging from 28 to 50 cm. Our focus was on the detection of bright features on these planets. In 2015, we have imaged a long-living bright storm on Neptune, which existed for at least 5 months. This storm showed a westward drift of 24.0º/day, which fitted quite well with the know local wind speeds. Other spots were also detected.
In 2016 a bright spot was detected on Uranus. In general, the occurrence of bright features on Uranus seems to be rarer than on Neptune. This study illustrates the potentials of amateurs to contribute to studies of the distant ice giants.

2. Introduction

For amateur astronomers, the distant planets Uranus and Neptune are quite a challenge. With their angular size of maximal 3.6" and 2.4", respectively, it is not easy to detect atmospheric details. However, the recent development of digital cameras with increased sensitivity in the near-infrared, including the methane bands at 616, 727, 862 and 889 nm, has opened new possibilities.

3. Results

3.1 Uranus

Our studies of Uranus started in 2006 [1]. At that time, no atmospheric details could be detected. In 2007 the Earth crossed the equatorial plane of Uranus and its satellites allowing the observation of the partial occultation of Umbriel by Ariel on 7 August 2007.

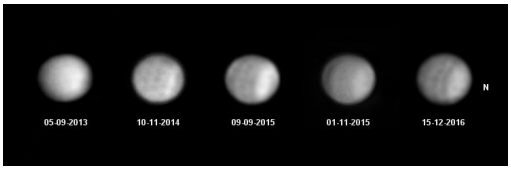

Fig.1: Uranus from 5 Sep. 2013 till 15 Dec. 2016. C14 and different types of cameras. Red long pass (>610nm) or IR filters

In the following years, the atmosphere of Uranus showed increased formation of darker and brighter bands (Fig. 1). In addition, brightening of the North Polar region could be detected. These changes might be seasonal effects.
An exceptional activity occurred in 2014, leading to several observations of a major storm by some amateurs [2] (Fig.2).

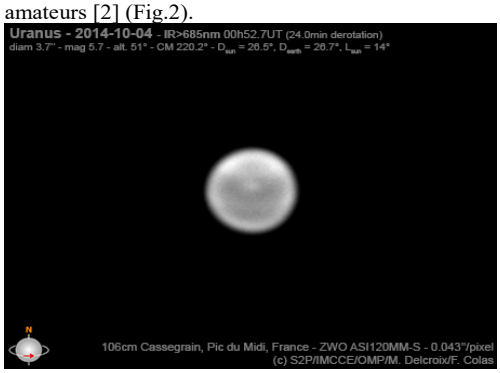

Fig.2: Uranus in Oct. 2014 from Pic du Midi 1m telescope in infrared, showing storm K1 at meridian.

However, the occurrence of bright spots detectable for amateurs turns out to be very rare. On 15 August 2016 nonetheless, a bright spot could be detected at coordinates longitude 241.9 º, latitude +56.7º (Fig.3).

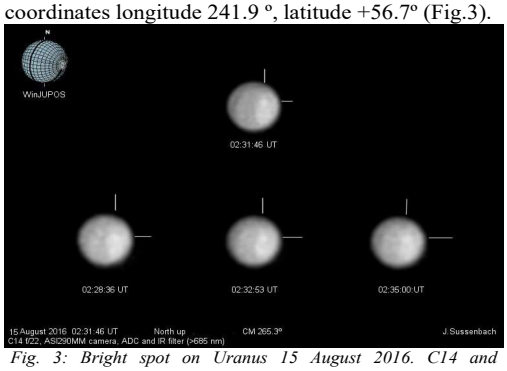

Fig. 3: Bright spot on Uranus 15 August 2016. C14 and ASI290MM camera and IR filter. At the top the combination of the three lower images. In the left upper corner a WinJUPOS simulation.

Unfortunately, prolonged poor weather conditions hampered to observe the development of this spot (only a few observations by other amateurs showed also possible activity in that zone). In the coming years, the declination of Uranus will increase steadily, which will give observers at the Northern hemisphere the opportunity to perform extensive studies of the atmosphere of Uranus by amateurs.

3.2 Neptune

After several sparse amateur observations of bright features on Neptune since 2013 [3], the frequent observation of Neptune by amateurs started in July 2015, when Ricardo Hueso from the Universidad del Pais Vasco, Bilbao, Spain did an appeal to the amateur world [4]. He requested amateurs to investigate whether a bright spot at -41º professionals discovered on Neptune on 13 July 2015 was also detectable with amateur instruments. This was indeed the case and we followed this feature (Spot A) till December 2015 (Fig.4).

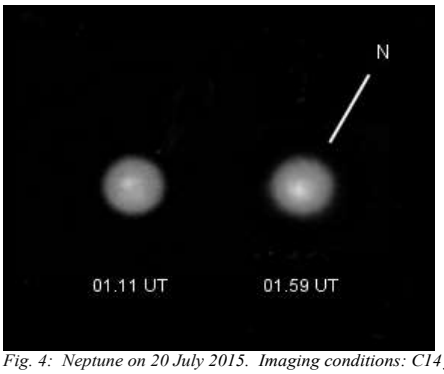

Fig. 4: Neptune on 20 July 2015. Imaging conditions: C14 f/22, QHY5LII camera and a 610 nm red long pass filter. North is up.

Later, also a second bright spot was detected, this time in the Northern hemisphere. We measured the drift of this Spot A and found a value of 24.0º/day westward in longitude (Fig.5) [5]. This fits quite well with the results of professional measurements showing a westward drift of 24.27º/day [4].

4. Conclusion

The bright features detected in the atmospheres of Uranus and Neptune represent high-altitude atmospheric disturbances. Interestingly, these features are less frequently present on Uranus than on the more distant planet Neptune. The appearance of atmospheric features deserves a longer period of observation to establish seasonal effects. This study illustrates that with the current equipment available to amateurs valuable information can be obtained about the atmospheric processes on Uranus and Neptune.

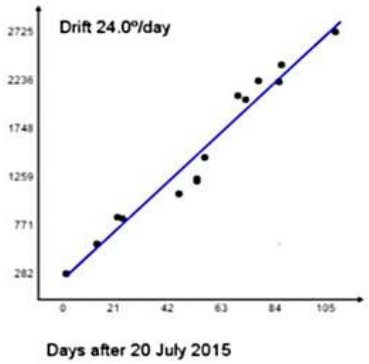

Fig. 5: Drift of Spot A on Neptune in 2015

5. Acknowledgements

We gratefully acknowledge the support of Dr. Ricardo Hueso Alonso who immediately informed the amateur astronomers about the discovery of spot A on Neptune on 13 July 2016 and stimulated them to detect and to observe its development. We thank him for his assistance.

6. References

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