

End of Apparition Summary of Visual Observations of Jupiter made during the 2022-23 Apparition

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Start of Observations: 2022 July 08

Last Observation: 2022 December 29, $L_s = 356^\circ$ to $L_s = 12^\circ$

Opposition: 2022 September 26 (Pisces), $D = 48.8''$

Number of Observations: 13, **Number of Drawings:** 16

Instruments used:

- 305mm Newtonian Reflector (Leicester)
 - 508mm Planewave Dall-Kirkham (University of Leicester Observatory)
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1. Introduction

The 2022-23 apparition of Jupiter saw the planet come to opposition on 2022 September 26 in the constellation of Pisces. Although south of the celestial equator, Jupiter reached a much greater altitude compared to the last three years. The planet came to opposition on 2022 September 26 in the constellation of Pisces close to perihelion and as a result, subtended an apparent diameter of $48.8''$ at the time of opposition.

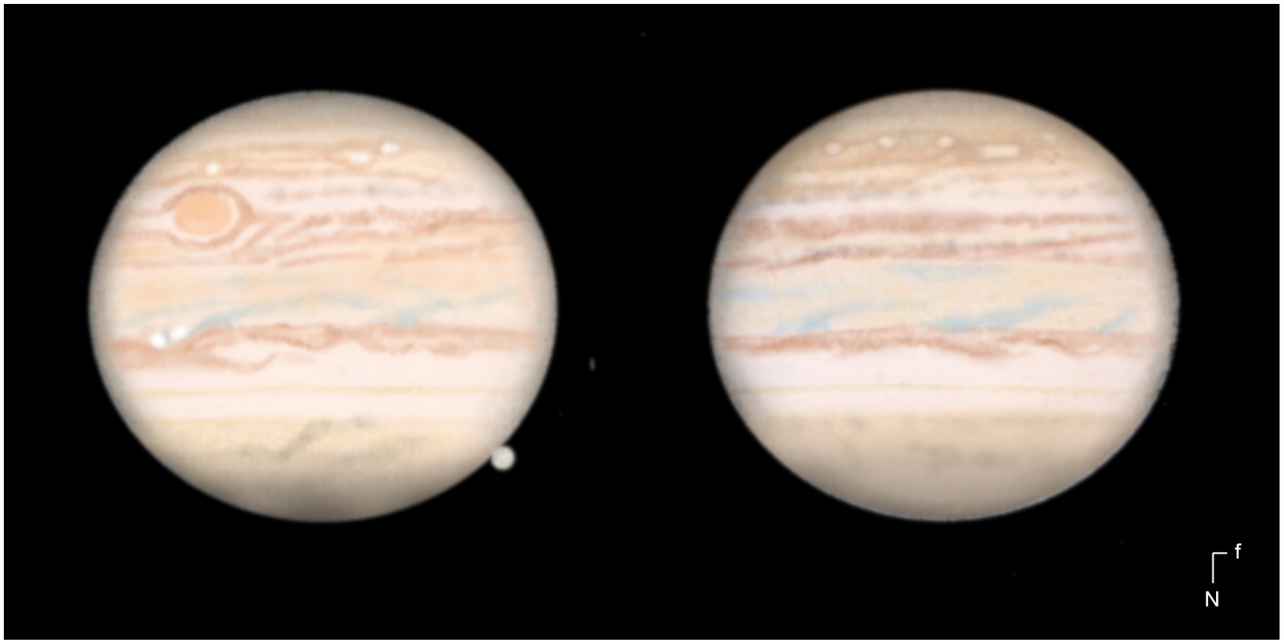
In this report we summarise visual observations made by the author during the apparition. The primary instrument used was the author's 305mm Newtonian Reflector, and on occasion, the University of Leicester's 508mm Planewave Dall-Kirkham was used. No intensity estimates were recorded during this time, however it is hoped that they will be taken during the next apparition of 2023-2024.

2. The Southern Hemisphere

Souther Polar Region [SPR]: This was a vague greyish region- a southern polar cap could be made out in the very far south.

South South Temperate Belt [SSTB]: This was an interesting belt and was not uniform in appearance. It contained a number of darker sections and could either appear greyish or greyish brown in colour. The belt was also the homr of a number of white ovals: A1, A2, A3, A4, A5, A7 and A8.

Oval A8 was probably too small to be seen visually. There was a large elongated bright section between ovals A4 and A5 which was observed a number of times (figure 1). The belt was not present at all sections of longitude; there were a number of places where it was absent or appeared to be broken.



Disk Drawing 1: 0029UT, x300, Seeing: All -III
 CM1: 155.7° CM2: 58.6° CM3: 339.1°

Disk Drawing 2: 0143UT, x300, Seeing: All
 CM1: 200.9° CM2: 103.3° CM3: 23.8°

2022 August 20th, Start: 0016UT Finish: 0146UT, Seeing: All - III. Transparency: Very good.
 305mm Newtonian Reflector, x300. Filter(s): None - integrated light only.
 B= 2.6°, Ds= 2.1°, Ls= 0°, Disk Diameter= 47.3"

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Figure 1: Two drawings of Jupiter made on 2022 August 20th.

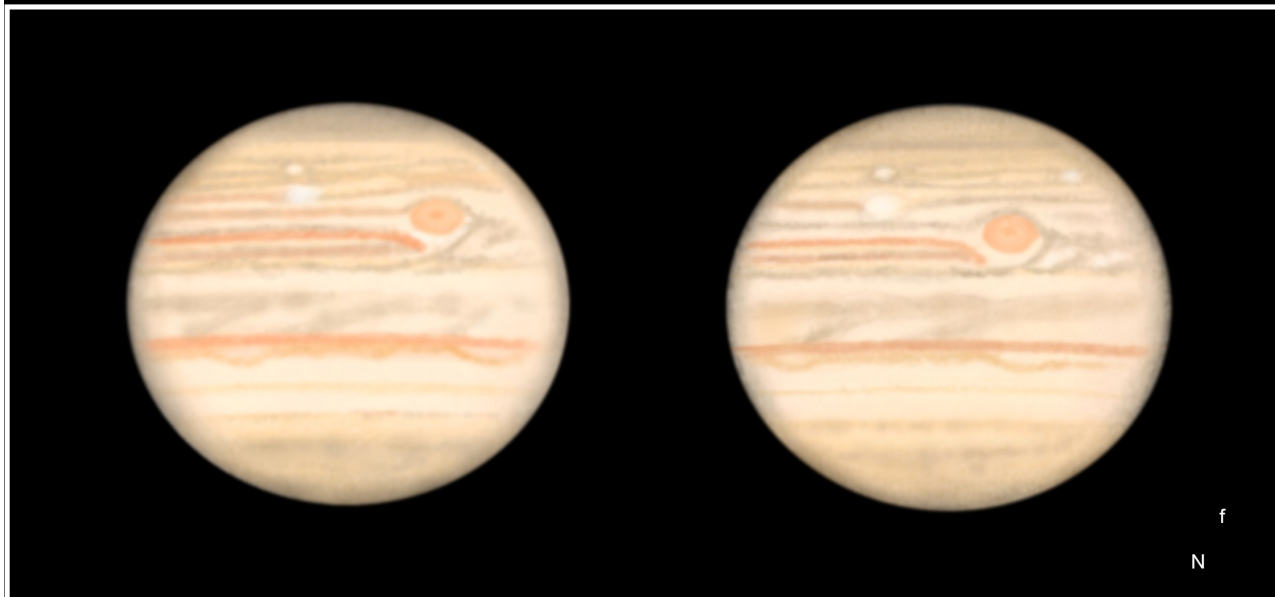
South Temperate Zone [STZ]: A bright zone but not overly so and in many places it contained a strong yellowish colour. Fragments of the SSTB could be seen extending into the zone at some longitudes.

South Temperate Belt [STB]: Quite a dark belt and usually fairly well defined at most longitudes. A number of darker sections and spots can be found here. DS8 was not observed but WS6 may have been seen.

South Tropical Zone [STropZ]: In general a bright zone but it gave the impression of being rather crowded in some locations. A faint belt could be made out from $\lambda_2 \sim 40^\circ$ to 100° : it was not clear if this is part of the STB or a belt unique to this zone. There also appeared to be a thin section connecting and passing south of the Great Red Spot (see figure 2).

Southern Equatorial Belt [SEB]: A broad complex belt containing a lot of fine details and structure. In most places there were three distinct components: a southern component SEB(s), a darker zone labelled SEB(z) and finally a northern component SEB(N).

In the region preceding the Great Red Spot, there seemed to be an additional belt- either that or the SEB(z) had an additional part which had a dark grey appearance. There was considerable turbulence in the region immediately following the Great Red Spot. The structures observed here were not constant in shape but did conform to a general picture of large white spots which were irregular in shape. These appeared to get squashed between the main SEB belt components as distance from the GRS increased on the following side.

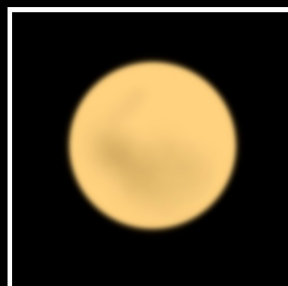


Disk Drawing 1: 2317UT, x300. Seeing: A1 - II.
CM1: 330.8° CM2: 357.5° CM3: 286.2°

Disk Drawing 2: 2350UT, x300. Seeing: A II
CM1: 350.9° CM2: 17.4° CM3: 306.2°

2022 September 19, Start: 2308UT Finish: 2354UT. Seeing: A1 - II (exceptionally calm at times). Transp: Hazy- getting misty.
305mm Newtonian Reflector, x300. Filter(s): None- IL only. B= 2.2°, Ds= 2.6°, Disk Diameter= 49.8", Ls= 3°

Markings on Ganymede?:



Disk Drawing: 2327UT, x600, Seeing: A1

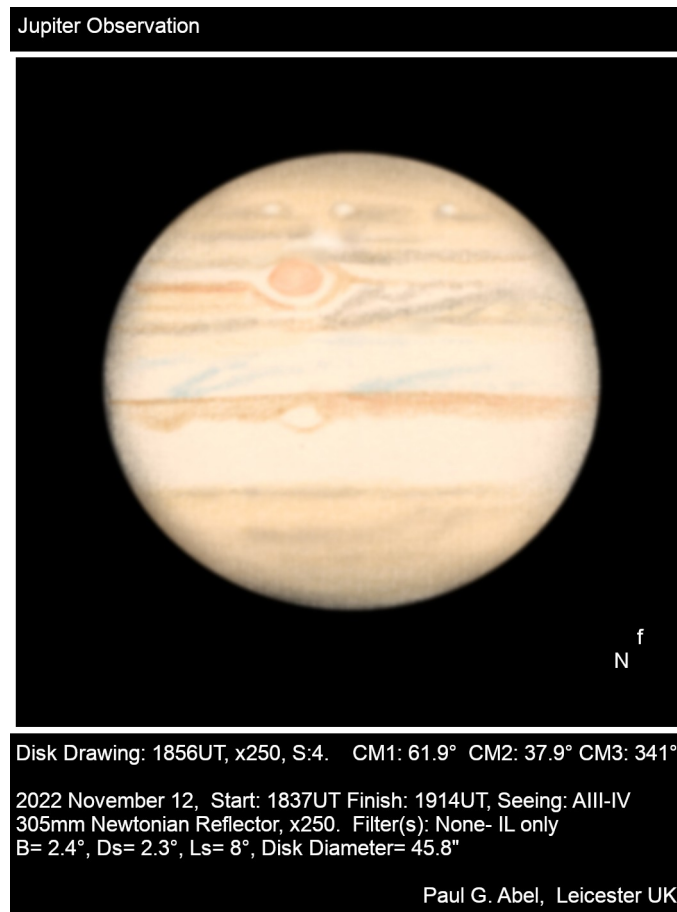
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Figure 2: Two drawings of Jupiter made on 2022 September 19 in good conditions. There also appeared to be subtle details visible on the largest satellite, Ganymede.

The Great Red Spot [GRS]: The author found that the spot did not appear to be quite as visually striking or as colourful as it has appeared in previous apparitions. The drawing made on 2022 November 12 (see figure 3), was uploaded into WINJUPOS and its semi-major axis length was determined to be 15595 ± 150 km. There was an image taken by Yasuaki on the same date and the author measured the GRS (again in WUJUPOS) in this image and determined a semi-major axis length of $15022 \text{ km} \pm 150 \text{ km}$. This is the same order of magnitude in size as the drawing in figure 3.

The stability of the Great Red Spot has been of interest in recent years. As is well known, the spot has been shrinking steadily for the last couple of centuries, however in recent years the GRS has undergone periods of accelerated shrinkage. Additionally, 'flakes' have been observed coming from the GRS leading some to speculate that its demise may be imminent. The situation seems to have settled down once more but questions regarding the eventual fate of the GRS still remain.

unanswered.



*Figure 3: Drawing made on 2022 November 12.
This drawing was used to estimate the width of the
GRS.*

3. The Equatorial Zone [EZ]

In the last couple of years the EZ has been a very dynamic regions: there have been many festoons and bright spots appearing in the zone. There was also a strong yellowish colour present which was somewhat reminiscent of the planet's appearance in the 1950s.

Much of the yellow colouration present in the last apparition now seems to have cleared, in places where it is present it looks rather like a equatorial belt. The festoon activity seems to have reduced, and in general, the whole zone now has a 'quieter' appearance.

4. The Northern Hemisphere

Northern Equatorial Belt [NEB]: This appeared to be quite thin- much more so compared to the last few years. At a number of longitudes there appeared to be large white sections/rifts within the belt (see figure 4). There seemed to be two parts to the belt, a dark reddish brown in the south and a lighter, golden coloured component immediately below this to the north.

At a number of places, material from the northern edge of the the NEB seemed to extend north into the North Tropical Zone. Often these extensions would take the form of large loops whose boundaries were usually golden-yellow in colour.

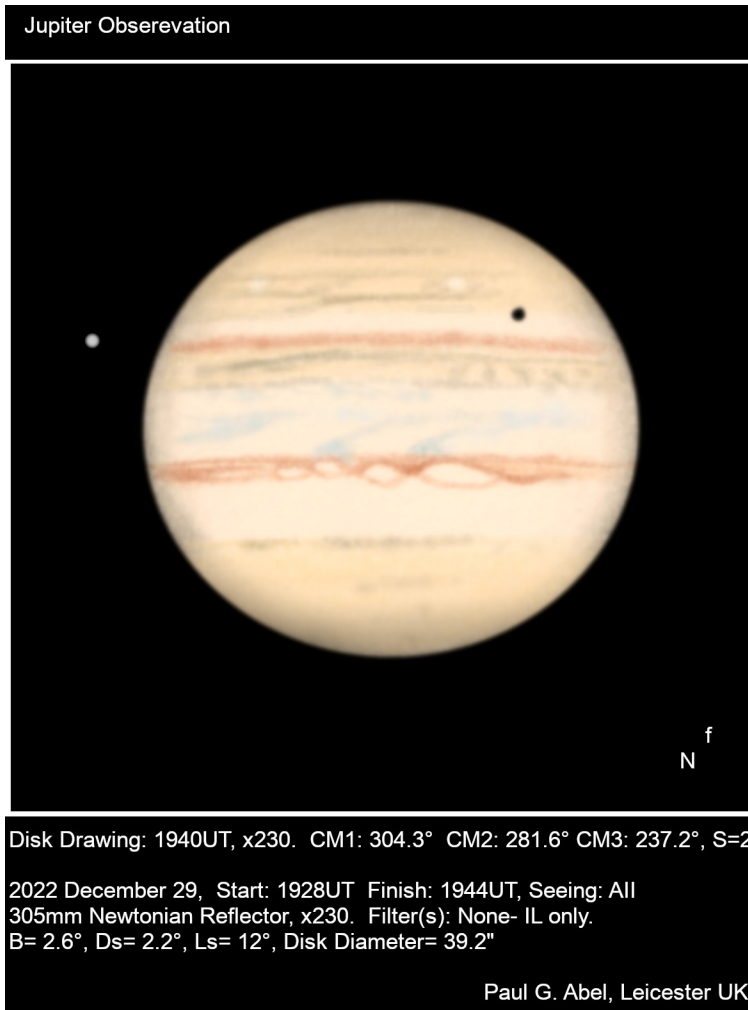


Figure 4: A drawing made on 2023 December 29 showing bright white sections and rifts within the NEB.

North Tropical Zone [NTropZ]: A bright white zone which seemed to be largely featureless except in those places where material near to (or associated with the NEB) could be observed.

North Temperate Belt- south [NTB(s)]: This is the name given by the BAA Jupiter Section for the next belt north of the NEB. The NTB appeared as a thin uniform golden band. It was complete at all longitudes observed and didn't appear to show any other features. At times the belt could be very difficult to pick up visually.

North Temperate Zone [NTZ]: Another bright zone, cream in colour and appeared to be featureless.

North-North Temperate Belt [NNTB]: Observed in some places and appeared either as a thin irregular greyish-brown fragments or else as a series of darker spots.

Northern Polar Regions [NPR]: In general a rather vague greyish region, however some mottling and vague structures were observed in the far north at some longitudes. A northern polar cap could also be made out.

5. The Galilean Satellites

The four major moons of Jupiter- Io, Europa, Ganymede and Callisto are very easy targets. In small telescopes they appear as bright starlike points, but in large instruments they can be resolved into individual disks. The satellites do not appear white to the author- Io usually has an orange hue which can vary in shade and intensity. Europa appears uniformly white, while Ganymede is yellowish and Callisto appears yellowish-bronze.

Two interesting observations were made of the Galilean satellites, the first was on the night of 2022 September 19 (see figure 2). At 2327UT, conditions were excellent and the author was able to use a power of x600 to observe Ganymede. During these moments, subtle darker markings- greyish in colour, were strongly suspected on the disk. Examining the Ganymede simulation on WINJUPOS for this date and time, we see that Ganymede has a CM value of $\lambda = 126^\circ$ and the Galileo Regio can be found in this location- this may have been what was observed.

On 2022 October 10, Europa passed behind Jupiter and at 2109UT it was possible to see the satellite partially occulted by Jupiter (see figure 5).

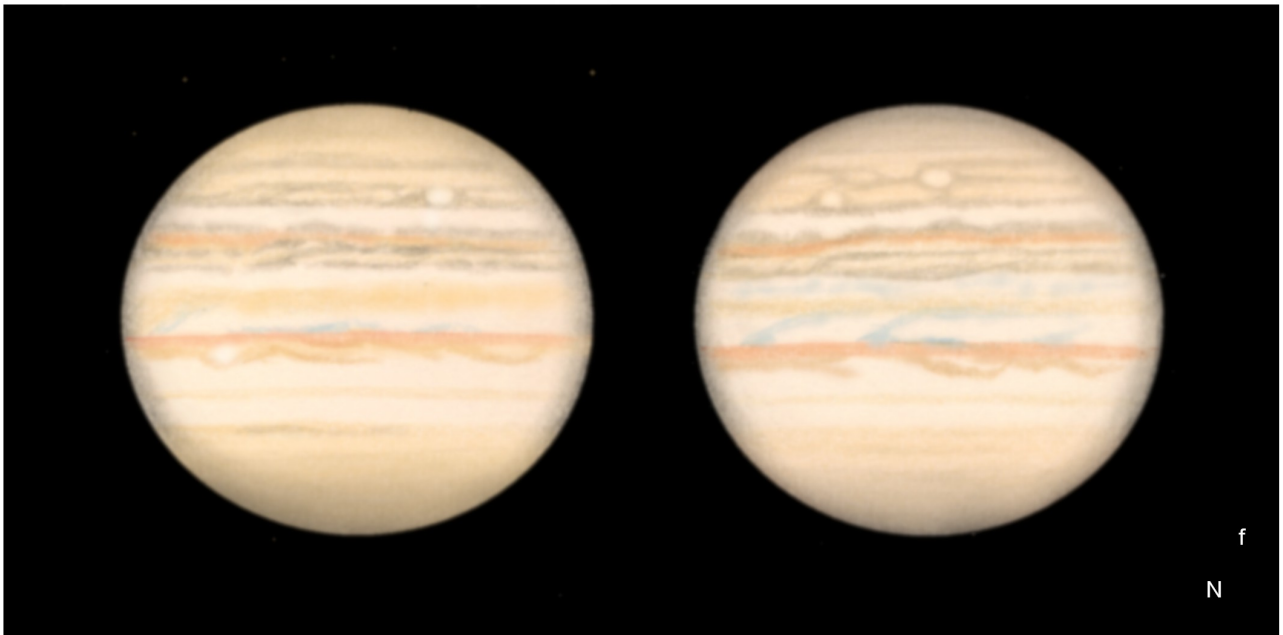
6. Conclusions

The 2022-23 apparition of Jupiter was a great improvement on the previous three as the planet reached a higher altitude in the sky. A great deal of activity was observed on the planet, and more fine details were observed due to the planet's higher altitude in the sky and the larger aperture that the author now uses for planetary work.

There were a number of changes- the GRS seems to be a little less prominent than before and the main equatorial belts continue to show a lot of activity. The EZ has now largely lost its yellowish colour and there were fewer festoons visible during the apparition.

Jupiter will now continue to climb higher in the northern skies and the author hopes to increase the number of observations and to start recording intensity estimates once more.

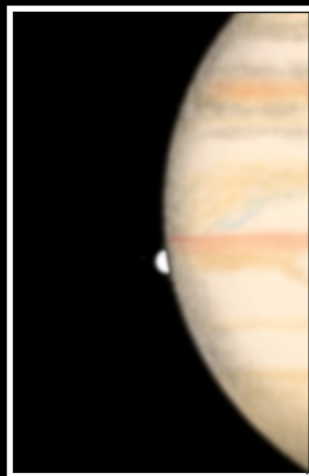
Jupiter Observation



Disk Drawing 1: 2117UT, x300, Seeing: All - III
CM1: 336.1° CM2: 203.2° CM3: 137.5°

Disk Drawing 2: 2248UT, x300, Seeing: All - IV
CM1: 31.6° CM2: 258.2° CM3: 192.5°

2022 October 10, Start: 2103UT Finish: 2250UT. Seeing: All - IV. Transparency: Hazy.
305mm newtonian Reflector, x300. Filter(s): None - IL only.
B= 2.3°, Ds= 2.5°, Ls= 49.4°, Disk Diameter= 49.4"



Europa partially eclipsed by Jupiter:

2109UT, x300. Seeing: All

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Figure 5: Jupiter on 2022 October 10. At 2109UT, Europa was partially eclipsed by Jupiter.