Formation of NEB Rift in 2000-2001

Yuichi Iga
ALPO Japan

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Summary

There were many rift structures on NEB in the apparition of 2000-2001. I generated 24 strip maps and measured the longitudes of white spots and rifts on NEB from CCD images. A small white spot occurs in the center of NEB, and it grows toward the east and west by the sheared jetstream and toward the north and south at the same time. Finally it grows to the rift of NEB. Because the rift is supplied from the new white spot, it is extended more toward the east and west. The rift grows up to 15-30 days, and disappears gradually after it has 110 degrees length of longitude. The white spots occur one after another in the same location of NEB, then its generate a new rift. These sources are identified to eight locations, and these have 9h54m15s of the averaged rotation period. Also, these sources themselves live until 3 to 5 months.

1. The Feature of North Equatorial Belt

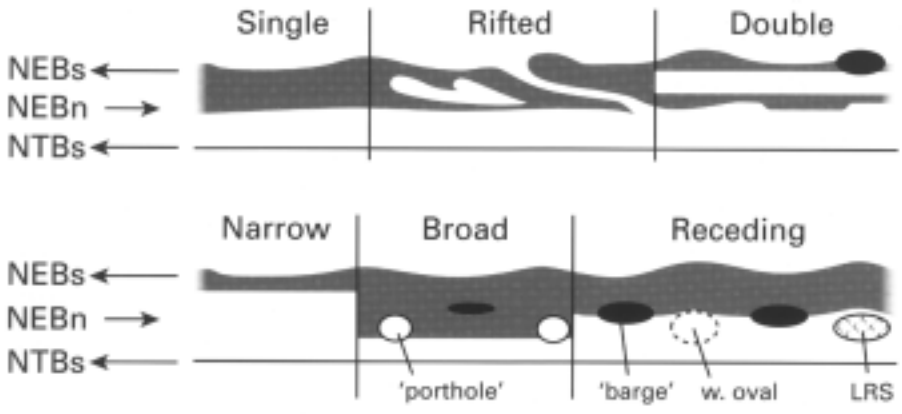

Fig. 8.1. Sketches of typical aspects of the NTropZ and NEB. The NEB commonly evolves as sketched from left to right, (top row) during an episode of rifting, or (bottom row) during a typical cycle of activity – broadening, reddening, and creation of stable ovals. W., White; LRS, Little Red Spot. (Detailed forms of NEBs disturbances are not shown; see Fig. 9.1.)

Figure 1. Sketches of typical aspects of the NTropZ and NEB [1)]

2. The Activity of NEB Rift in 2000-2001

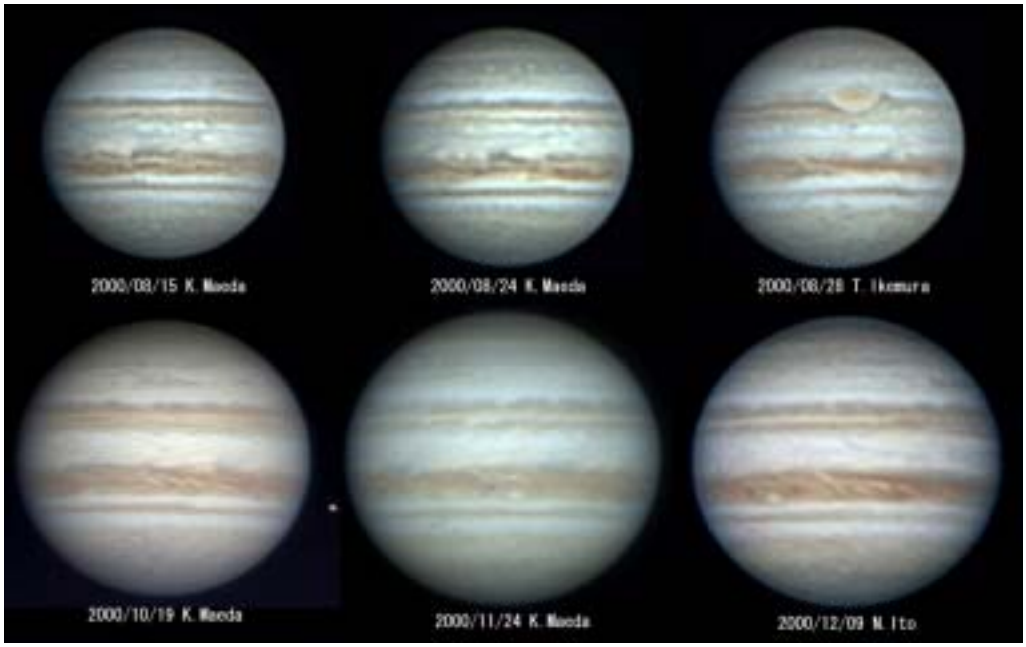

Figure 2. CCD Images of typical aspects of the NEB in 2000-2001

3. What is known about the NEB Rift?

month	N
2000/06	1
07	1
08	3
09	4
10	1
11	1
12	1
2001/01	3
02	4
03	5
Total	24

Table 1. Number of strip map from CCD Images

The strip maps shows the following things:

1) The rift moves forward in NEB; a rift has the faster rotation period to system-II.
2) The rift changes the length of the longitude; there is the variety of the length of the rift. A short rift is extended toward the east and west, and it disappears after that. Also, some rifts are located on side by side, and some rifts are overlapped each other.
3) The rift has a white spot near the center.
4) The short length of rift has a bright white spot; as the rift grows toward the east and west, the white spot, which is centered in the rift, disappears gradually.
5) The festoons of EZn pass through the rifts, but these festoons have no changes of the feature.
6) The rifts pass the barges of NEBn, but the barges have no change. Therefore, it seems that the activity of the rifts is located in only NEB region.

Figure 3. Strip maps of NEB region in 2000-2001

4. The Hints of the formation of the NEB Rift

There were many rift structures in the past apparitions. There were several images of the rift by the HST and spacecrafts of NASA. These images show that the rift of NEB is formed from a white spot of NEB (See Figure 4, Figure 5 and Figure 6).

Figure 4.shows that two small white spots are located in the rift (upper-left). Then, these white spots change to the brighter, and the rift is more active by our observations.

Figure 5. shows that there is an active rift structure with the white spots.

Figure 6. shows that there are four rifts in the NEB. This movie shows that the rift moves forward faster in NEB, it has some white spots near the center. The rift is supplied the clouds from the white spot, and grows toward the east and west.

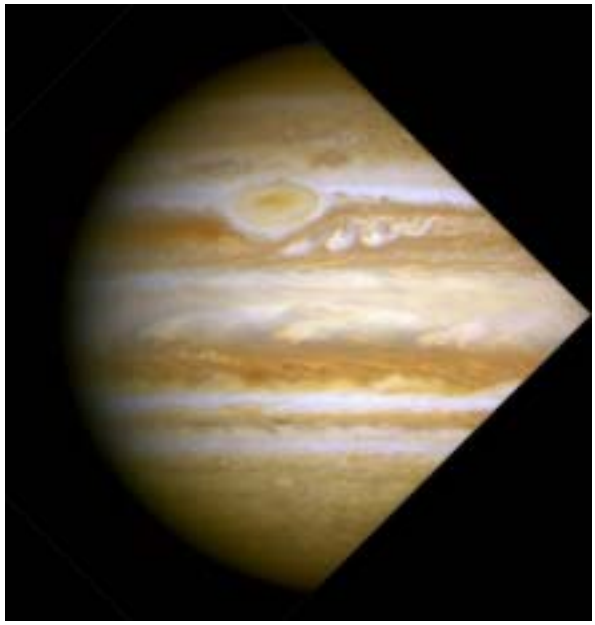

Figure 4. HST image in 1999

Figure 5. Cassini image in October 14, 2000

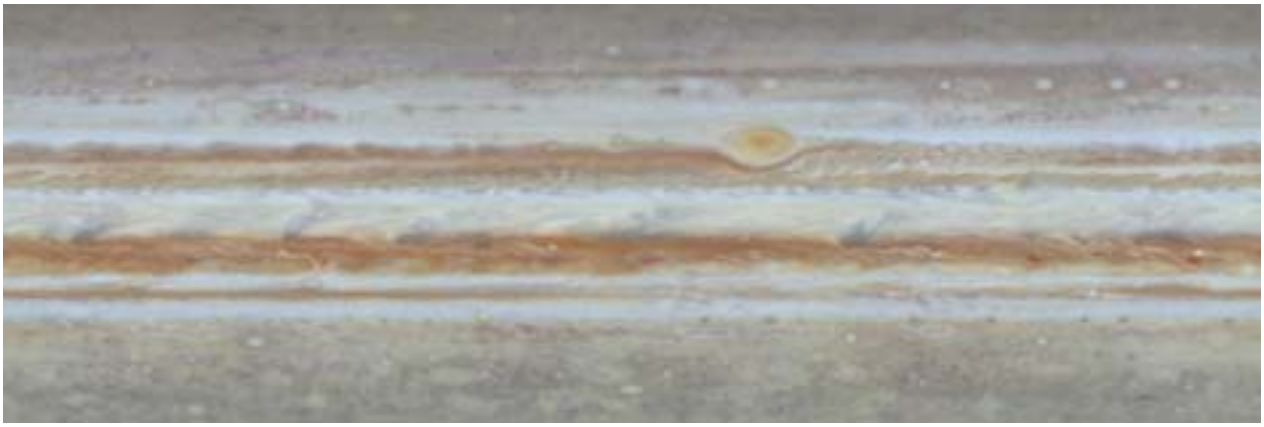

Figure 6. Strip map of Cassini image from October 31 to November 9, 2000

5. Analysis from the measurement of the longitude

I measured the 8708 longitudes of the feature from CCD images of ours members. There are 704 data of the rifts and white spots of the NEB (See Figure 7). The open circles (red) are the white spot, and the arrows (black) are the rifts of the NEB. It seems that the rift and white spots of NEB move faster than the system-II, but the white spots move constantly.

Figure 8 shows the drift chart of only white spots plotted by the special system of 9h54m15s. There are 8 groups of the white spots that have the averaged rotation period 9h54m15s(drift-II +62.7 degrees). Each group is the source of the white spots, and the many white spots occur at the same source. The source is activated only during 3 to 5 months.

Figure 9 shows the drift chart of rift (green triangles). The preceding end of the rift starts at the occurrence of the white spot, moves forward by -63.3 degrees/month relative to the source. Also the following end of the rift moves backward by the +48.0 degrees/month relative to the source.

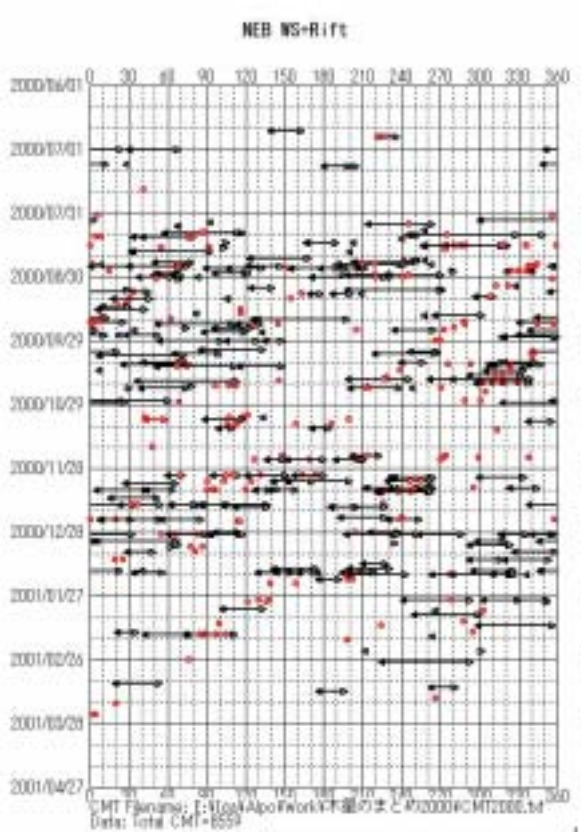

Figure 7. Drift chart of white spot and rift in NEB (plotted by System-II)

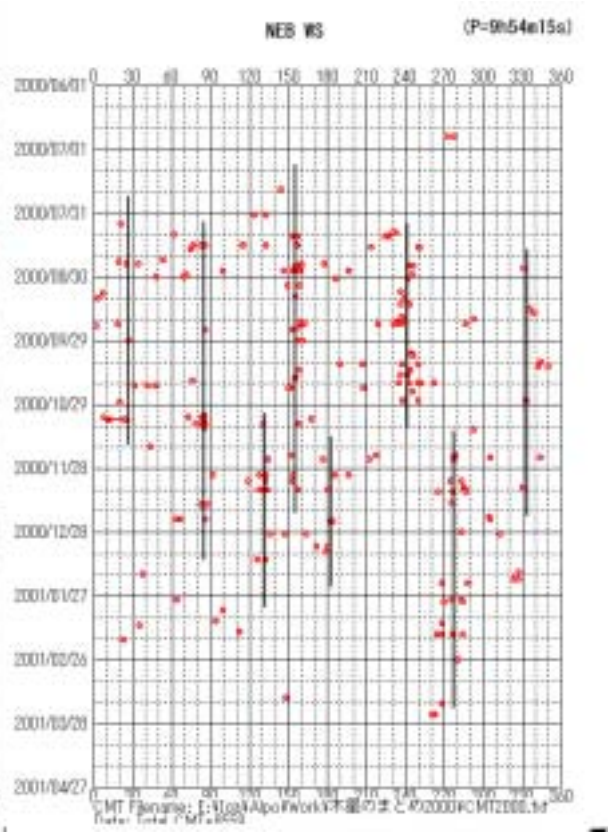

Figure 8. Drift chart of white spot of NEB (plotted by special system=9h54m15s)

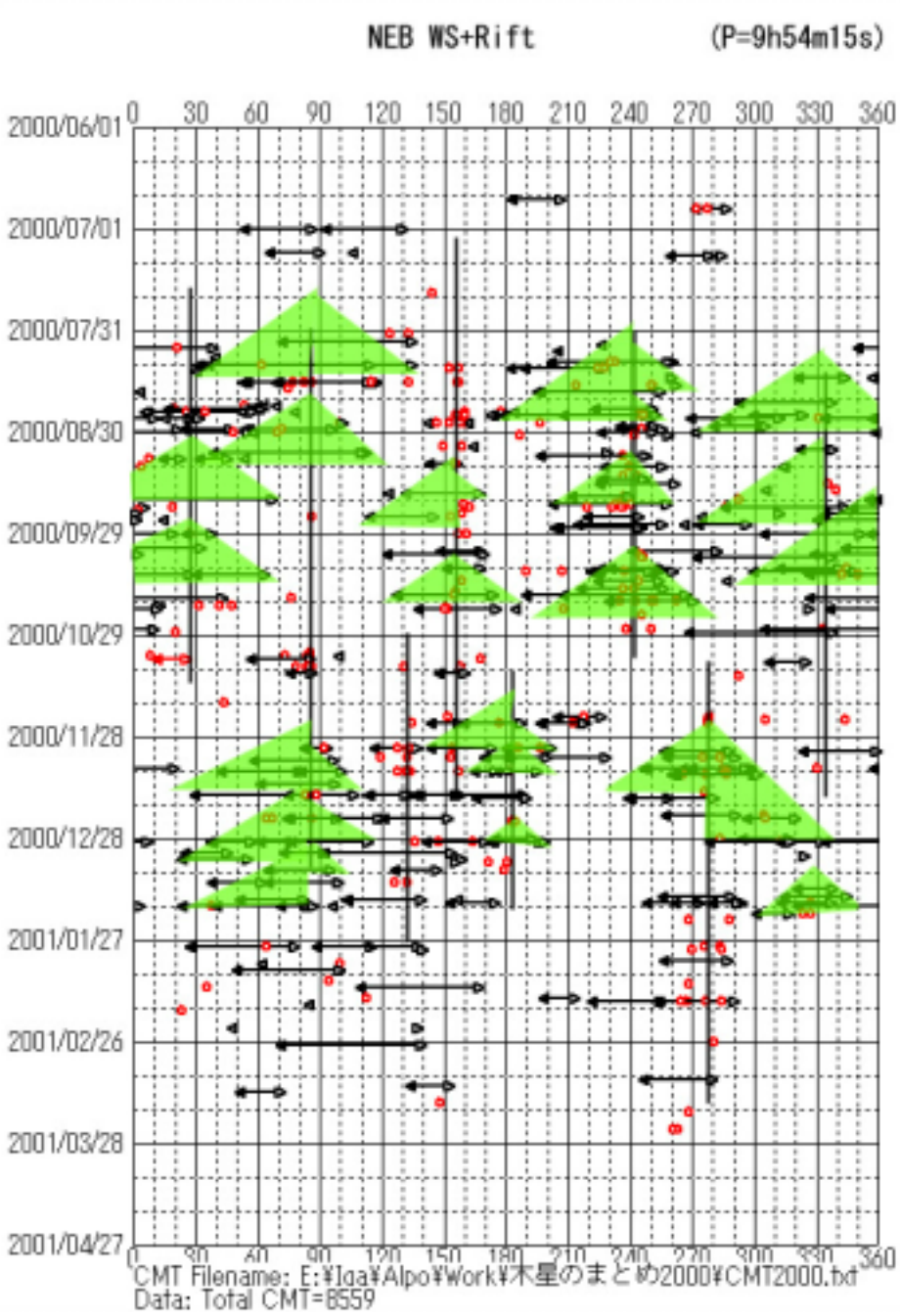

Figure 9. Drift chart of identified white spot and rift (plotted by special system=9h54m15s)

6. Results

There are 8 sources, which are the continuous occurrence of the white spots in NEB. These sources have the averaged rotation period of 9h54m15s. A white spot occurs at a source, grows toward the east and west by the sheared jetstream, and forms the rift of NEB. The preceding end of rift moves forward by the rotation period 9h52m49s. Also the following end of the rift moves backward by the

rotation period 9h55m21s. The rift grows to the direction of the longitude, but this growth is limited up to 15-30 days. This rift disappears gradually, as the longest rift has the length of 110 degrees. The new white spot occurs on the same source again, and then the new rift is formed from the white spot. But this source has the life of 3-5 months.

Features	Period	Drift(day)	Drift(month)
White spot	9h54m15s	+2.1(system-II)	+62.7(system-II)
Rift p.end	9h52m49s	-2.1(relative to WS)	-63.3(relative to WS)
Rift f.end	9h55m21s	+1.6(relative to WS)	+48.0(relative to WS)

Table 2. Averaged rotation period of NEB features

7. Model of the formation and growth of the NEB Rift

The white spot is the origin of the NEB rift. The white spot is expanded toward the east and west by the sheared jetstream of NEB. The rift grows more as long as the white spots occur. But the rift disappears gradually when the rift grows up to about 110 degrees length of longitude. As a new white spot occurs at the same source, grows, and formed a new rift. At this time, a new bright rift and an old receding rift are overlapped.

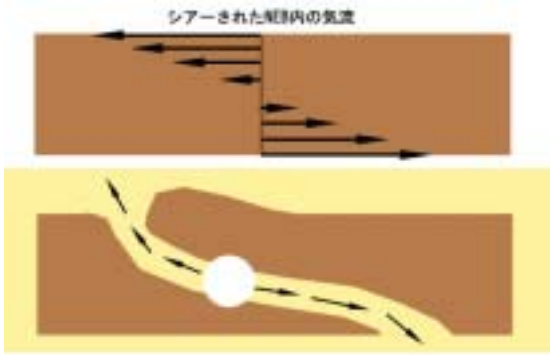

Figure 10. Model of the rift that is grown by the sheared jetstream

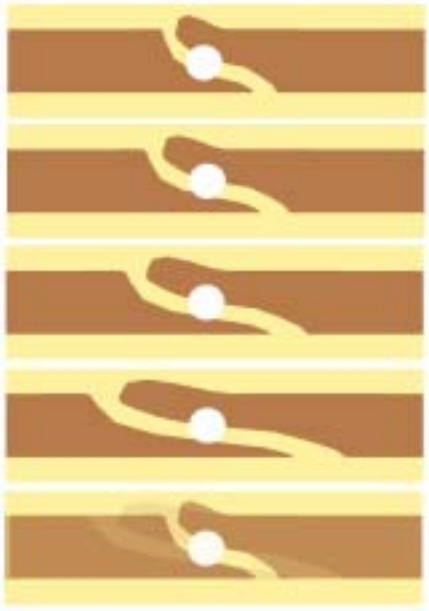

Figure 11. Model of the growth of the NEB rift

Reference:

(1) J.H.Rogers, The Giant Planet Jupiter, Cambridge Univ. Press(1995)