

Early occurrence of 2018 Encircling Dust Storm

ALPO Japan Makoto Adachi

Abstract

The Encircling Dust Storm in 2018 was discovered by Mr. Efrain Morales Rivera of Puerto Rico on May 30, 2018. Later, this dust storm grew to a large dust storm covering the entire surface of Mars.

I examined the process of spreading over the entire Mars based on the images reported to ALPO Japan. As a result, I realized that there are 3 stages before spreading to the front. Here, we introduced the three stages, and the cause was related to the development of the dust storm in the straightforward direction.

1 How to organize data

1-1 Number of data

The period during which the data was gathered is 17 days from the date of occurrence of May 30 to June 15 where aggregation was done. The number of reports was as follows.

Date	Observed				
	Number				
May, 30	2	Jun. 5	6	Jun. 11	4
	31 5		6 6		12 13
Jun. 1	14.	7	16	13	15
	2 25	8	5	14	8
	3 5	9	9	15	23
	4 14.	10	6	16	17
				17	9
					Total 202 observations

1-2 State taken out from data

Some of the images reported include bad ones, but we examined each image individually as much as possible from there.

The following characteristics were observed until the dust storm of this time occurred on the Mars surface, but after the occurrence, how these features changed was tracked.

a Low latitude water ice clouds and orographic clouds

Among them, the north side of Terra Cimmerium, It is noticeably seen in the northern side of Cryse Planitia, but it was waning more than the peak.

The orographic clouds of Tharsis also looked outstanding.

b Dust veil

Dust spreads lightly in the atmosphere, and a lot of parts that lowered the contrast of the pattern were seen. From the image of May 27th and 28th, it was seen that the veil is surrounded by a wide area centered on Oxia, located just north of Meridiani.

The point of occurrence of the large dust storm this time is located on the north edge. After occurrence, it proceeded toward the center of this veil. The author believes that this dust veil increased the temperature of the atmosphere and led to the generation of a large dust storm.

c Direction of dust storm

Looking at the reported image, paying attention to the passage of time, I watched in which direction and how to proceed. At this time, I also referred to the image by MRO.

1-3 Production of developed drawing

(1) Preparing a map

Prepare the following recording sheets in advance. (Figure 1) The map shows the north and south of the observation image

I made a map made by an orthographic projection method matching with the former, and the author broke the pattern and elevation respectively. I expressed it using lines and practice.

The shape of the pattern is important in order to grasp the position of the dust storm, but the shape of the dust storm. Since the progress depends on the topography, we created a map that shows both.

(2) Read from image

The reading of the object is visually matched by the writer based on the pattern.

Outline blurred In addition to things, there are also major differences depending on the exposure and processing method at the time of shooting, so we did not use position reading software and we wrote the location on the map with years of experience. Of course, the reading error is very large. However, a big trend was able to be grasped.

2 3 Stages

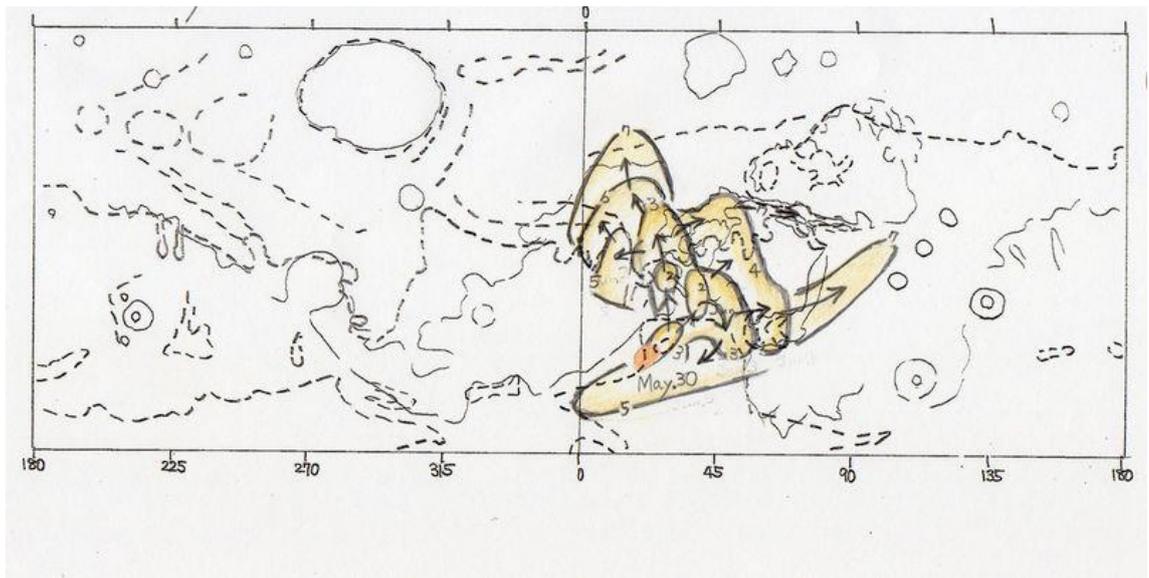
2-1 Development map created

See below for commentary on this map.

(1) Development drawing created (Note: Top is on the South)

A Activity First Phase (A stage)

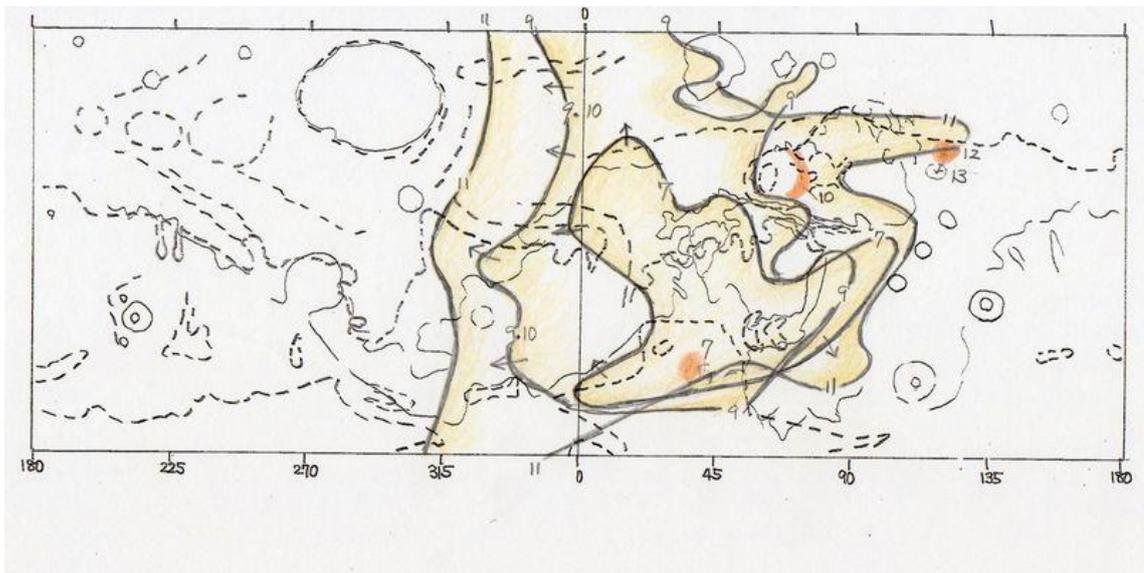
Orange is the origin of the first dust storm.



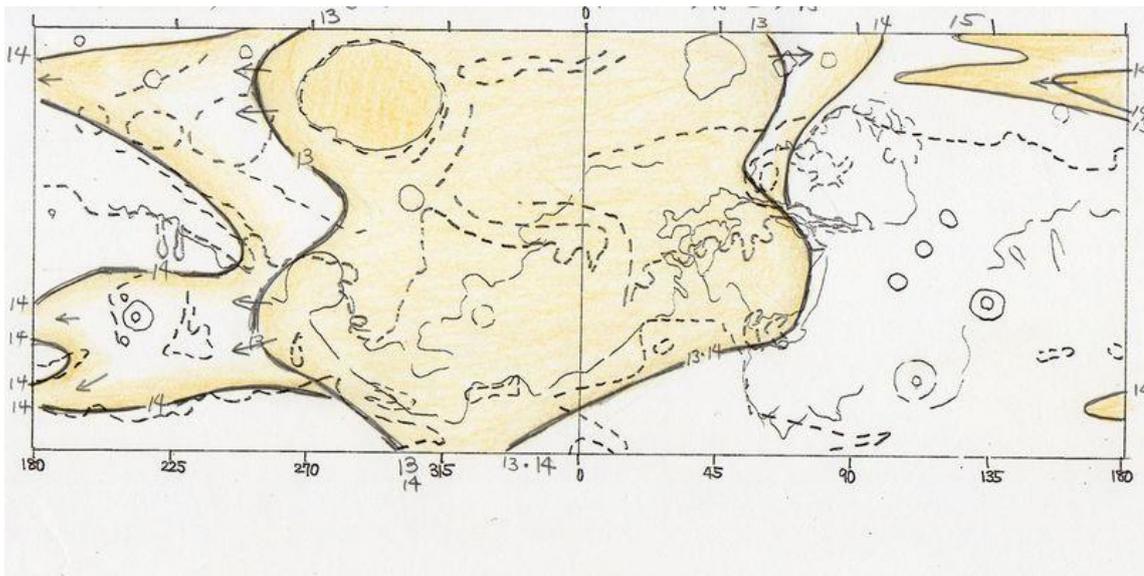
B Activity Second Phase (B stage)

Arrows indicate the direction of travel of the dust storm. Numbers represent dates, and solid lines show the spread of dust storms.

Orange is the point where a newly generated dust storm occurs after the occurrence of dust storm.



C Activity Phase 3 (C stage)



2-2 Developmental stage

First stage (A stage)

It has moved to dozens of degrees per day on the basis of latitude and longitude after occurrence. You can see that both are climbing near the surface of Mars and enlarging. After occurrence, the main part spread to the south, but after 5 days it also expands northwestward. It seems that this was blown down by the belt flow near the Arctic. Therefore, the way of spreading in one day is rapidly growing.

2nd stage (B stage)

The way of spreading in one day suddenly increases. Probably it is thought that it is the influence by raising altitude from the surface of the earth. On June 11th, both the northern hemisphere and the southern hemisphere are spreading east.

Unfortunately, on the 8th, there is no observation report of the dust storm, so you can not enter it on the map. However, on June 8th, the tip of the dust storm seems to have reached the South Pole crown. After this, it rapidly expands to the global.

Stage 3 (C stage)

After June 13, it expands at a stretch. On June 16th, it almost completely spread to the whole world.

After this, sporadically, the occurrence of new dust storms came to be seen under the dust storm.

After June 16, a new dust storm occurs due to the cold air from the SPC, and a new stage comes, but now (2018. Aug. 18th), we can start with these summaries Not. It

seems that the initial activities in the occurrence of dust storms have passed through the three stages as above.

1 Developmental Factors and Summary

3-1 Requirements for occurrence of dust storm

The author thinks that the veil of dust covers the area, the temperature of the atmosphere rises due to the influence of radiant heat from the sun, and the dust storm like this time occurred. I think that how much calorific value has been drawn during a certain period greatly affects the occurrence of dust storm. However, I do not have a means to express it numerically.

3-2 Transition to Encircling Dust storm

In order to become a large dust storm, whether it can ride on the air current enough to diffuse at a stretch, like the B stage, is probably a point. It is also important to develop in the vertical direction while spreading horizontally. The fact that the dust veil was in a wide area this time is also considered to be a major reason why the dust storm developed into Encircling Dust storm.