

## ***Interactive comment on “Decrease of total electron content during the 9 March 2016 total solar eclipse observed at low latitude stations, Indonesia” by Wahyu Srigutomo et al.***

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We are very grateful pleased for the constructive and encouraging reviews provided by first reviewer of our manuscript.

AC is abbreviation for Author Comment

The main comments 1. Page 2, a line 22: it is desirable to specify, what system of coordinates (geographical or geomagnetic) Figure 1 is presented in. The same concerns to Figure 2.

AC: Geographic coordinate system is used in this study. We add this information in the

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text and also captions of Fig.1 and Fig.2.

Original: The path of solar eclipse totality and the locations of 40 GPS receiver stations used for TEC recording in this study is shown in Fig. 1. Revision: The path of solar eclipse totality and the locations of 40 GPS receiver stations used for TEC recording in this study are mapped using geographic coordinate system in Fig. 1.

Original: Fig. 1. Totality path of the 9th March 2016 solar eclipse over the Indonesian archipelago at low latitudes. Revision: Fig. 1. Totality path of the 9th March 2016 solar eclipse over the Indonesian archipelago at low geographic latitudes.

Original: Figure 2 (a) and (b) show VTEC distribution maps at 5:00:00-05:59:59 WIB on 8 and 9 March 2016, respectively. Revision: Figure 2 (a) and (b) show VTEC distribution maps at 5:00:00-05:59:59 WIB on 8 and 9 March 2016, respectively, using geographic coordinate system.

Original: Fig. 2. (a), (c), (e), (g), (i) and (k) are VTEC distribution maps on 8 March 2018 at one hour interval started from 05:00:00 WIB (UTC + 7 hours). Revision: Fig. 2. (a), (c), (e), (g), (i) and (k) are VTEC distribution maps on 8 March 2018 at one hour interval started from 05:00:00 WIB (UTC + 7 hours) drawn in geographic coordinate system.

2. Page 4, lines 14-19: a little inconsistent paragraph. On the one hand, in lines 14-17 it is underlined, that during the main period of the eclipse an increase of  $\Delta \text{TEC}$  is observed, on the other hand, in lines 17-19 a decrease of  $\Delta \text{TEC}$  is marked. It is desirable to clarify. Also, it is necessary to explain, what means a word-combination "concentrations of TEC": value, size, color?

AC: We want to express that based on VTEC maps in Fig. 2 there are two important points: 1. Generally, both on 8 and 9 March 2016 the TEC values are higher in central and eastern part of Indonesia than those in western part of Indonesia. This feature is due to the higher position of the sun in the central and eastern parts of Indonesia.

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2. Comparison between TEC values on 8 March and 9 March confirms that the TEC values on 9 March are lower than those of 8 March. This is due to the solar eclipse effects.

To void the inconsistency we modified several sentences: Original: VTEC distribution maps shown in Figure 2 show that there is an increase in the TEC values within the interval of 5:00:00 15 - 10:59:59 WIB on 8 and 9 March 2016. For both days, higher concentrations of TEC were found in central and eastern part of Indonesia. This is due to the higher sun position in those areas so that the reception of solar radiation and the photoionization process became more intense. By comparing the VTEC values between the 8 and 9 March 2016 at the same hours, it is found that the TEC on the 9 March experienced a decrease compared to that on 8 March. The decrease in the TEC was due to the effect of the total solar eclipse occurred on 9 March 2016.

Revision: VTEC distribution maps shown in Figure 2 show higher values of TEC were found in central and eastern part of Indonesia for both days of 8 and 9 March 2016. This is due to the higher sun position in those areas so that the reception of solar radiation and the photoionization process became more intense. However, by comparing the VTEC values between those of 8 and 9 March 2016 at the same hours, it is found that the TEC values on the 9 March experienced a decrease compared to those on 8 March. The decrease in the TEC values was due to the effect of the total solar eclipse occurred on 9 March 2016.

We also have erased a redundant sentence: Original: The variability and decrease percentage of the TEC in PRN 24 and 12 during the solar eclipse on 9 March and during thenormal condition one day earlier are plotted in Figure 5 (a), (b) and (c) for CNDE, CREO and CSMN stations, respectively. The time interval of measurements covers start time, maximum time when the solar eclipse reached its totality and end timeas denoted by vertical S, M and E lines, respectively in the figure. Figure 5 depicts the TEC value on 8 and 9 March 2016 and TEC decrease during the solar eclipse relative for PRN 24 and 12 at CNDE, CREO and CSMN stations. The TEC decrease

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during the same recorded time for CNDE station measured on PRN 24 and PRN 12 is about 22.87% for PRN 24 and 29% for PRN 12.

Revision: The variability and decrease percentage of the TEC in PRN 24 and 12 during the solar eclipse on 9 March and during the normal condition one day earlier are plotted in Figure 5 (a), (b) and (c) for CNDE, CREO and CSMN stations, respectively. The time interval of measurements covers start time, maximum time when the solar eclipse reached its totality and end time as denoted by vertical S, M and E lines, respectively in the figure. The TEC decrease during the same recorded time for CNDE station measured on PRN 24 and PRN 12 is about 22.87% for PRN 24 and 29% for PRN 12.

Also, it is necessary to explain, what means a word-combination "concentrations of TEC": value, size, color? AC: We changed the words "concentrations of TEC" into "TEC values" in the text.

3. Page 5, a line 15: Table 1 has appeared earlier than the reference to it. It is desirable to specify number of station from Figure 1.

AC: We relocate Table 1 to be appeared after the reference to it. We also added the number of station to each of three stations discussed (CSMN, CREO, CNDE) in Table 1, the text and Fig. 4.

Original: To investigate the behavior of TEC related to the magnitude of the eclipse during the total solar eclipse on 9 March 2016, an analysis of two PRN numbers namely PRN 24 and PRN 12 from three GPS receiver stations was carried out. Those three stations are CNDE, CREO and CSMN (Figure 4). CSMN station is located closer to the totality path of the solar eclipse followed by CREO and CNDE stations. The location of GPS stations and trajectory of each PRN observed in this study are shown in Figure 4.

Revised: To investigate the behavior of TEC related to the magnitude of the eclipse during the total solar eclipse on 9 March 2016, an analysis of two PRN numbers namely PRN 24 and PRN 12 from three GPS receiver stations was carried out. Those three

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stations are Station 26 (CSMN) in Sumenep, Madura Island, Station 30 (CREO) in Reo Ruteng, Sumbawa Island and Station 31 (CNDE) in Ende, Flores Island which can be seen from Fig.1 and Fig. 4. CSMN station is located closer to the totality path of the solar eclipse followed by CREO and CNDE stations. The location of GPS stations and trajectory of each PRN observed in this study are shown in Figure 4.

Some small remarks 1. Page 1, a line 13: to replace “ionospheric”. AC: We have replaced “ionospheric” with “ionospheric” 2. Page 1, a line 16, page 11, a line 7: faster to replace on less. AC: We have replaced “faster” with “less” 3. Page 3, a line 20: are to replace on is. AC: We have replaced “are” with “is” 4. Page 8, a line 5: confuses a word “farther”. AC: We have replaced “farther” with “larger” 5. Page 10, a line 9: can be in a word-combination “that that the” there is anything superfluous? AC: We have corrected “that that the” to “that the” 6. Page 11, a line 22: respon to replace on response. AC: We have corrected “respon” to “response” 7. Page 11, a line 28: respons to replace on response. AC: We have corrected “respons” to “response” 8. Page 11, a line 29: atmos to replace on Atmos. AC: We have corrected “atmos” to “Atmos” 9. Page 12, a line 10: to move the reference to page 12, a line 31. AC: We have moved the reference to its proper place 10. Page 12, a line 22: new to replace on New. AC: We have corrected “new” to “News” 11. Page 12, a line 29: march to replace on March. AC: We have corrected “march” to “March”

Please also note the supplement to this comment:

<https://www.ann-geophys-discuss.net/angeo-2019-11/angeo-2019-11-AC1-supplement.pdf>

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2019-11>, 2019.

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