

Ionospheric Disturbances in Mexican Territory Produced by Objects Entering the Atmosphere from Space

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Abstract

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1. Introduction

2. Meteors Database

We selected a sample of meteors which were observed in mexican territory from the Geostationary Lightning Mapper (Goodman et al., 2013). We used the interactive database available at <https://neo-bolide.ndc.nasa.gov/#/> to get the events positions presented in this section. The sample was selected in such way we chose the most probable objects to be detected by GPS sources in mexican territory:

- The objects were detected inside mexican territory.
- The objects were detected by both satellites GOES 16 and GOES 17 (stereo)
- The detection has been assigned a high confidence ratio.

For the selected sample, we obtained RINEX data from the TlalocNet (Cabral-Cano et al., 2018) and UNAVCO network databases to study potential alterations in the ionosphere due

to the presence of the passing meteor at the day the meteor was reported. The list of the sample meteors is shown in table 1. The events are in chronological order. The reported duration, latitude and longitude correspond to the mean between measurements from satellites GOES-16 and GOES 17; in the same way, the uncertainties correspond to the standard deviation. Also their respective positions are available in figure 1, where each label correspond to the ID (first column) of table 1.

3. Ionospheric background and vTEC maps

4. Frequency Analysis

5. Discussion

6. Acknowledgments

The RINEX data used in this paper were obtained from the Trans-boundary, Land and Atmosphere Long-term Observational and Collaborative Network (TLALOCNet, Cabral-Cano et al. (2018)), operated by the Servicio de Geodesia Satelital (SGS) at the Instituto de Geofísica-Universidad Nacional Autónoma de México (UNAM) in collaboration with UNAVCO Inc.

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Table 1. List of meteors passing through Mexico. The events are listed in chronological order. The listed duration, latitude and longitude correspond to the mean of the measurements of both GOES satellites. The uncertainties correspond to the respecting mean deviation.

ID	Date of event	Start Time (UT)	Duration (seconds)	Latitude (deg)	Longitude (deg)
01	2019-05-23	16:36:18	0.197 ± 0.0000	24.30 ± 0.000	-101.60 ± 0.849
02	2019-07-18	14:30:30	0.058 ± 0.0000	27.20 ± 0.000	-103.15 ± 0.778
03	2019-08-10	11:18:48	0.199 ± 0.0757	21.50 ± 0.000	-102.50 ± 0.849
04	2019-10-03	07:55:33	0.106 ± 0.0297	25.65 ± 0.071	-96.25 ± 0.778
05	2019-10-09	06:08:11	0.103 ± 0.0078	23.60 ± 0.000	-111.95 ± 0.212
06	2019-10-12	11:12:27	0.006 ± 0.0000	28.8 ± 0.000	-111.3 ± 0.000
07	2019-11-16	09:36:04	0.396 ± 0.0134	20.30 ± 0.000	-100.55 ± 0.919
08	2019-11-17	15:36:01	0.116 ± 0.0035	31.70 ± 0.000	-117.70 ± 1.131
09	2019-11-19	07:57:40	0.097 ± 0.1138	20.00 ± 0.000	-88.40 ± 1.131
10	2019-11-26	13:23:20	0.078 ± 0.0290	23.90 ± 0.000	-108.70 ± 0.849
11	2019-12-04	09:42:54	0.173 ± 0.0028	31.50 ± 0.000	-113.65 ± 0.919
12	2019-12-15	14:50:49	0.127 ± 0.0134	27.70 ± 0.000	-114.10 ± 0.849
13	2019-12-29	16:16:35	0.062 ± 0.0134	29.60 ± 0.000	-116.35 ± 0.919
14	2020-01-03	14:10:17	0.113 ± 0.0085	30.20 ± 0.000	-117.65 ± 0.919
15	2020-01-06	16:39:27	0.118 ± 0.0042	31.40 ± 0.000	-108.20 ± 0.990
16	2020-01-15	15:00:33	0.213 ± 0.1351	19.45 ± 0.071	-95.55 ± 0.919
17	2020-02-12	09:25:40	0.210 ± 0.0226	18.90 ± 0.000	-93.50 ± 0.849
18	2020-03-03	12:33:27	0.062 ± 0.0007	18.25 ± 0.071	-106.35 ± 0.636
19	2020-03-31	19:31:52	0.105 ± 0.0573	28.45 ± 0.071	-112.05 ± 0.636
20	2020-04-08	16:25:28	0.120 ± 0.0926	26.10 ± 0.000	-93.90 ± 0.849
21	2020-04-18	17:43:25	0.139 ± 0.0106	29.00 ± 0.000	-106.55 ± 0.919
22	2020-04-20	16:05:22	0.318 ± 0.1655	28.15 ± 0.071	-97.85 ± 1.061
23	2020-04-25	11:03:09	0.323 ± 0.0813	32.15 ± 0.071	-111.60 ± 1.131
24	2020-04-28	19:31:52	0.105 ± 0.0573	28.45 ± 0.071	-112.05 ± 0.636
25	2020-05-08	10:06:16	0.490 ± 0.0750	21.60 ± 0.000	-92.40 ± 0.849
26	2020-07-15	19:58:28	0.693 ± 0.0495	24.00 ± 0.000	-108.35 ± 0.495
27	2020-08-07	13:29:57	0.163 ± 0.0057	28.80 ± 0.000	-106.05 ± 0.919
28	2020-09-13	16:41:59	0.184 ± 0.0078	28.45 ± 0.071	-113.75 ± 0.919
29	2020-09-30	12:28:11	0.100 ± 0.0078	24.90 ± 0.000	-110.90 ± 0.849
30	2020-11-16	12:28:11	0.100 ± 0.0078	24.90 ± 0.000	-110.90 ± 0.849
31	2020-11-17	12:53:41	0.404 ± 0.0262	23.00 ± 0.000	-102.45 ± 0.919
32	2020-12-19	10:18:14	0.407 ± 0.0110	21.95 ± 0.071	-101.60 ± 0.990
33	2020-12-23	09:43:01	0.148 ± 0.0014	25.75 ± 0.071	-111.25 ± 0.778
34	2020-12-29	15:20:54	0.118 ± 0.0014	16.80 ± 0.000	-102.20 ± 0.707
35	2021-03-31	09:01:17	0.753 ± 0.3083	20.15 ± 0.071	-92.95 ± 0.212

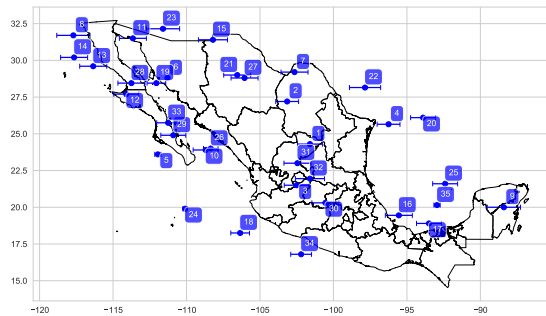


Fig. 1. Positions of events from table 1. The label of each point correspond to the ID (first column) of the referred table.

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