Supplementary Material to:

Ionosonde and GPS Total Electron Content Observations during the 26 December 2019 Annular Solar Eclipse over Indonesia

Jiyo Harjosuwito[1], Asnawi Husin[1], Varuliantor Dear[1], Johan Muhamad[1], Agri Faturahman[1], Afrizal Bahar[2], E Erlansyah[3], Agung Syetiawan[4], and Rezy Pradipta[5]

[1]Research Center for Space, Research Organization for Aeronautics and Space (LAPAN), National Research and Innovation Agency (BRIN), Indonesia
[2]Agam Atmospheric and Space Observation Office, Research Organization for Aeronautics and Space (LAPAN), National Research and Innovation Agency (BRIN), Indonesia
[3]Pontianak Atmospheric and Space Observation Office, Research Organization for Aeronautics and Space (LAPAN), National Research and Innovation Agency (BRIN), Indonesia
[4]Research Center for Geospatial, Research Organization for Earth Sciences and Maritime, National Research and Innovation Agency (BRIN), Indonesia
[5]Institute for Scientific Research, Boston College, United States

Correspondence: Rezy Pradipta (rezy.pradipta@bc.edu)

1 Introduction

Here we provide a set of additional data plots to accompany the results presented in the manuscript. These additional data plots include time series plots of TEC and ΔTEC, focused on the time interval 03:00–09:00 UTC on 26 December 2019. Also included are time series plots of TEC time derivatives ($d\text{TEC}/dt$) in the time interval 03:00–09:00 UTC on 26 December 2019. All of the aforementioned time series plots are over the four designated check points, i.e. KTB (0.20°S 100.32°E), GEC (1.01°N 102.25°E), GDU (0.78°N 105.08°E), and PTK (0.04°S 109.35°E). This is to provide further details on what happened around the time interval of the solar eclipse, highlighting the features discussed in the manuscript. We also provide extended colormap plots of the TECP values as a function of time and latitude along the four x-cut lines for 25–27 December 2019, each covering a full 24-hour period. This is to show the TECP evolution patterns from a wider point of view outside of the core time interval of the solar eclipse, providing a more complete comparison between the normal-day patterns and the solar eclipse effects that are reported in the manuscript. Other than the time intervals, the processing and computation methods for the data plots shown here are exacty the same as for those presented in the manuscript.

Finally, here we provide a list of codenames and geographic coordinates of GNSS receiver stations used in this study. Out of a total of 207 stations available from the INACORS network in 2019, 46 receiver stations with most suitable locations had been used for the study. These 46 GNSS receiver stations are distributed over Sumatra and Kalimantan islands, which were directly traversed by the main path of the 26 December 2019 annular solar eclipse.

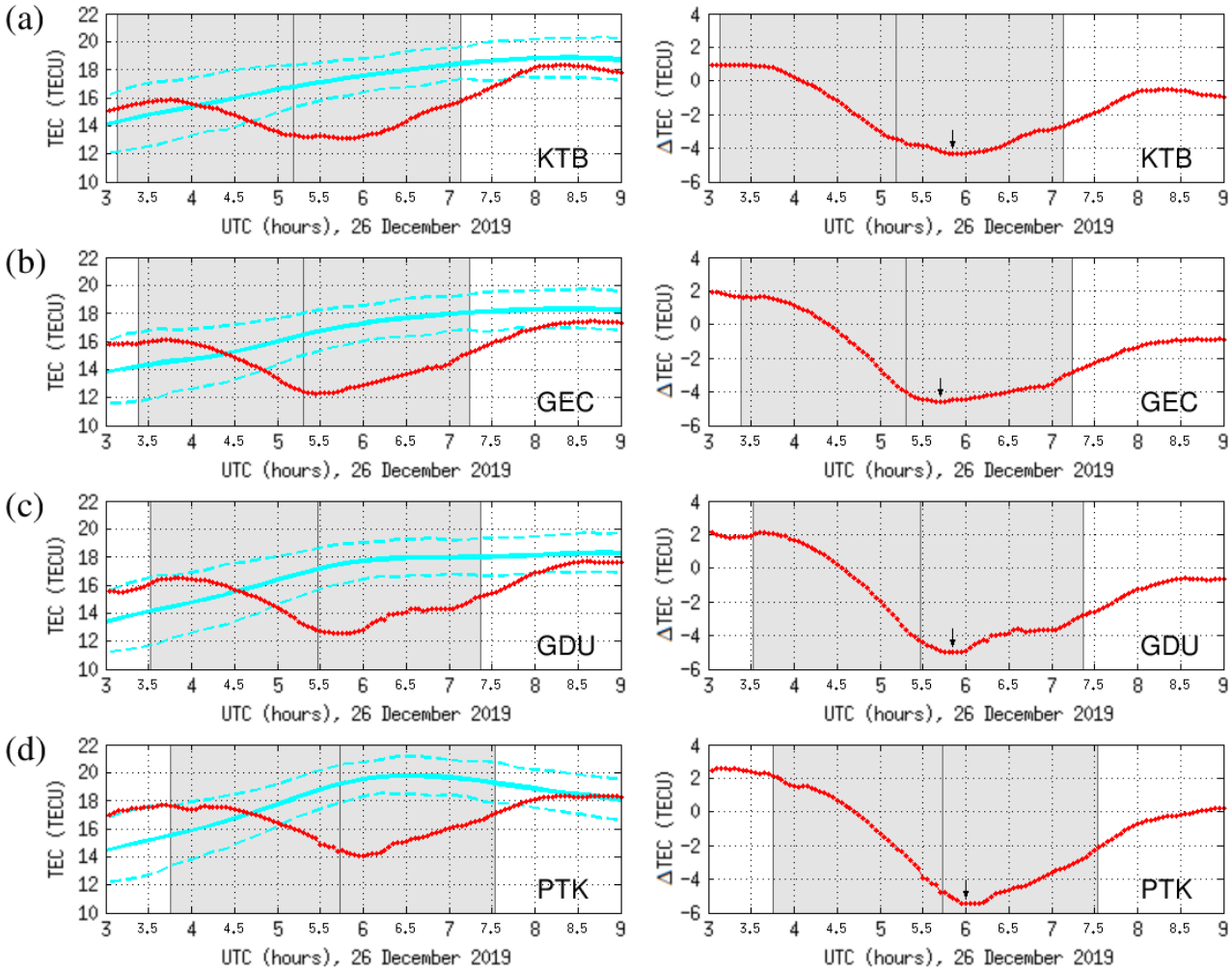

Figure A1. Magnified time series plots of TEC and ΔTEC around the solar eclipse period over the 4 designated check points (KTB, GEC, GDU, and PTK). The solar eclipse period is indicated with gray bands, and the minima in ΔTEC time series are marked with small arrows. Red curves are observations on 26 December 2019, and cyan curves are the baseline level.

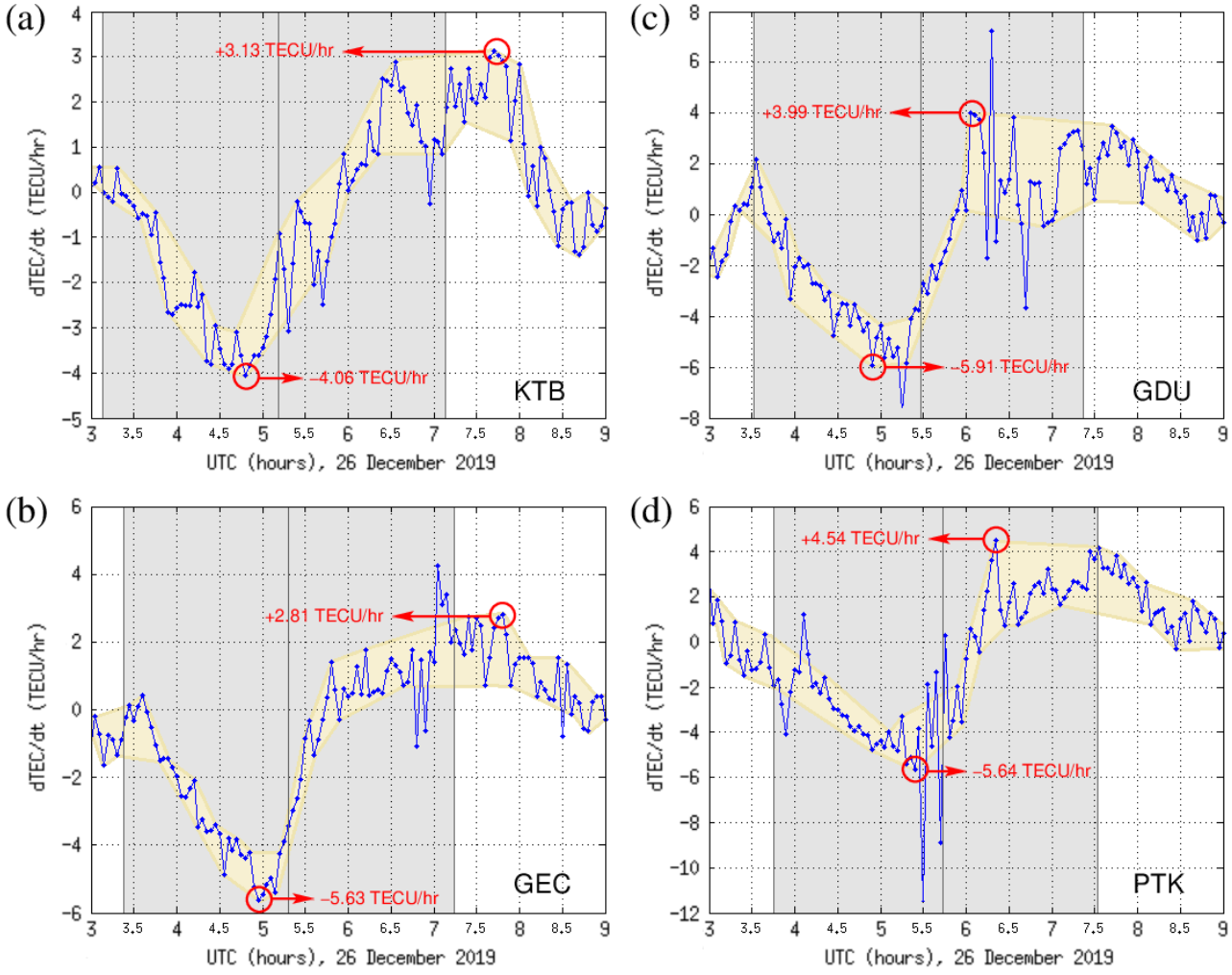

Figure A2. Magnified time series plots of the TEC time derivative ($d\text{TEC}/dt$) around the solar eclipse period over the 4 designated check points (KTB, GEC, GDU, and PTK). The solar eclipse period is indicated with gray bands, and the general $d\text{TEC}/dt$ trend (bypassing large spikes) is shown as yellow bands. Minimum and maximum values in the $d\text{TEC}/dt$ trend are marked accordingly on the plots.

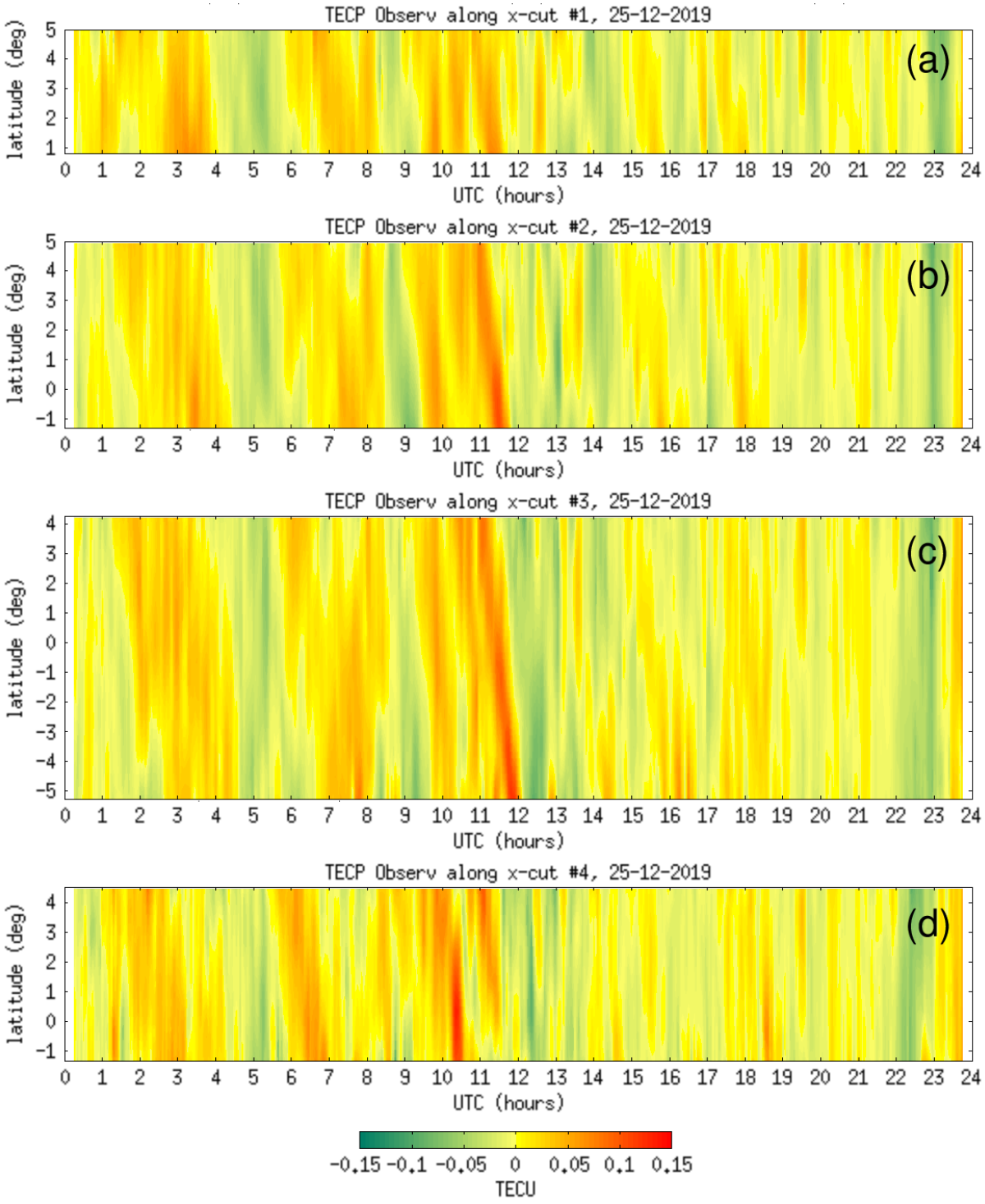

Figure A3. Colormap plots of TECP values as a function of time and latitude along x-cuts #1 to #4 for a full 24-hour period on 25 December 2019, the day before the annular solar eclipse event.

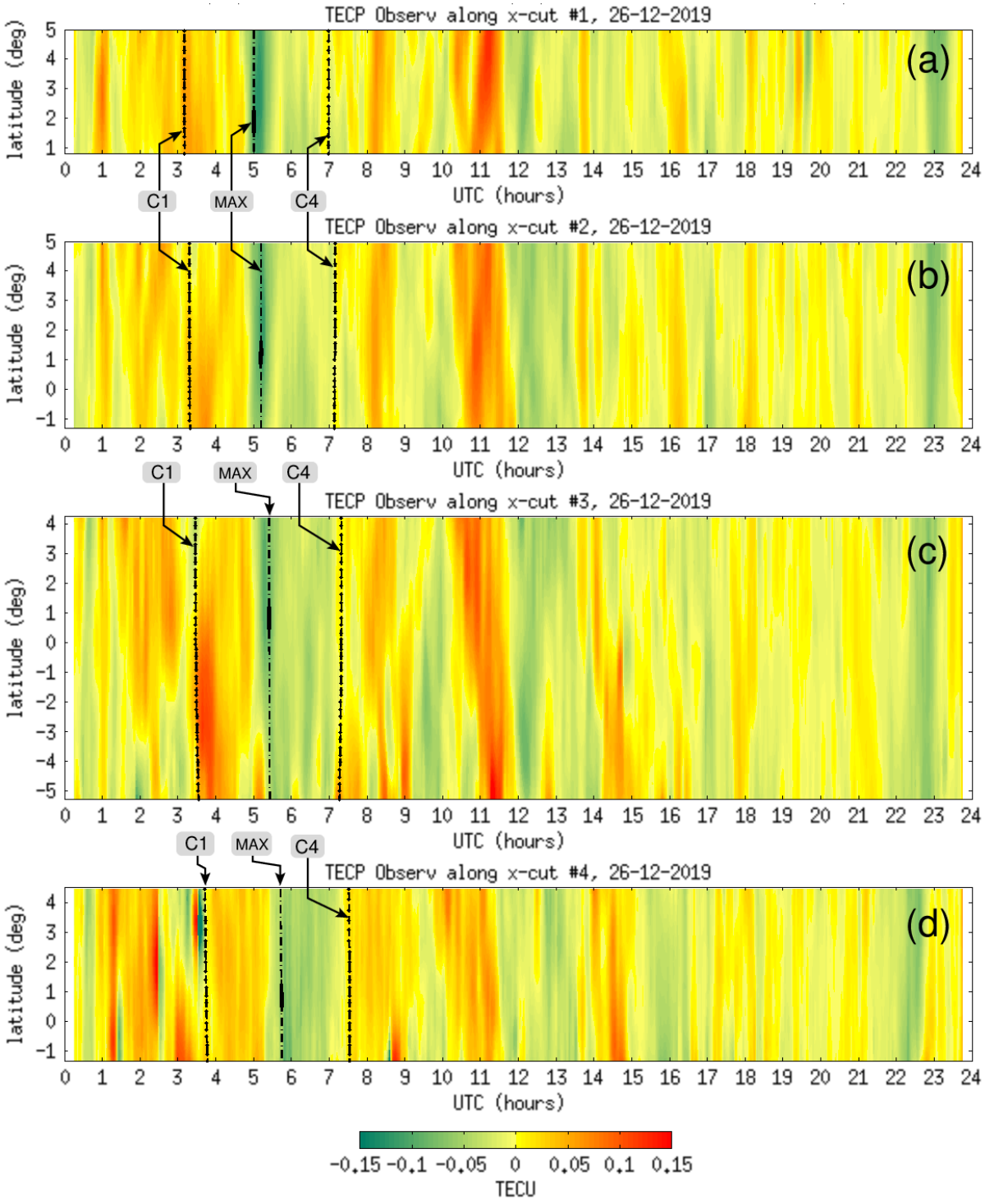

Figure A4. Colormap plots of TECP values as a function of time and latitude along x-cuts #1 to #4 for a full 24-hour period on 26 December 2019. The start and end times of the eclipse (C1 and C4) as well as the moment of maximum eclipse are indicated by dashed curves.

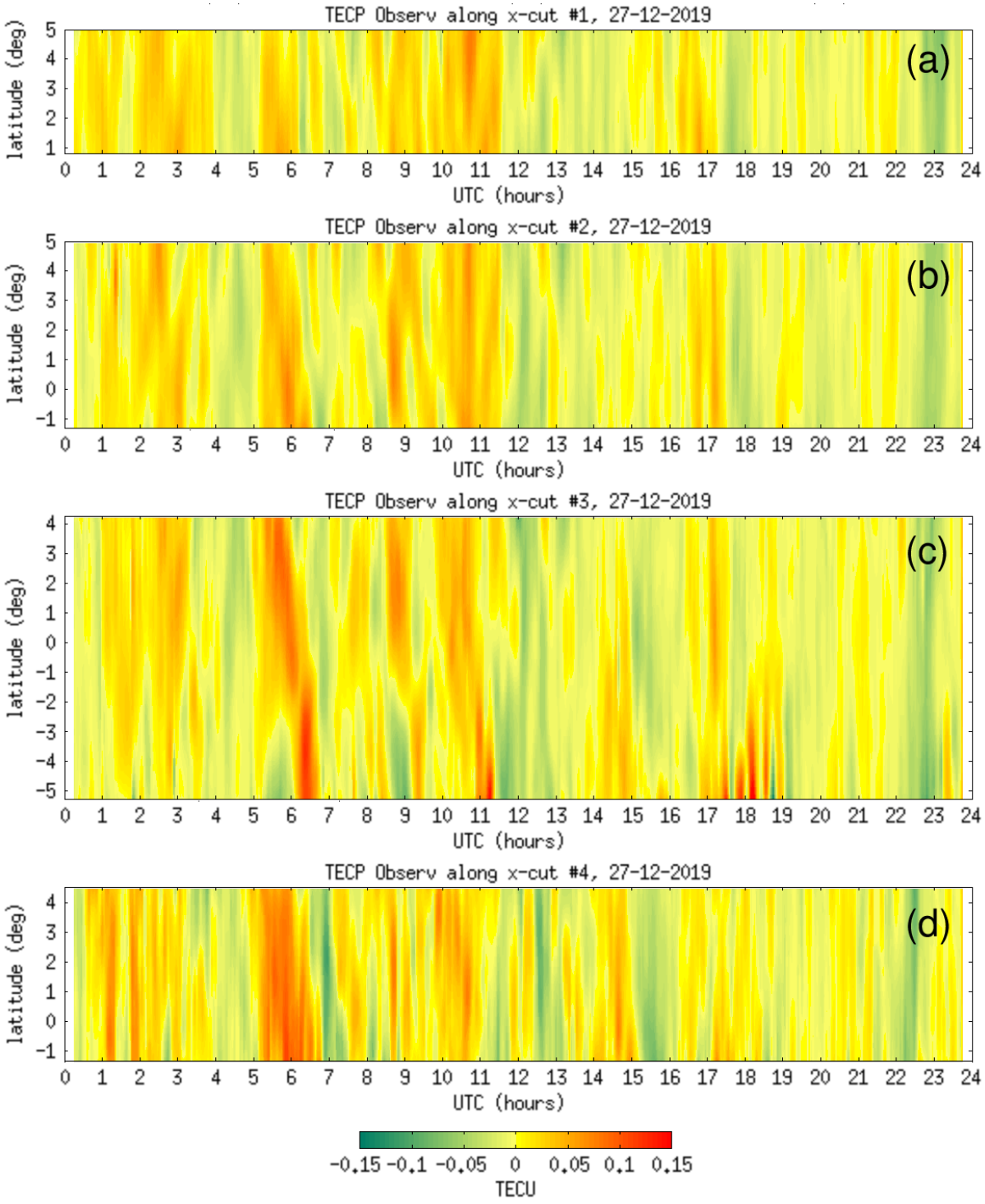

Figure A5. Colormap plots of TECP values as a function of time and latitude along x-cuts #1 to #4 for a full 24-hour period on 27 December 2019, the day after the annular solar eclipse event.

Table A1. Geographic coordinates of ground-based GNSS receiver stations from the INACORS network that were used in the study.

Station Code	Geog. Latitude	Geog. Longitude	Station Code	Geog. Latitude	Geog. Longitude
CKTF	3.09°N	97.33°E	CSEL	1.80°S	100.84°E
CKCN	3.49°N	97.81°E	CMOL	0.36°S	102.29°E
SAMP	3.62°N	98.71°E	CMUK	2.57°S	101.11°E
CSBS	2.64°N	98.00°E	CMTB	1.48°S	102.44°E
CSBL	2.74°N	98.41°E	CKTK	0.81°S	103.47°E
CKBJ	3.10°N	98.50°E	CSRI	2.30°S	102.72°E
CTBT	3.34°N	99.17°E	CJBI	1.61°S	103.59°E
CTJB	2.96°N	99.81°E	CBTM	1.07°N	103.93°E
CBLG	2.33°N	99.07°E	CTJP	0.92°N	104.51°E
CSIB	1.74°N	98.78°E	CBAS	1.36°N	109.30°E
CKPI	1.89°N	100.09°E	CPON	0.00°S	109.33°E
CSBH	1.05°N	99.74°E	CPUT	0.88°N	112.92°E
CAIR	0.21°N	99.39°E	CNAT	3.94°N	108.39°E
CPPR	0.86°N	100.30°E	CNAU	3.59°N	116.62°E
CDRI	1.27°N	101.19°E	CTHN	3.61°N	125.50°E
CDUM	1.68°N	101.45°E	CTOL	1.04°N	120.82°E
CSAP	1.12°N	102.16°E	CPOH	0.47°N	121.94°E
CKRC	0.42°N	101.86°E	CGUT	0.84°N	122.92°E
CBKN	0.34°N	101.02°E	CALO	0.63°N	122.98°E
CPSM	0.12°N	100.17°E	CBOM	0.74°N	124.31°E
CBKT	0.31°S	100.37°E	CBIT	1.44°N	125.19°E
PANJ	0.47°S	100.38°E			
CPAR	0.63°S	100.13°E			
CPDG	0.95°S	100.36°E			
CSDH	0.97°S	101.51°E			