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Ionospheric disturbances due to the 2017 American solar eclipse detected at a European observatory

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1 Extended Abstract

A total solar eclipse occurred on 21 August 2017, with the path of totality crossing the entirety of North-America, starting in the Pacific Ocean and ending over the Mid-Atlantic Ocean. The ionospheric observatory in Dourbes (50.1°N, 4.6°E), Belgium, was at the edge of the partial eclipse and was exposed for only few minutes just before the local sunset. A special campaign of high time resolution ionospheric measurements—identical to the one used to observe the 2015 European eclipse [1, 2]—was carried out at the observatory with collocated digital ionosonde and GNSS receiver.

Various data sets were obtained from the ionosonde and GNSS receiver on the day of the eclipse as well as the days before and after. Analyses of the various data series reveal wave-like disturbances in the ionosphere arriving before the local onset of the eclipse.

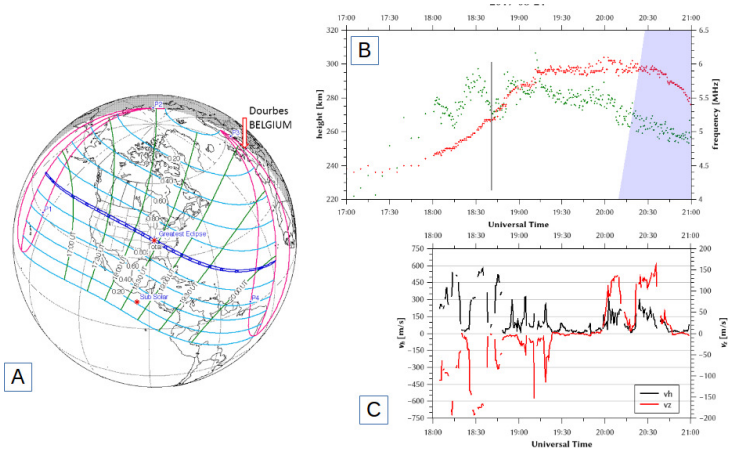

Figure 1. [A] The path of the solar eclipse (credtit: NASA); [B] the ionospheric peak height (green) and peak density (red) during the eclipse; and [C] the horizontal (black) and vertical (red) components of the bulk plasma drift during the eclipse.

Figure 1 shows on the left side the path of the eclipse and on the right side the time-series of the ionospheric peak characteristics f_oF_2 and hmF_2 as well as two components of the bulk plasma drift velocity, all obtained from various types of ionosonde soundings. Only through comparing the different observations can disturbances caused by the eclipse be distinguished from disturbances due to other sources, e.g. geomagnetic activity. The source of these disturbances is an area of higher obscuration, close to the path of totality of the eclipse.

References

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[2] S.M. Stankov, N. Bergeot, D. Berghmans, D. Bolsé, C. Bruyninx, J.-M. Chevalier, F. Clette, H. De Backer, J. De Keyser, E. D'Huys, M. Dominique, J.F. Lemaire, J. Magdalenić, C. Marqué, N. Pereira, V. Pierrard, D. Sapundjiev, D.B. Seaton, K. Stegen, R. Van der Linden, T.G.W. Verhulst, and M.J. West, "Multi-instrument observations of the solar eclipse on 20 March 2015 and its effects on the ionosphere over Belgium and Europe," *Journal of Space Weather and Space Climate* **7**, July 2017, A19, doi:10.1051/swsc/2017017.