



The Effect of the 2015 Total Solar Eclipse on the High-Latitude Ionosphere

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On 20th March 2015 a total solar eclipse was observed over northern Europe. The EISCAT (European Incoherent Scatter) radars at Tromsø (69.6°N, 19.2°E, 66.7° MLAT, 102.2° MLON) observed the path of totality in the F-region of the ionosphere. During totality the production of plasma by photoionisation ceased and a reduction in plasma density of approximately 10% was observed.

The primary plasma decay mechanism is via a two-step rearrangement and recombination reaction involving oxygen and nitrogen. Several authors have determined the rate of this reaction in laboratory conditions. These experimental reaction rates are compared to the plasma decay rate observed in the ionosphere. The reaction rates of Hierl et al. (1997) are shown to be the most representative of the observed conditions in this case.

Reference: Hierl, P. M., Dotan, I., Seeley, J. V., Van Doren, J. M., Morris, R. A. and Viggiano, A. A. (1997) 'Rate constants for the reactions of O⁺ with N₂ and O₂ as a function of temperature (300–1800 K)', *The Journal of Chemical Physics*, 106(9), p. 3540. doi: 10.1063/1.473450.