

A study of 7 MHz Grey-Line Propagation between the United Kingdom and New Zealand

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It is challenging to predict long-distance radio propagation using HF radio signals for specific links at specific times. For very long distance paths, such as from New Zealand to the United Kingdom, there is a reputed tendency for links to be made more often at dawn and dusk. This is known amongst the amateur radio community as “greyline propagation” – propagation of the radio signals along the terminator or simply entering the ionosphere and exiting the ionosphere at the terminator.

This paper aims to investigate 7 MHz propagation between two countries that lie on the same terminator. The study analyses radio propagation between the United Kingdom (UK) and New Zealand (NZ) as they are situated along the terminator at certain times of year, as shown in Figure 1.

Recordings from the Weak Signal Propagation Reporter (WSPR) database [1] are used to investigate radio propagation between the UK and NZ. The WSPR database is a very useful resource for radio science as it offers the date and time of links made between two radio stations, as well as their callsigns and locations. This data was used to identify the time of day when links between the UK and NZ are realised throughout the year 2017 and the statistical results were analysed.

Preliminary results from the WSPR data analysis showed evidence that while links were made from the UK to NZ at both sunset and sunrise in the two countries, links were made from NZ to the UK mainly during NZ sunrise/UK sunset hours. Investigation into the cause of this difference in the propagation of WSPR data is done by running ray-tracing scenarios. Raytracing through a standard International Reference Ionosphere [2] did not re-produce the asymmetry in the propagation. Possible reasons for the asymmetry are discussed.

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Reference

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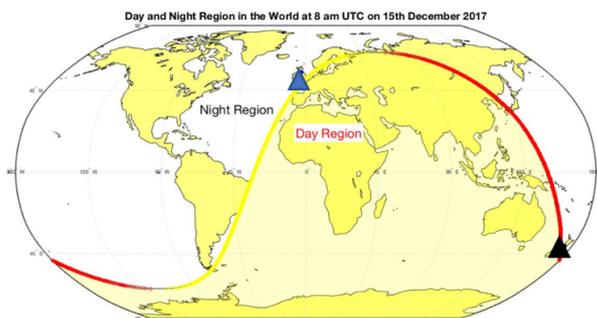


Figure 1- Day and night region in at 08:00 UTC on 15th December 2017 with the sunrise terminator in yellow and the sunset terminator in red. The shaded region is the day region. The blue triangle indicates the chosen location of the United Kingdom, and the black triangle indicates the chosen location of New Zealand.