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Correlation analysis between HF channel and the ionosphere gone through by HF channel link

Abstract:

The state of the ionosphere and its variation are important in the technology system based on sky wave, such as HF communications, OTHR and shortwave broadcasting system and so on. Before there are few simultaneous observation and quantitative correlation description between HF channel and the ionosphere gone through by HF channel link. Here this paper uses some data to analyze the correlation between HF channels (Xian - Wuhan - Putian , Xiamen – Wuhan) and the ionosphere gone by these links. The following data are – the HF channel observation data in July 2011 from 21 to 27 in Xiamen - Wuhan link and in December 2011 from 10 to 16 in Xi'an - Wuhan - Putian link, and the ionospheric vertical observation data in Xiamen , Wuhan, Xi'an.

The results of the analysis are as follows:

- (1) The correlation coefficient of the MUF of Xi'an - Putian HF channel and the foF2 of the link midpoint (Wuhan) is the biggest among all, as 0.974;
- (2) The correlation coefficients of the MUF of Xi'an - Putian HF channel and the foF2 of the endpoint (Xi'an), the MUF of Xi'an - Wuhan HF channel and the foF2 of the endpoints (Wuhan , Xi'an) are smaller, but still close to 0.930;
- (3) the correlation coefficient of the MUF of Xi'an - Putian HF channel and the foF2 of Xiamen (about 140 km from Putian) is also relatively small, being 0.912;
- (4) The correlation coefficients of the MUF of Xi'an - Wuhan HF channel and the foF2 of Xiamen (about 770 km from Wuhan) is even as small as 0.877;
- (5) According to the observation of Xiamen ionosonde, after removing the data related to the ionospheric Es, the correlation coefficient between the MUF of Xiamen - Wuhan HF channel and the foF2 of the endpoint (Xiamen) is 0.557; while the correlation coefficient is almost zero if not removing the data.

These results play an important role in improving the ability of HF channel prediction and the applying level of HF channel information in the technology system based on sky wave.