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E1-215: A simulation study on the correction of site errors in a network of magnetic direction finding stations

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It is well known that angular measurements by crossed loop antennas, which are widely used to locate lightning cloud to ground flashes are subject to a systematic error known as the site error. Site errors are caused by external objects in the vicinity of the antennas that absorb and reradiate the incoming lightning generated magnetic fields. Due to the presence of the site error, the reconstructed point of lightning strike can deviate substantially from the real strike location.

A simulation study was carried out to develop a relatively simple iterative technique to correct the site errors that are present in a network of DF stations.

The accuracy of the site error correction depends on the exact placement of the DF stations, the number of stations used, and, the shape and magnitude of the site error itself. When a simple double sine curve was used for the site error at one station in a three-station network, the algorithm was able to achieve an accuracy within1^0. When a fourth station was added the accuracy increased sharply bringing it closer to the inherent instrumental accuracy of the system ($\pm 0.5^0$). When site errors are added to all the stations in the network, the accuracy decreased notably. The simulation work indicates that the developed technique can be used to correct the site error with a reasonable accuracy (within 2° to 3°), when a large number of well distributed data is available for a network comprising of several DF stations. The developed algorithm does not know in prior the shape of the site error curve. Thus, this method can be applied to real data to reduce the site errors in the DF networks to improve the strike position reconstruction.

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