14th Symposium on Meteorological Observation and Instrumentation
16th Conference on Applied Climatology

JP2.13

Characterization of Anomalies Affecting Electric Field Mill Performance in Local Atmospheric Inversions—A Joint Study

PAPER WITHDRAWN

Michael R. Heer, ARINC Engineering Services, LLC, Colorado Springs, CO; and L. A. Brukardt, A. F. Heineman, J. L. Justice, and R. Wacker

ARINC has been installing electric field mills (EFMs) at major airports for several years as part of our ForeWarn™ Lightning Warning and Detection System.

ForeWarn is a sophisticated system that eliminates unnecessary, random curtailing of airport and launch site ground operations through the accurate monitoring and prediction of lightning threats. ForeWarn continuously analyzes data and automatically triggers warning alarms that indicate the severity of current conditions in specific areas of the airport or launch site and surrounding vicinity. The system provides five different levels of warning allowing users to set policy and plans of action.

A typical ForeWarn installation requires a meteorological survey of the area to assist with optimum siting of the EFMs. In general, the EFMs are kept away from trees, power lines, steam/pollution generators, and away from edges of buildings, etc. ARINC has a prototype system installed at their facility in Colorado Springs, Colorado for testing, evaluations, and customer demonstrations.

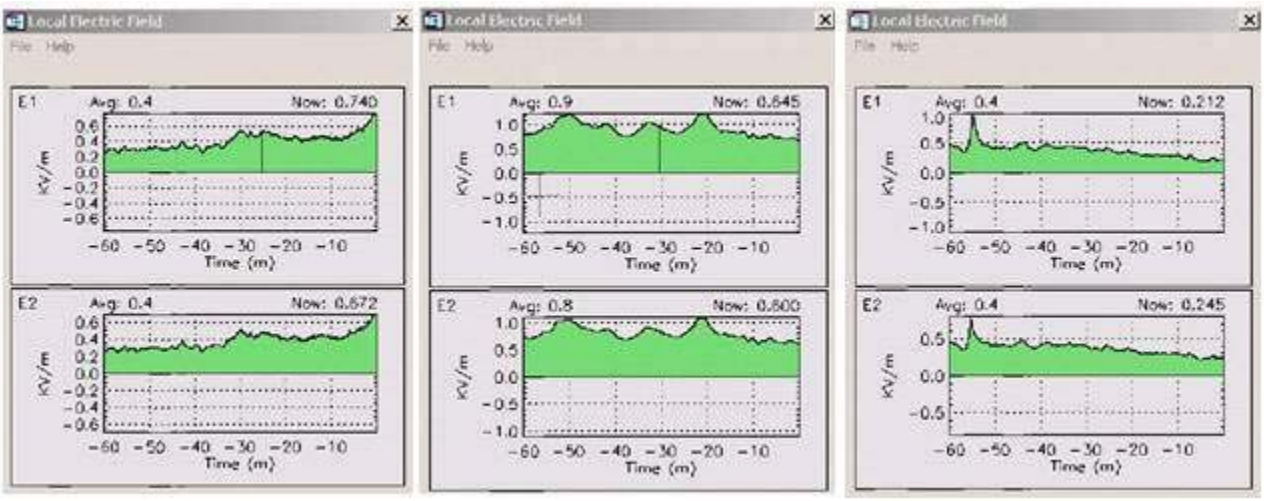
During our testing and evaluations, we noticed an anomaly that causes the EFMs to go into alarm threshold (with no apparent lightning event) in the early morning hours (near/just after sunrise) and sometimes the EFMs will even indicate a polarity switch (+ to – values or visa versa) in conjunction with the anomaly. This has been observed and recorded several times. Refer to Figure 1 for a three-panel illustration of this anomaly.

Our theory is that environmental factors are causing the anomaly as a result of a diurnal temperature/subsidence inversion created at night that traps charged particulates (dust, smoke, pollution, etc.) beneath the inversion layer and the EFMs detect this increase in atmospheric charge in the layer beneath the inversion and goes into alarm (naturally a false alarm – which is a concern to users of the system). Shortly after day break (as surface temps rise and the temperature inversion breaks) the EFMs appear to work normally for the remainder of the day.

The primary objective of this effort is to team with the US Air Force Academy (USAFA) Department of Physics (Director of Meteorology) via a Cooperative Research and Development Agreement (CRADA) partnership and jointly investigate and quantify the causes of the observed anomalies to EFMs at the ARINC Colorado Springs facility. The secondary objective is to determine if the causes can be generalized to EFMs in specific environments, and to identify how to mitigate or compensate EFM effects in those locations (e.g., specific customer locations).

The ARINC/USAFA team is strategically placing EFMs around Colorado Springs and outlying areas, and collecting data from the EFMs. We will also collect temperature, dew point, RH, winds (surface and possibly data from the boundary layer) for each of the EFM locations. In addition, visibility (haze, fog, other obstructions, etc.) and precipitation (rain, snow, etc.) data (obtained from local weather reporting stations such as COS Airport, Peterson AFB, and USAFA) will also be evaluated during the times the anomaly is occurring. The data will be analyzed for times when the anomaly is observed and an effort made to correlate these environmental and/or man-made factors. These data and the results of our analysis will be presented in a final paper. This information would be useful to enhance EFM design, promote customer awareness (system limitations), and report findings to other users of EFM technologies.

Figure 1. Three-Panel Time Depiction of EFM Anomaly



Joint Poster Session 2, Observation and Datasets-Part II (Joint between the 16th Conference on Applied Climatology and the 14th Symposium on Meteorological Observations and Instrumentation)
Wednesday, 17 January 2007, 2:30 PM-4:00 PM, Exhibit Hall C

Previous paper **Next paper**

Browse or search entire meeting

AMS Home Page