

Report R19-1018-01

Feasibility of using Satellite Data to Predict Insulator Pollution Levels

Report 1: Literature review on ground-based and satellite-based pollution data available and creation of practical plan of further investigations

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Summary

Satellite observations of air pollution offer the possibility of assessing site pollution severity (SPS) for design of electrical power system insulators. There are several links in the data chain. Dustfall has been exploited to predict SPS, using directional and non-directional samplers. While these studies were underway, the air pollution monitoring moved to adopt aspirated samplers that accumulate Particulate Matter (PM) on filter packs. The filters provide readings of particulate matter density. Two aerosol particle size ranges, less than 2.5 μm ($\text{PM}_{2.5}$) and less than 10 μm (PM_{10}), form the foundation of most modern reporting programs.

The satellite observations of optical density have been processed into estimates of ground-based $\text{PM}_{2.5}$ with two decades of coverage in Norway. In recent years, independent EU measurements of PM_{10} have been reported over the same region. These data sets provide uniform coverage up to about 70° north latitude with 10 x 6 km (0.1° x 0.1°) grid cell resolution.

This report provides a summary on different approaches for the ground-based and satellite-based proportion of salt concentration in Norway. The PM_{10} data from EU satellite observations covering ground-truth reference sites in the period 2011-2017 had low year-to-year variation and roughly the same range, 2 to 12 $\mu\text{g}/\text{m}^3$ each year. These data are considered as the most promising for further use due to:

1. Better correlation in size with sea salt in the air
2. Better availability (saved per hour)

A practical proposal on how to proceed in the project to reach the project goal includes several steps and is summarised in the “Conclusions” section of the report and illustrated by several figures for better explanation.