

# Optimal Sensor Placement in Environmental Research: Designing a Sensor Network under Uncertainty

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## Abstract

One of our main challenges in meteorology and environment research is that in many important areas like the Arctic and Antarctica, sensor coverage is sparse, leaving us with numerous blind spots. Placement and maintenance of sensors in these areas are very expensive. It is therefore desirable to find out how, within a given budget, we can design a sensor network are important activities was developing reasonable techniques for sensor that would provide us with the largest amount of useful information while minimizing the size of the “blind spot” areas which is not covered by the sensors.

This problem is very difficult even to formulate in precise terms because of the huge uncertainty. In this talk, we will describe two important aspects of this problem: (1) how to best distribute the sensors over the large area, and (2) what is the best location of each sensor in the corresponding zone.

In describing how to deal the first aspect of the problem, we expand on the general methods described in Nguyen et al. (2008).

We illustrate how to deal with the second related of the problem on the example of optimal selection of locations for the Eddy towers, an important micrometeorological instrument. Several towers have already been placed in different locations around the world. For some of placements, detailed reports were produced that described how different geographical aspects were taken into account when selecting these locations. In this talk, we describe a general algorithm for finding the optimal tower location based on different factors affecting the location of the tower, such as the closeness to the roads, the surface slope, vegetation, etc. One of the most important factors is the size and shape of the tower’s footprint, the surface area from which the tower collects the data. Ideally, this footprint should be as large as possible, so as to provide the widest possible coverage.

## References

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