

## **Observing Network Design Applied To Antarctic Surface Observations**

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Surface weather measurements in Antarctica are critical for supporting base operations and monitoring climate, but expense and logistical challenges necessarily limit the scale and scope of the network. These challenges and limitations motivate research into optimal configurations of the network to maximize performance. Here we apply the methodology of optimal network design to explore what an idealized, continent-wide network would look like, as well as how to augment the current network. Two cases are of particular interest: where to place a station to sample an area that is inaccessible, as well as where to sample for forecasting purposes. The network design procedure used here employs an ensemble approach to maximally reduce the variance ("uncertainty") in a chosen metric. Locations are selected conditional on the reduction in variance from previously selected locations. Daily 00Z 2 meter temperature data from the Antarctic Mesoscale Prediction System (AMPS) is used to construct several preliminary optimal networks using this algorithm. One is constructed in West Antarctica to explore statistical degradation – two optimal networks are constructed using the average temperature over the West Antarctic coast, one allowing for station siting on the coast and one masking the coast. An optimal network is also constructed in East Antarctica for consideration in forecasts for field campaigns where the network is especially sparse; this case uses a metric defined by 24-hour forecasts of regionally averaged 2-m temperature. These analyses are compared to the current network to gain understanding of the spatial gaps as well as to provide a basis for augmenting the current network.