5.022 Spatial and Temporal Optimisation of Variable Density/Capability Air Quality Networks. Improving returns from emerging low-cost Air Quality Monitoring Networks.

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Abstract:

Observational studies can now be undertaken at very high resolution as a result of the development of transformative minituarised low-cost sensor technologies. However the increasing use of dispersed networks has highlighted the need for network optimisation to maintain affordability (especially important in developing economies), avoid redundancy and identify areas of sub sampling.

Dense sensor networks have been deployed often to evaluate performance and utility, primarily in Europe and N America. Studies in Africa and SE Asia are limited, even though pollution problems are generally more severe with routine episodes of national and transnational very poor air quality and haze. Optimisation of networks is vital to maximise scientific and public good returns in often resource limited environments.
Based on high resolution training datasets (including the NASA DISCOVER-AQ missions) this work demonstrates a flexible approach to determining optimal temporal and spatial resolution within a variable density/capability network. Primary species investigated are CO, NO_X/O_3, and PM. **Temporal Optimisation:** Variogram parameters derived from fast data (≤1/60Hz) were compared to parameters derived from the same data averaged over a range of time intervals. The optimal time interval for measurements without loss of information (including non-continuous data e.g. diurnal variability) was identified by the degree of similarity of the fitted variogram parameters for the fast and averaged data at each sampling location. **Spatial Optimisation:** The time interval identified plus estimated variogram ranges (i.e. the time length over which air pollution levels are correlated) were used to generate spatial predictions of change. Fitted variogram parameters for spatial predictions were used to assess appropriateness of sensor

locations as well as areas of redundancy and under-sampling identified.
This presentation will describe this advanced network design concept as well as present preliminary results from the “High Density Air Quality Monitoring in the Klang Valley Malaysia” project based on this approach.