

## Working Draft 1 -

### Report of “Metrics Brainstorming Group” from Day 1 of NonStationary Covariance Workshop

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We discussed metrics to compare covariance models within the broader framework of a model selection/comparison problem.

Different types of non-stationarity were discussed. Some estimation/modeling methods may work well for smoothly varying non-stationarity. However, Bani mentioned that he worked on processes where the spatial covariance may abruptly go from strong to zero between points – such as in ground water contamination – due to the presence of rocks at unknown locations underground. Some methods may work well in smoothly varying types of non-stationarity, and others may be needed for abruptly changing non-stationarity.

Suggestions for comparisons included:

Predictive variances – of field, and  
- of covariances between unmonitored locations

Due to the **high dimensionality** of many spatial and space-time problems, single number summaries would be extremely valuable within the suite of comparisons, with possibilities including **Bayes factors, Likelihood Ratio Tests, average or some transformation of Frobenius norms, Kullbach Leibler distances.**

Decisions would need to be made about which loss function to use, and how best to compare Frequentist and Bayesian problems on a similar footing.

**In simulation studies** we know the truth – so we have the advantage there of being able to estimate the **coverage of credible intervals and confidence intervals**. This could involve bootstrap based confidence intervals for frequentist methods for simulations with replications by resampling replications (keeping the spatial structure unchanged) – or (even better) we could simulate multiple collections of replications from the same field – and base coverage estimates on these.