

# GC14B-05 Testing competing models on spatial fields

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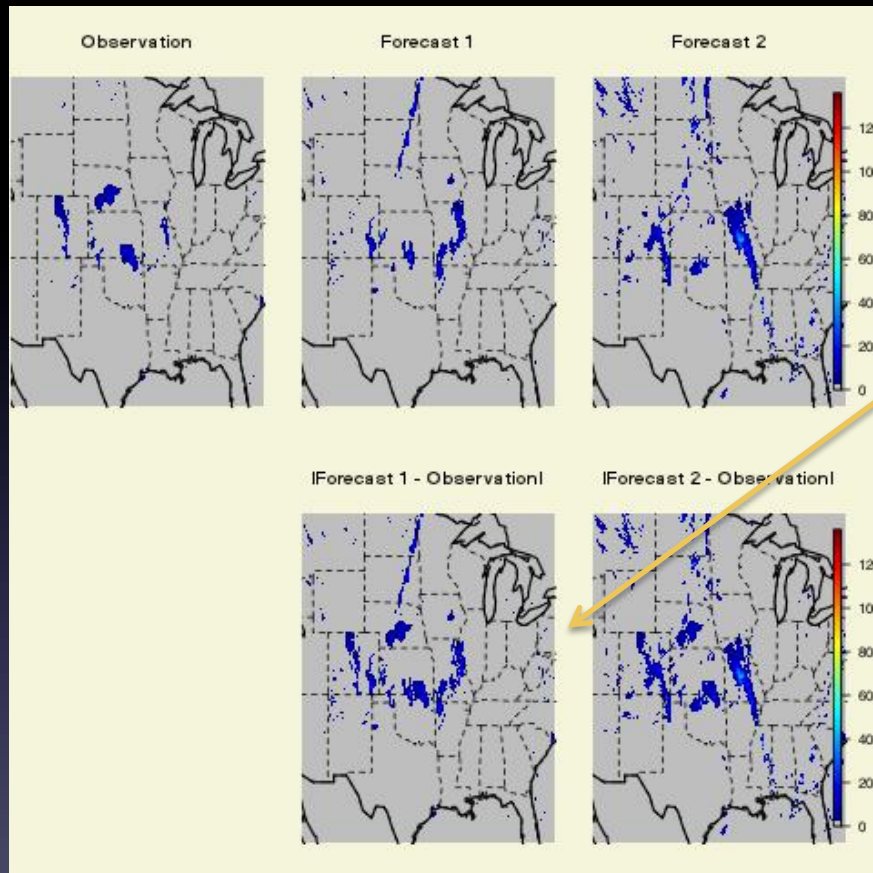
Photo by Everett Nychka

AGU Fall Meeting  
9 – 13 December 2013  
San Francisco, California.

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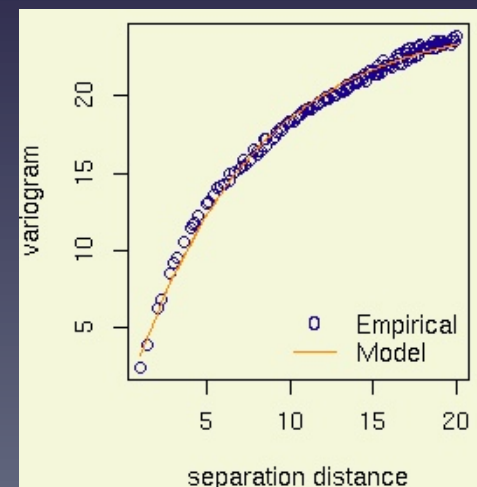
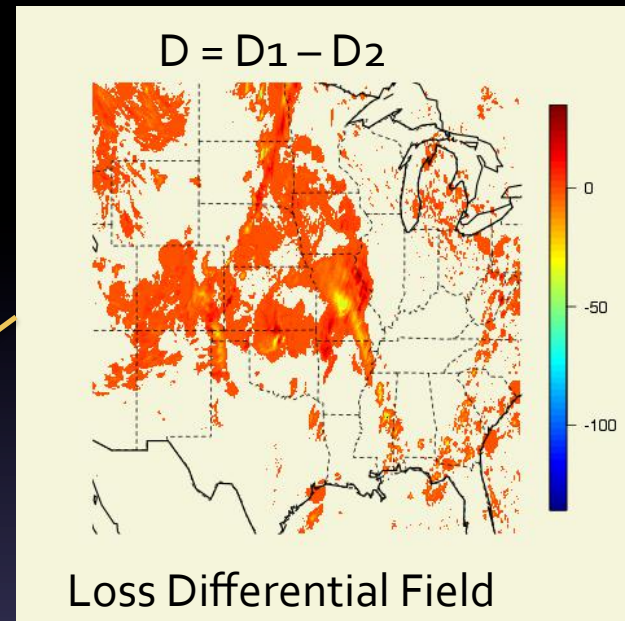


# Spatial Prediction Comparison Test



D1

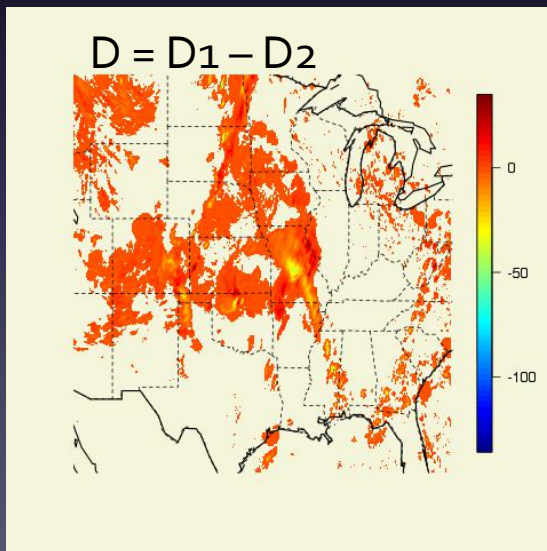
D2



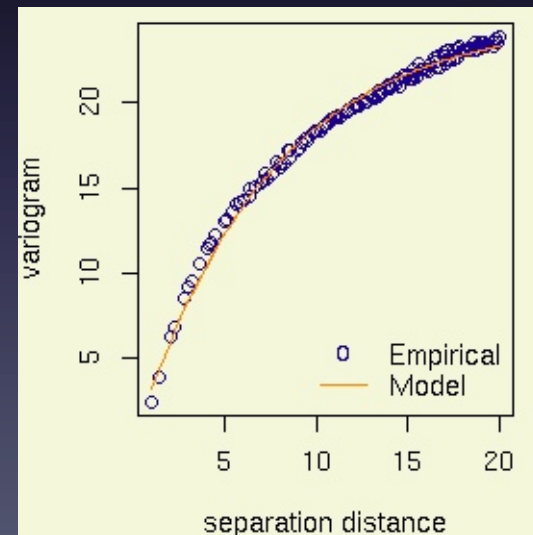
# Spatial Prediction Comparison Test

Introduced by Hering and Genton (2011, *Technometrics*, **53**, 414 – 425)

Extension of the time series version introduced by Diebold and Mariano (1995, *J. Business and Economic Statistics*, **13**, 253 – 263).

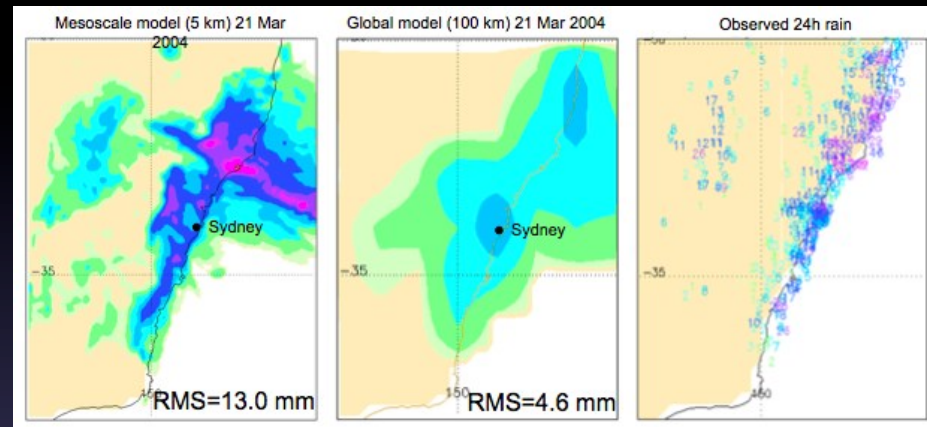
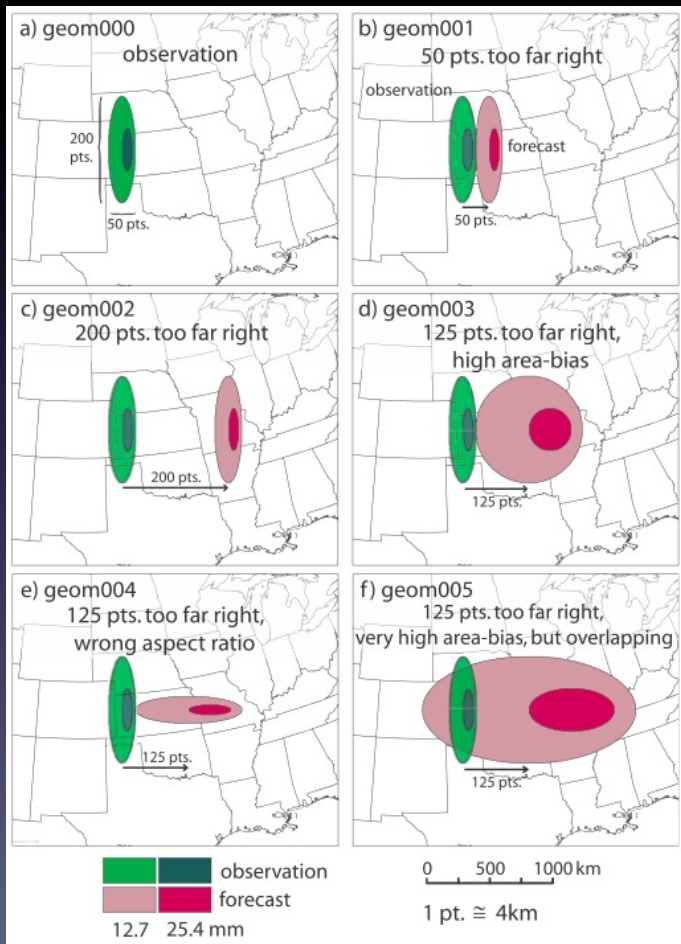


$$S = \frac{\bar{D}}{\sqrt{\text{var}(\bar{D})}}$$



# Spatial Prediction Comparison Test

Accounting for Location Errors and Reducing Effects of Small Scale Errors



Traditional score	geom001/002/004	geom003	geom005
Accuracy	0.95	0.87	0.81
Frequency bias	1.00	4.02	8.03
Multiplicative intensity bias	1.00	4.02	8.04
RMSE (mm)	3.5	5.6	6.9
Bias-corrected RMSE (mm)	3.5	5.5	6.3
Correlation coefficient	-0.02	-0.05	0.20
Probability of detection	0.00	0.00	0.88
Probability of false detection	0.03	0.11	0.19
False alarm ratio	1.00	1.00	0.89
Hanssen-Kuipers discriminant (H-K)	-0.03	-0.11	0.69
Threat score or CSI	0.00	0.00	0.11
Equitable threat score or GSS	-0.01	-0.02	0.08
HSS	-0.03	-0.04	0.16

Above Figure  
from Beth Ebert

# Spatial Prediction Comparison Test

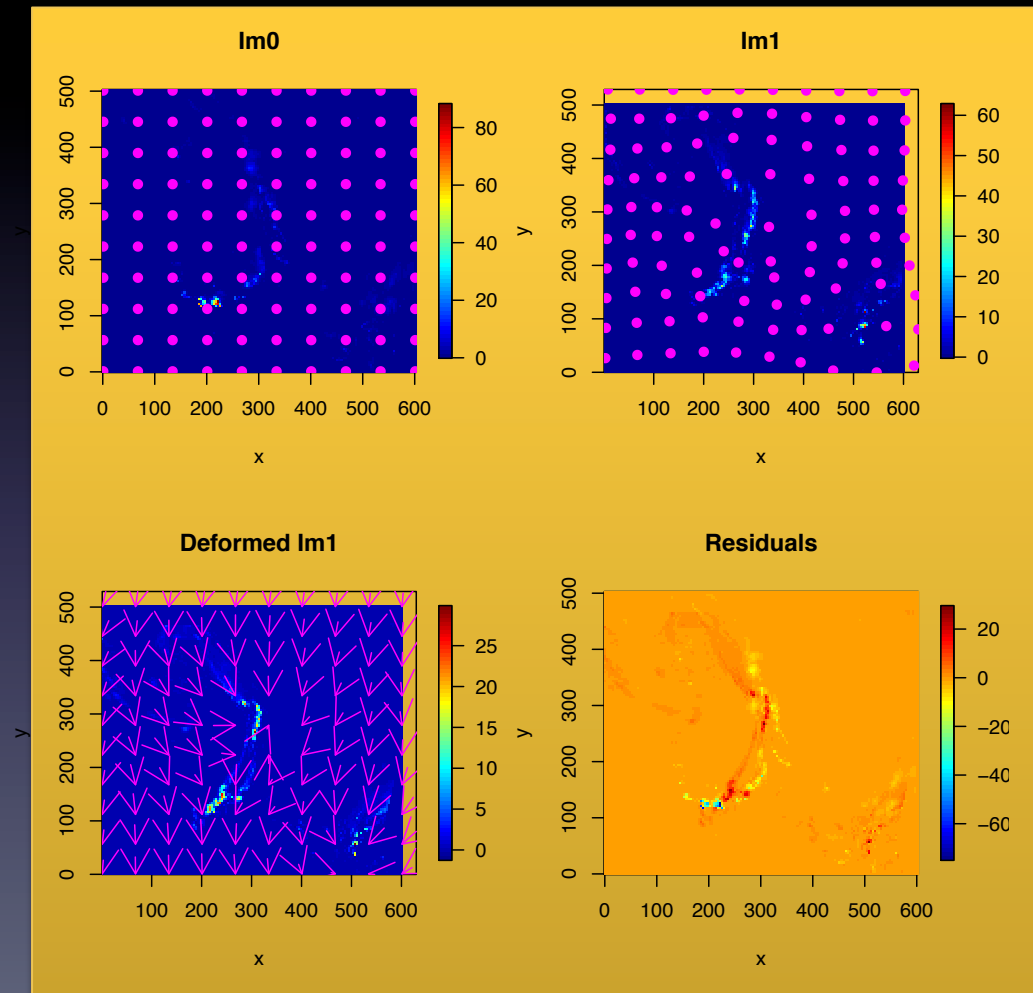
Accounting for Location Errors and Reducing Effects of Small Scale Errors



Above Figure from Johan Lindström

# Spatial Prediction Comparison Test

Accounting for Location Errors and Reducing Effects of Small-Scale Errors



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# Spatial Prediction Comparison Test

Accounting for Location Errors and Reducing Effects of Small Scale Errors

Loss at each point =

Distance from original location of each point to warped location



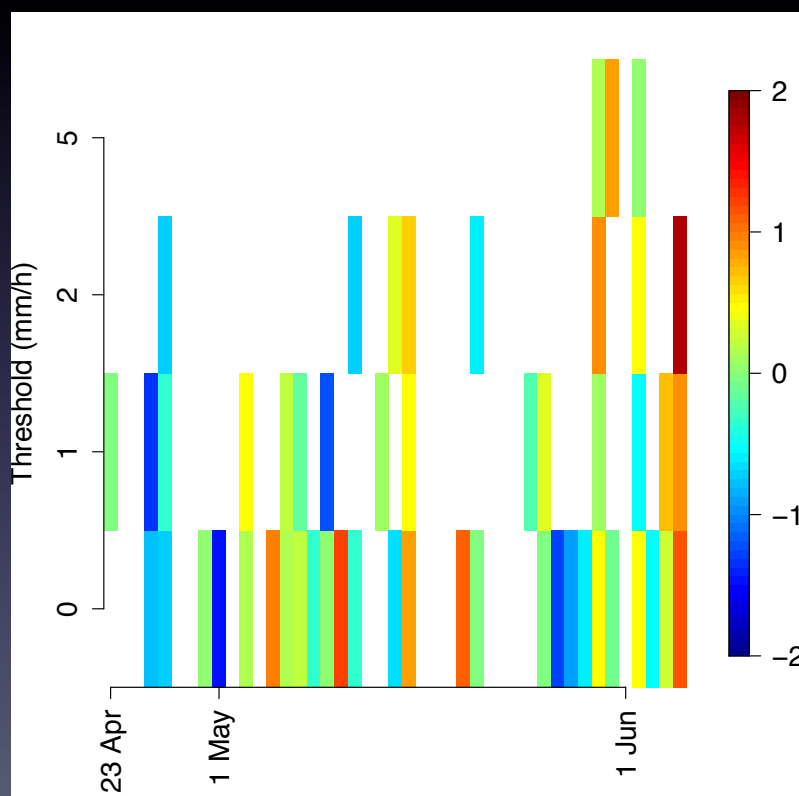
Loss at each point between observation value and warped value

G. (2013, *MWR*, **141** (1), 340 – 355)

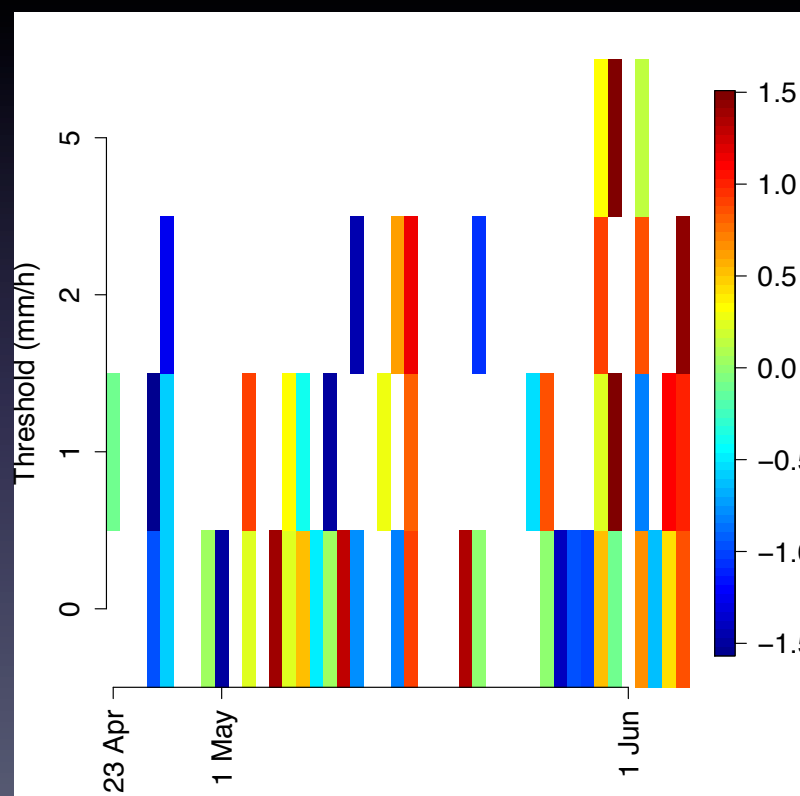
# Spatial Prediction Comparison Test

Accounting for Location Errors and Reducing Effects of Small Scale Errors

$\bar{D}$



$S$



# The Spatial Prediction Comparison Test (SPCT)

## Summary and Conclusions

- Applying image warping first results in a test that accounts for location errors as well as spatial correlation.
- Optimizing the warp function takes time, but is not terribly inefficient either.
- Can be applied to non-gridded fields, but perhaps trickier.

## Future Work

Additional uncertainty introduced because of uncertainty associated with fitting the warp function to the fields. Can this be incorporated into the test?

It is possible to extend this to a test for spatio-temporal fields, but how exactly?

# The Spatial Prediction Comparison Test (SPCT)

## Other Remarks

- Phase 2 of ICP: Mesoscale Verification Inter-Comparison over Complex Terrain (MesoVICT) is about to begin.

<http://www.ral.ucar.edu/projects/icp>

Dorninger et al., 2013, *NCAR Technical Note*, NCAR/TN-505+STR.

- R (<http://www.r-project.org>) package, SpatialVx, in the works to do most spatial verification techniques.
- R image warping package on its way.