Advanced climate and regional model validation
for societal applications

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2014 CESM Societal Dimensions Working Group Meeting

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Spatial Methods

SPCT Distributions

Image Warping

MODE

good performance

Quilt plots

poor performance

FSS

Perfect skill

Useful scales

Too much smoothing

asymptotes to value that depends on the frequency bias (1 if no bias)

Present output on these scales

uniform

target skill

FSS

No skill

grid scale

Spatial scale (length of neighbourhood squares)
User Needs

F

O
User Needs
User Needs
Current Climate: Precipitation (mm)

CRU 3.10 (t = January)

CESM–CAM5 (t = January)
Location Error Measures

Binary fields obtained via setting all values below 5 mm to zero.
# Location Error Measures

<table>
<thead>
<tr>
<th>Threshold (mm)</th>
<th>0</th>
<th>0.1</th>
<th>1</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hausdorff distance</td>
<td>0</td>
<td>0</td>
<td>10.6</td>
<td>19.6</td>
<td>59.1</td>
<td>9.2</td>
<td>215.4</td>
<td>0</td>
</tr>
<tr>
<td>Baddeley’s Δ metric</td>
<td>0</td>
<td>0</td>
<td>1.80</td>
<td>4.0</td>
<td>21.4</td>
<td>2.7</td>
<td>149.6</td>
<td>0</td>
</tr>
<tr>
<td>Mean Error Distance</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>1.4</td>
<td>21.9</td>
<td>2.5</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>metrV</td>
<td>0</td>
<td>0</td>
<td>13.85</td>
<td>15.77</td>
<td>21.14</td>
<td>5.44</td>
<td>72.18</td>
<td>0</td>
</tr>
<tr>
<td>FQI</td>
<td>-</td>
<td>0</td>
<td>0.42</td>
<td>0.70</td>
<td>1.93</td>
<td>0.14</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Field Deformation

Above Figure from Johan Lindström
Spatial Prediction Comparison Test

Observation  
Forecast 1  
Forecast 2

D1  D2

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Feature-based Methods

Threshold = 5 mm

Threshold = 10 mm
Feature-based Methods

Threshold = 5 mm

Same as above, but features have been merged and matched
Results show (1) forecasts have some skill in capturing these events and (2) in which aspects the forecasts need improvement. Ex: 90th percentile of precipitation; storm placement/timing.
Feature-based Methods

Fuzzy Logic Interest Maps
This is the end

- SpatialVx is an R package (in the works) for doing spatial verification. Most of the techniques shown in this presentation are already available in the package.
- MesoVICT is the second phase of a spatial forecast verification methods inter-comparison project.

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