

Intensity Scale Verification Synthetic Case Studies

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Verification Methods
Inter-Comparison Project



Intensity-scale verification technique

Casati et al. (2004), Met App, vol. 11

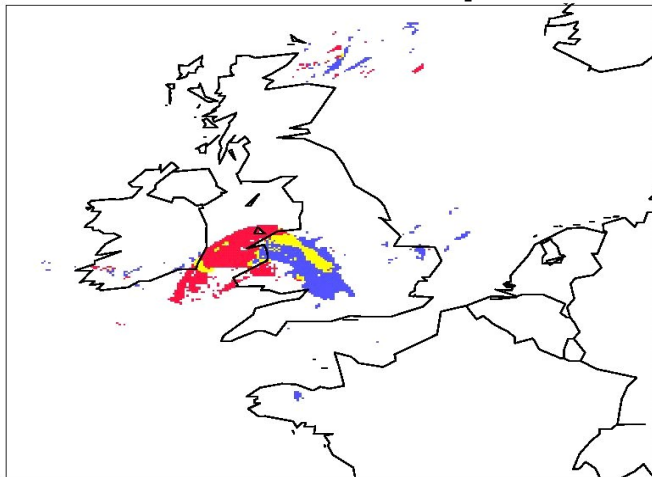
The **intensity-scale** verification approach measures the skill as function of precipitation intensity and spatial scale of the error

>> **intensity: threshold** --> binary images (**categorical approach**)

>> **scale: 2D Wavelets decomposition** (features and discontinuities)

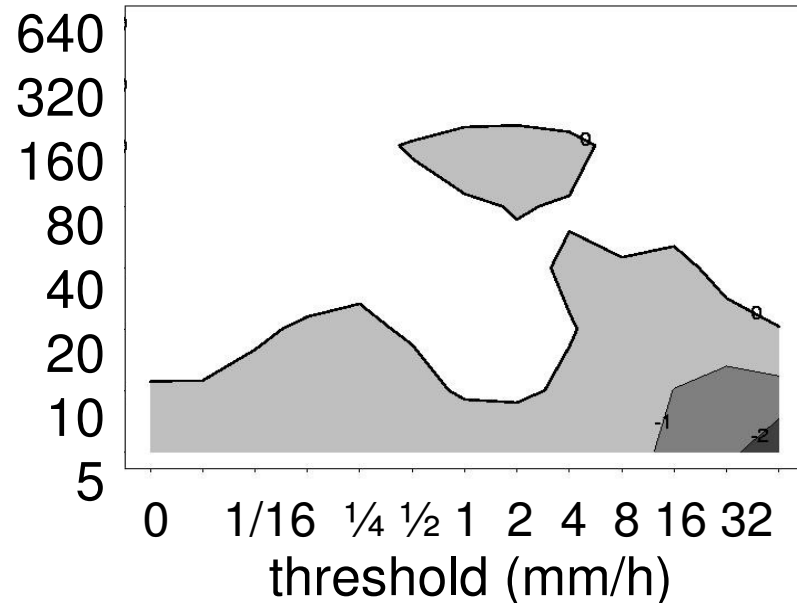
For each threshold and scale: skill score associated to the MSE of binary images = Heidke Skill Score (bridges categorical with scale approaches)

Intense storm displaced

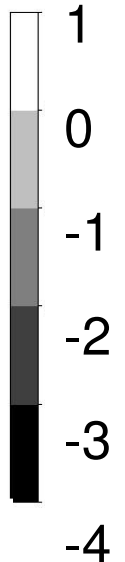


threshold = 1mm/h

scale (km)



Skill

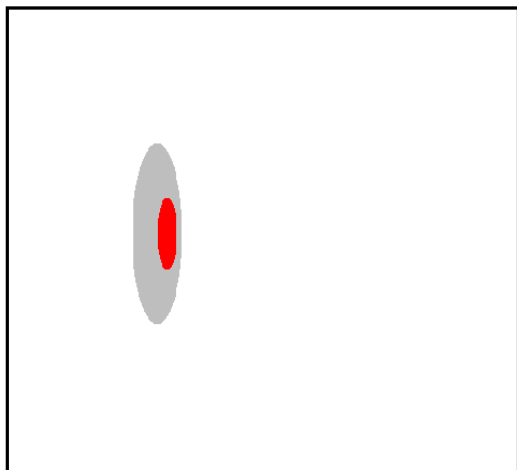


Intensity Scale Verification

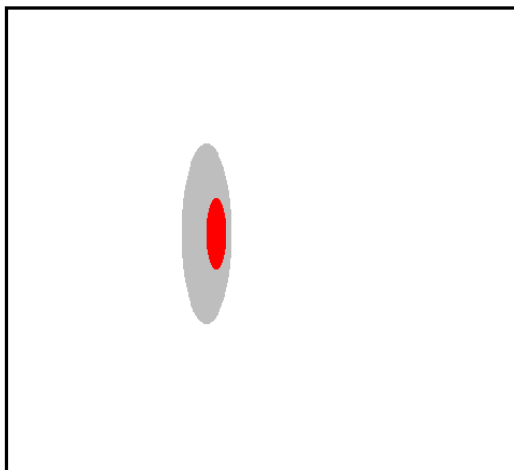
Geometric Shapes

Sensitivity to displacement

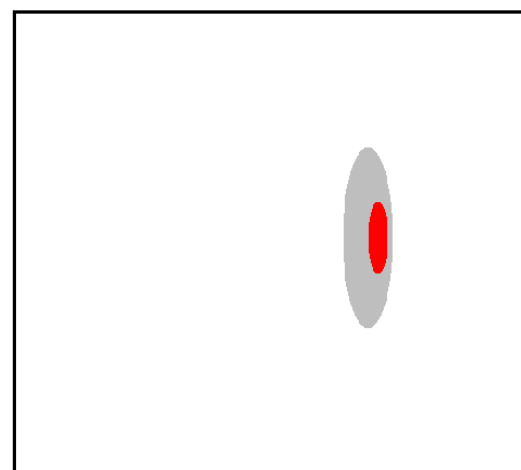
geom000 (truth)



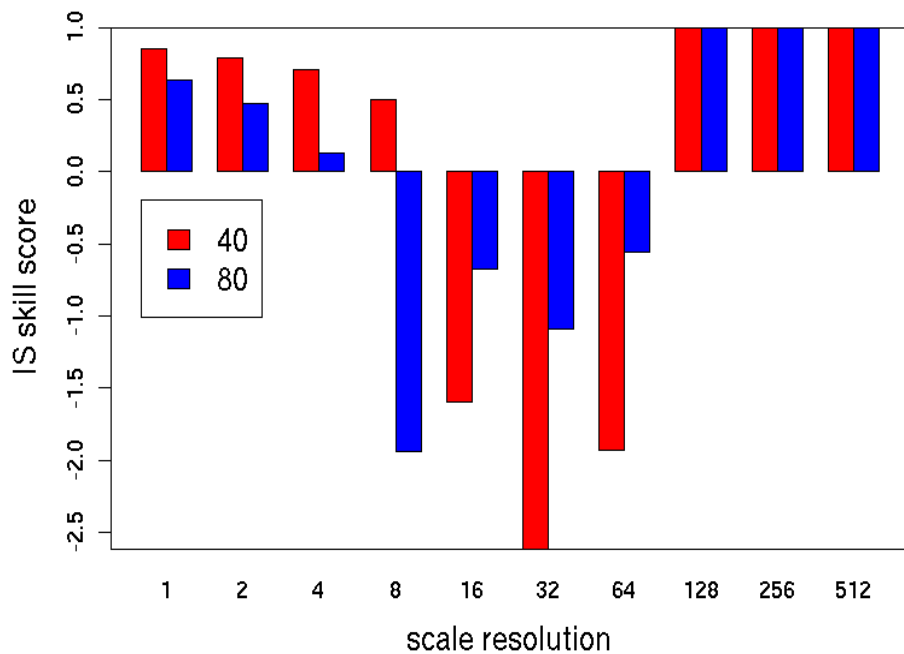
geom001



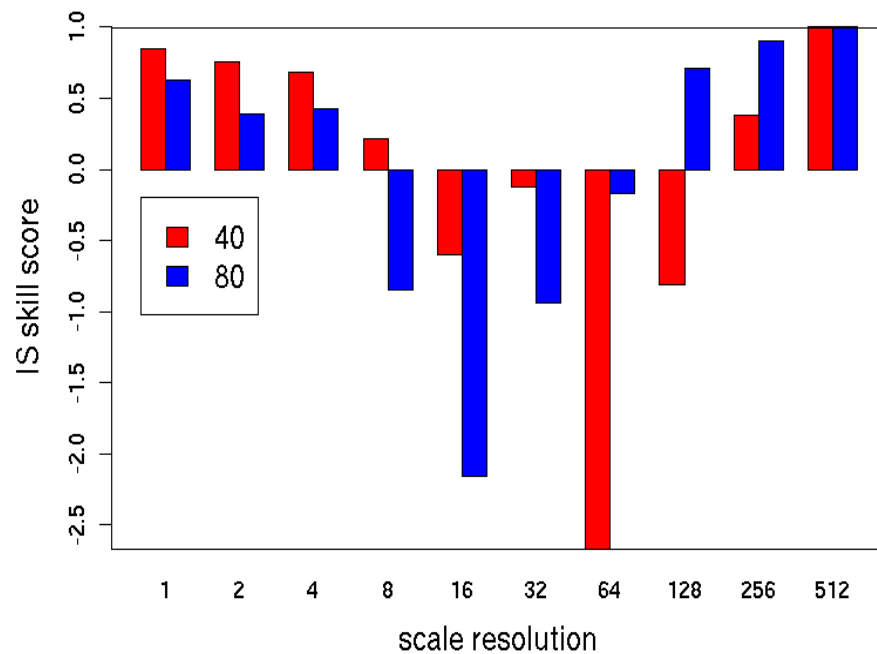
geom002



50 pt to the right (GEOM 001)

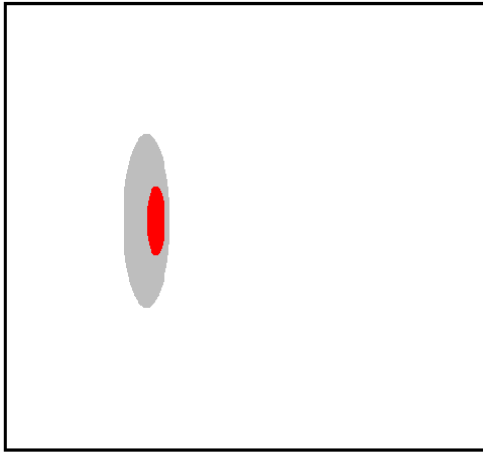


200 pt to the right (GEOM 002)

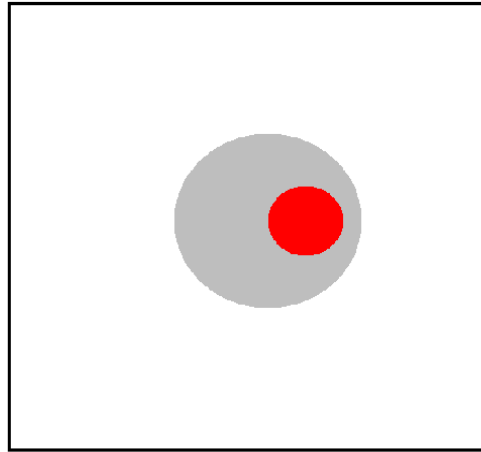


Sensitivity to displacement and size

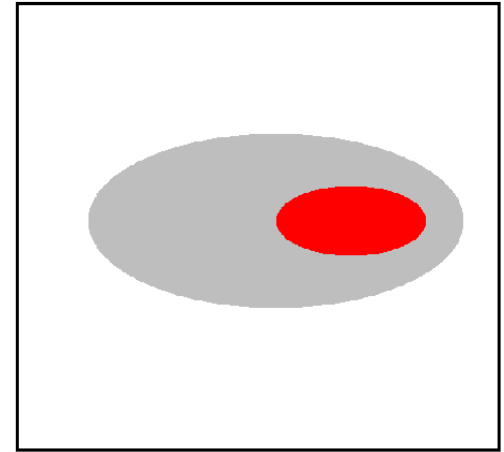
geom000 (truth)



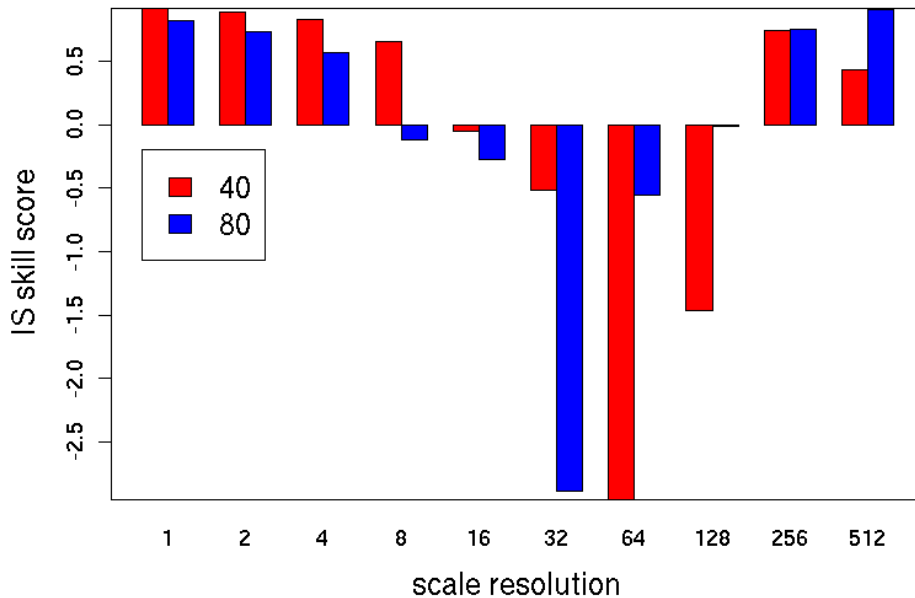
geom003



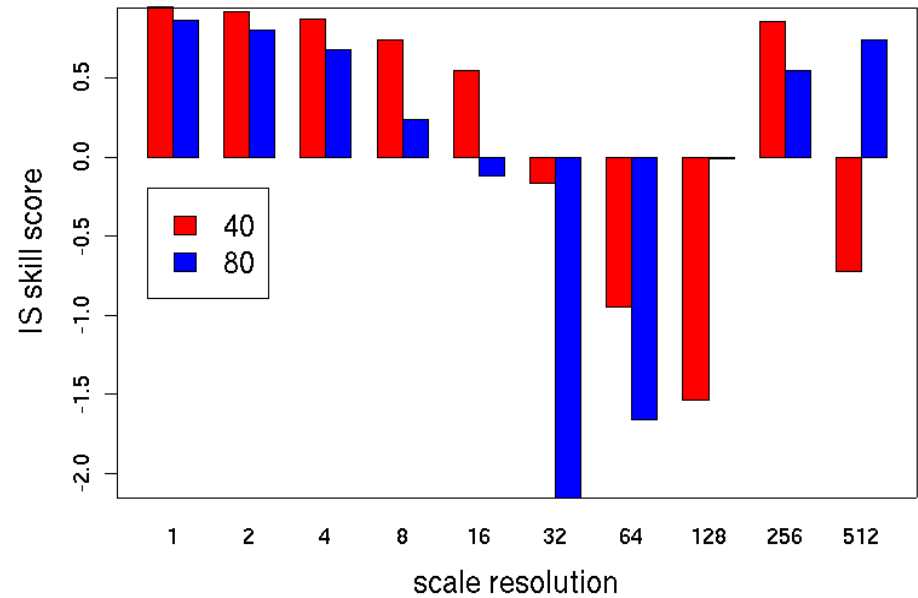
geom005



125 pt to the right and too big (GEOM 003)

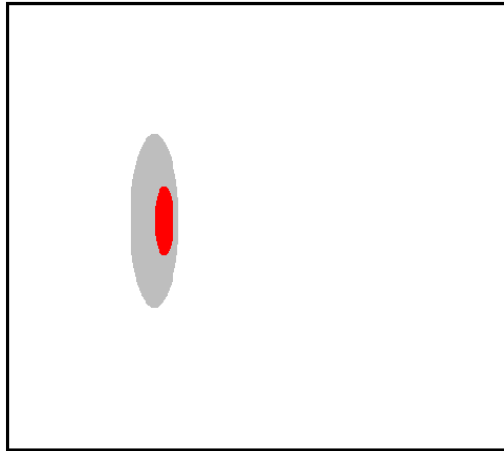


125 pt to the right, huge, wrong orientation (GEOM 005)

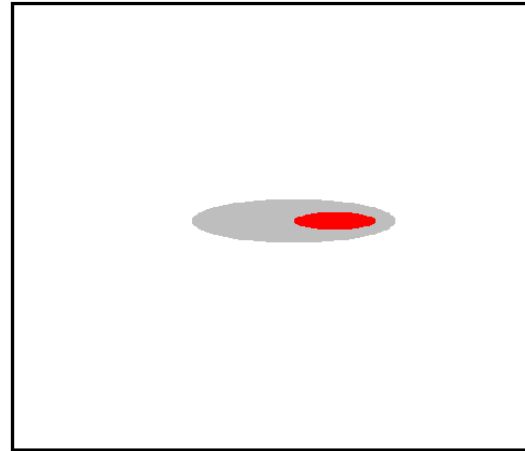


Sensitivity to displacement, orientation and size

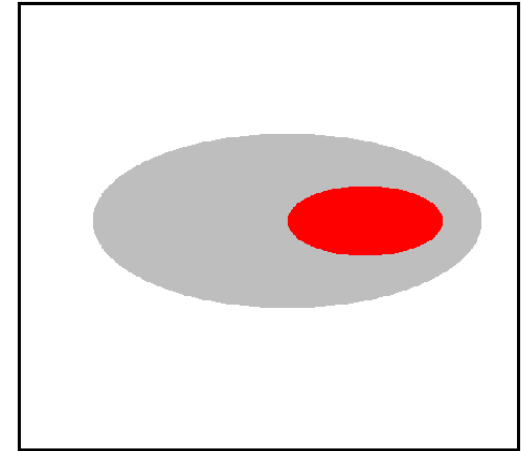
geom000 (truth)



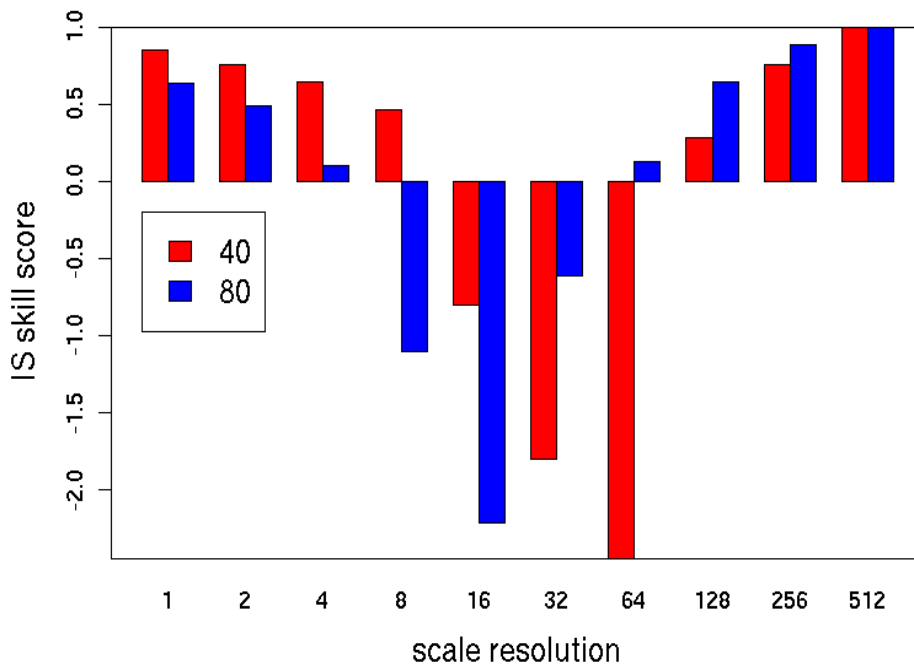
geom004



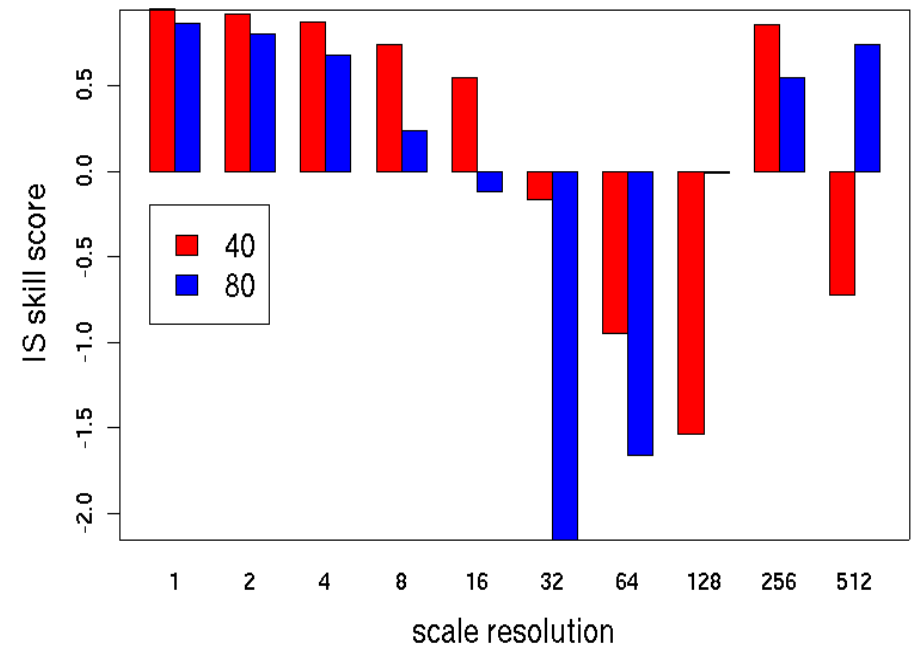
geom005



125 pt to the right wrong orientation (GEOM 004)



125 pt to the right, huge, wrong orientation (GEOM 005)



Intensity Scale Verification, Geometric Shapes

Conclusions

The IS skill score is sensitive to:

1. precipitation intensity (threshold)

2. the scale of the error:

scale (size) of the feature & displacement

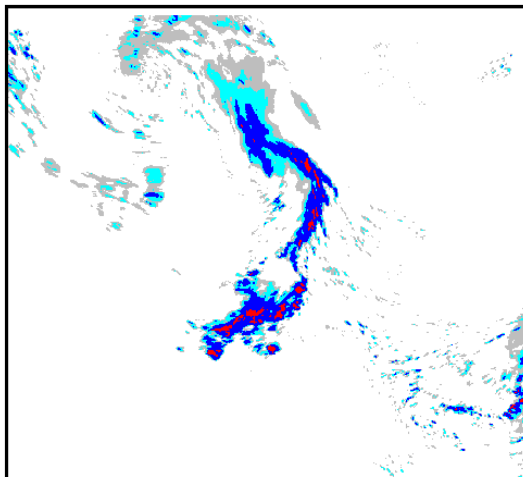
3. not too sensitive to the orientation

Intensity Scale Verification

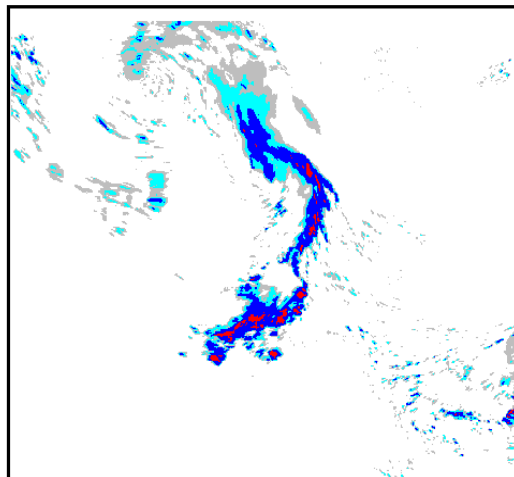
Perturbed Cases

Sensitivity to displacement

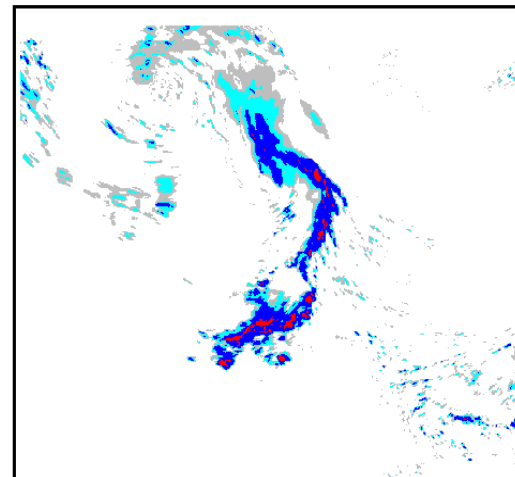
pert000 (truth)



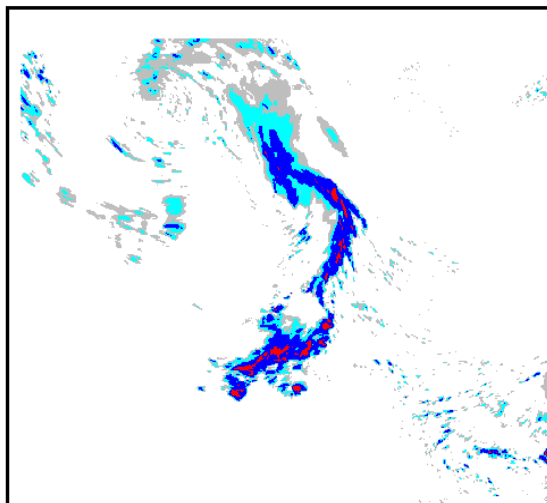
pert001



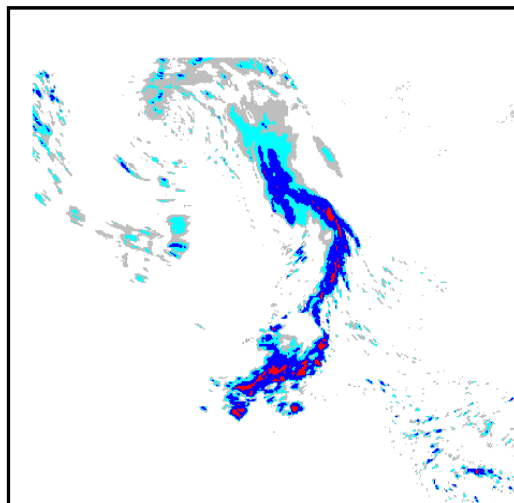
pert002



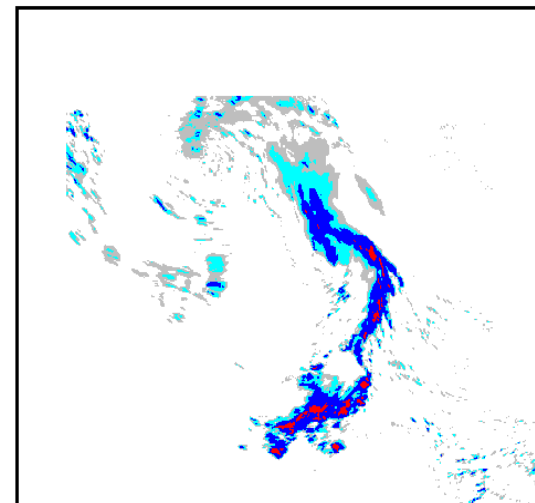
pert003



pert004

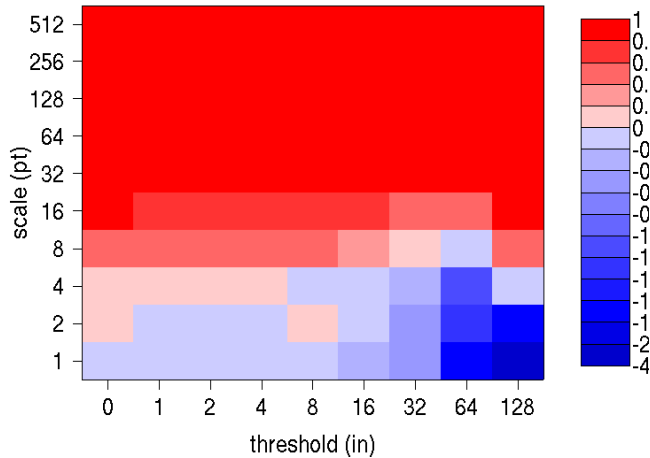


pert005

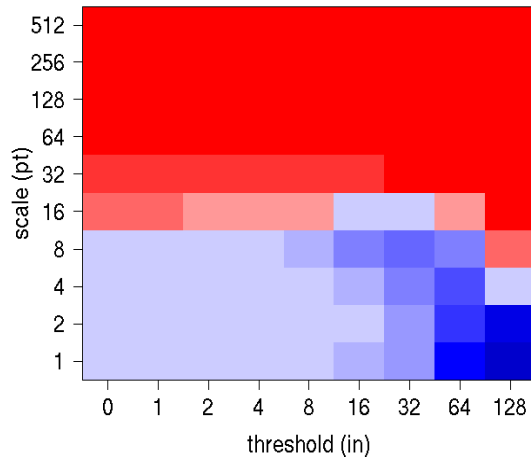


Sensitivity to displacement

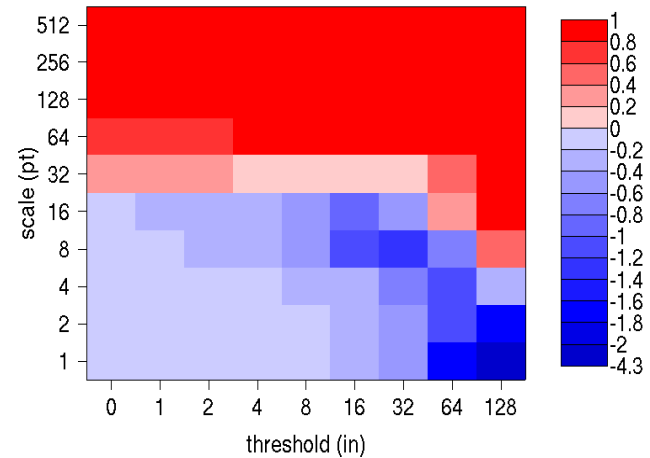
pert001: 3 pt right, 5 pt down



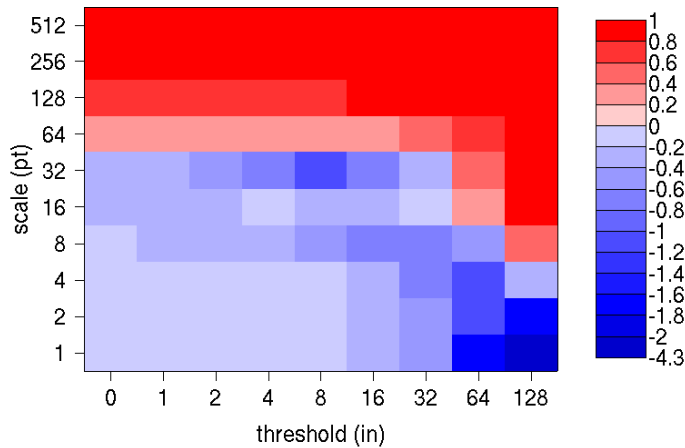
pert002: 6 pt right, 10 pt down



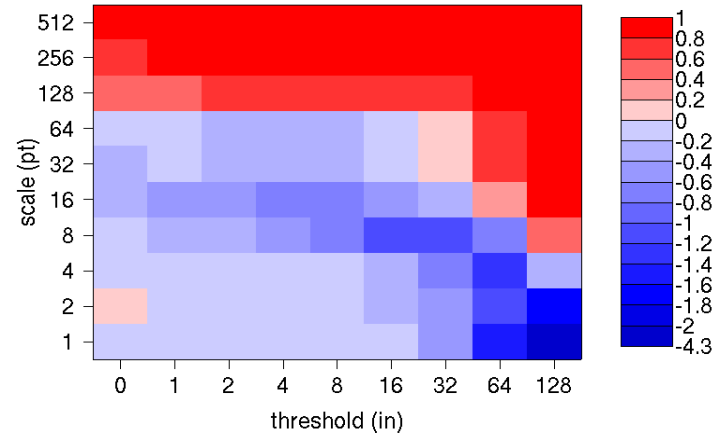
pert003: 12 pt right, 20 pt down



pert004: 24 pt right, 40 pt down



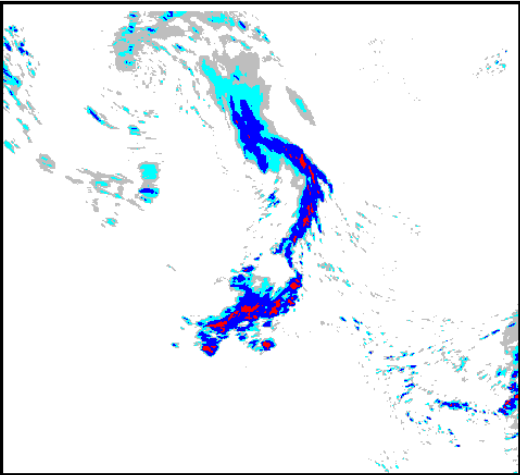
pert005: 48 pt right, 80 pt down



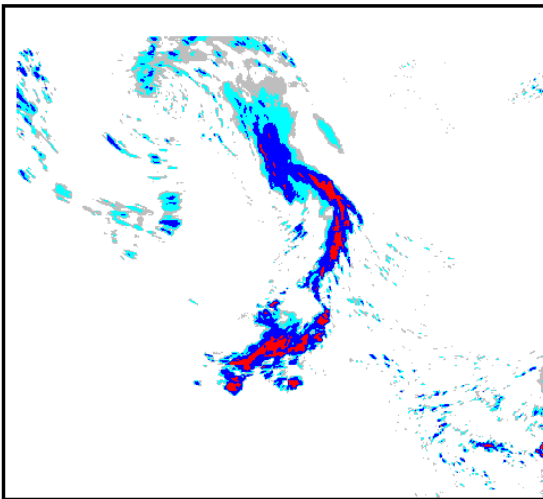
as the displacement is larger, the skill score gets negative on larger scales and smaller thresholds (the fronts separate)

Sensitivity to precipitation intensity

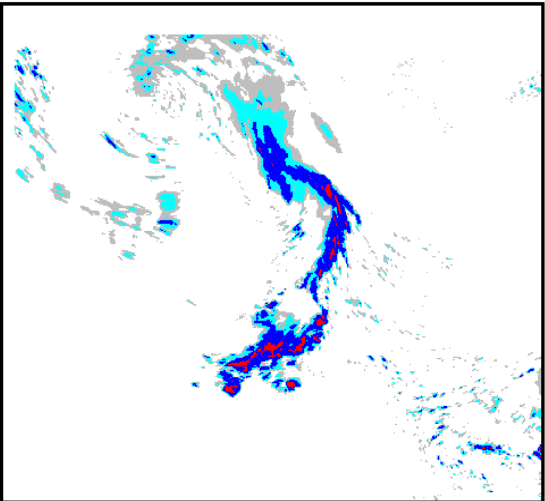
pert000 (truth)



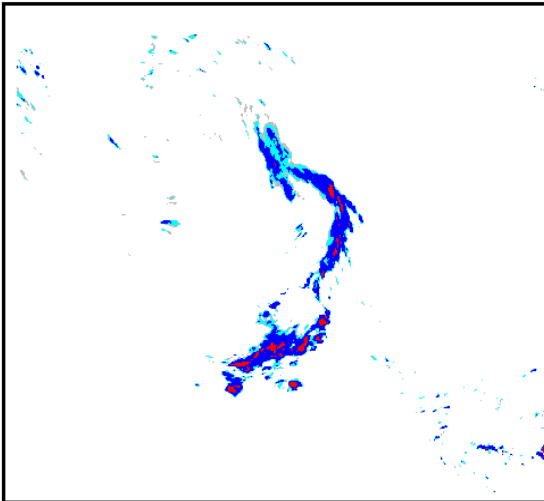
pert006



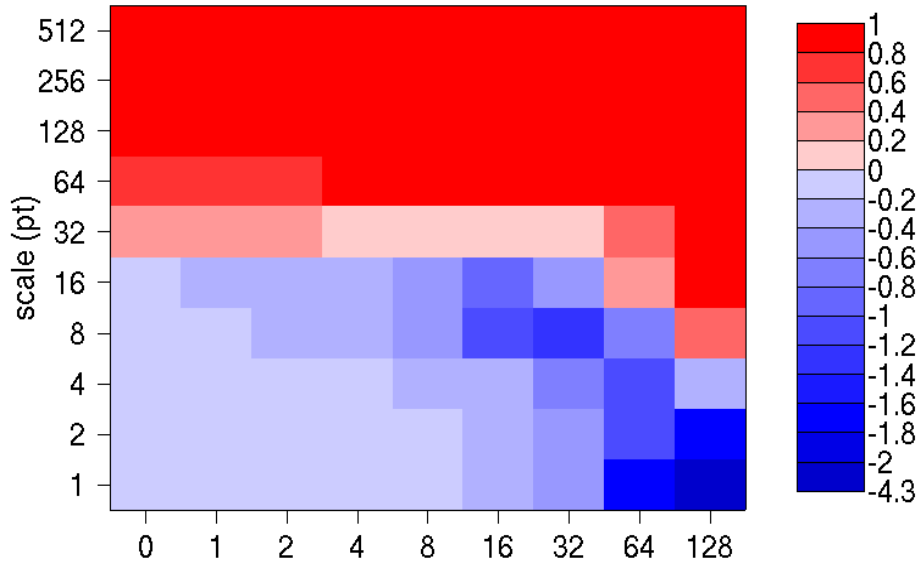
pert003



pert007



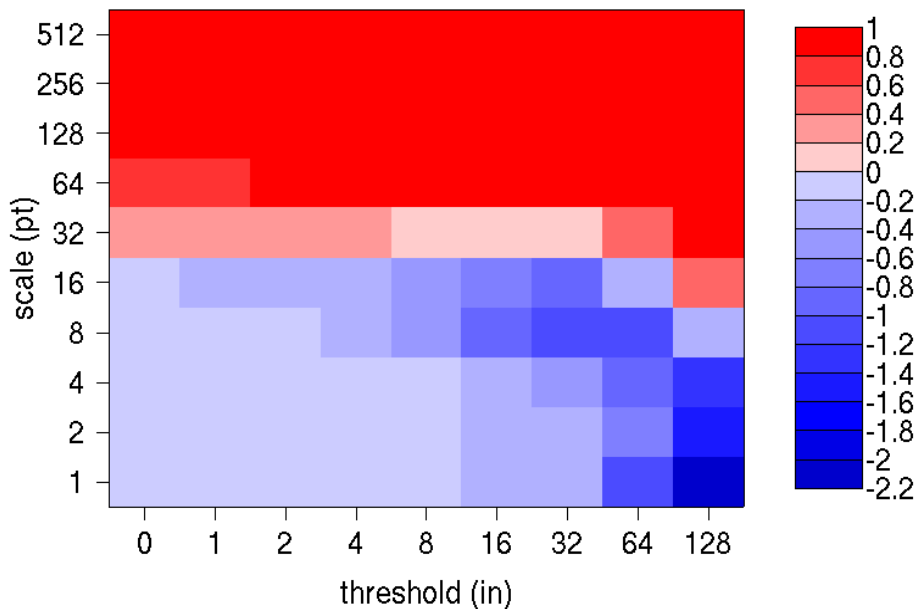
pert003: 12 pt right, 20 pt down



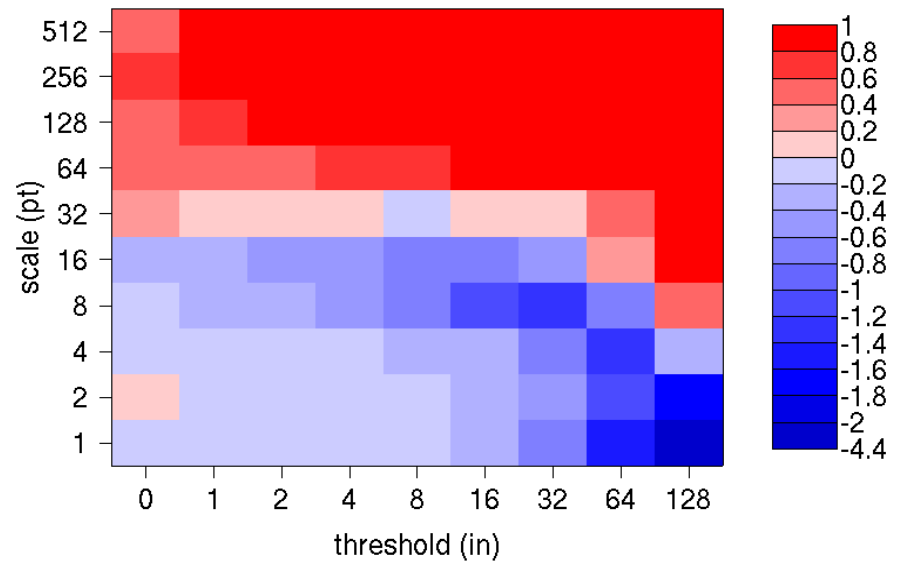
Sensitivity to precipitation
intensity

the negative skill shift from
smaller to larger intensities

pert006: 12 pt right, 20 pt down, pcpn x 1.5



pert007: 12 pt right, 20 pt down, pcpn - 0.05in



Intensity Scale Verification, Perturbed Cases

Conclusions

The IS skill score is sensitive to both the displacement of the front and errors in the intensity of the precipitation

Note that as the displacement is larger, the skill score gets negative on larger scales, but also on smaller thresholds, since the original front and displaced front in the binary images get more and more apart