TBC at WG5 session!

Intercomparison of Spatial Verification Methods for COSMO Terrain (INSPECT): Preliminary results

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Abstract

A COSMO consortium project devoted to spatial verification methods (INSPECT) has been created to follow MesoVICT (Mesoscale Verification Inter-Comparison over Complex Terrain) activities and to summarize the COSMO experience of applying spatial verification methods to high and very high resolution forecast systems, both deterministic and EPS.

The basic part of INSPECT involves the experiments with MesoVICT test cases (http://www.ral.ucar.edu/projects/icp/) so that the comparison between different spatial methods can be made and guidelines as to the applicability of each method can be given.

Part of work concerns the reruns of these test cases using state-of-the-art COSMO systems (both deterministic and ensemble).

The results of HNMS for the MesoVICT cases are given (neighborhood and SAL methods).

Features-based (CRA, MODE) methods are explored by IMGW-PIB and Roshydromet using R SpatialVx package. The first results show that the methods taking into account the feature area give better features matching. The matching appears to be easier for large-scale features.

Long time series of neighborhood scores are analyzed (results of DWD and MeteoSwiss).

As a result of several INSPECT tasks, some common routines for data preprocessing and running the most widespread spatial methods are being developed.

ΕΘΝΙΚΗ ΜΕΤΕΩΡΟΛΟΓΙΚΗ ΥΠΗΡΕΣΙΑ
HELLENIC NATIONAL METEOROLOGICAL SERVICE

Application of Neighborhood Methods on MesoVICT Core Case

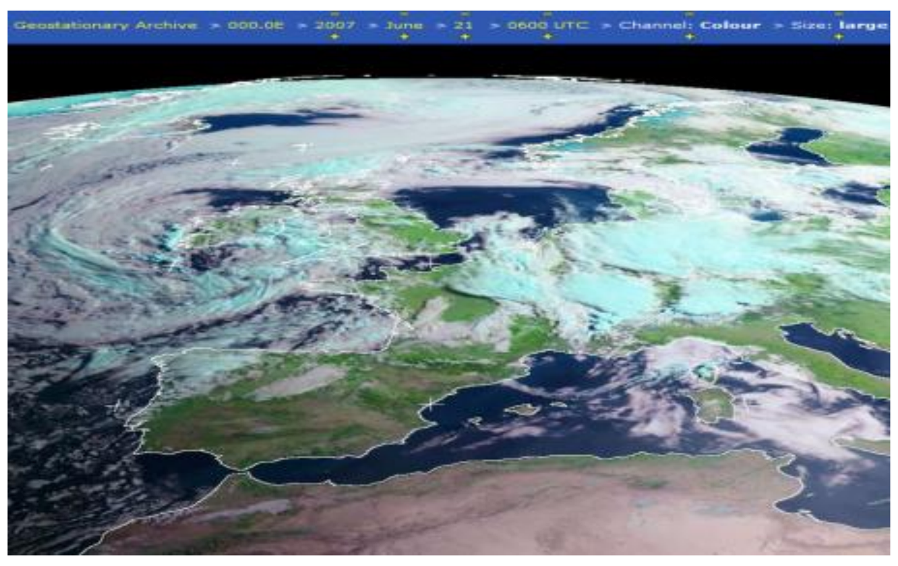
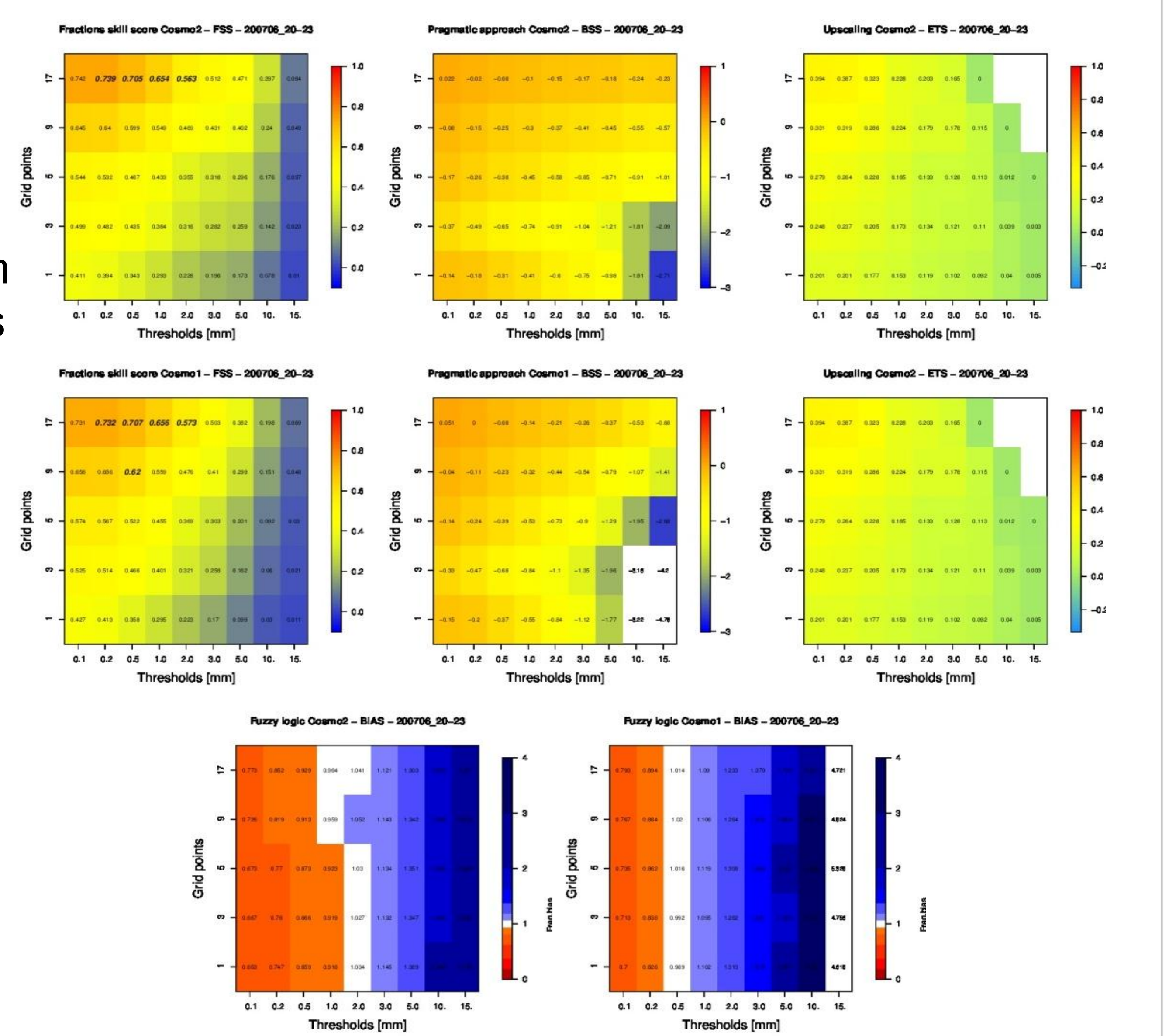


Fig.1. Satellite image, cloudiness on 21.06.2007, 00UTC

Forecasts from COSMO-2 and COSMO-1 of the Swiss Meteorological Service (Fig. 2) were used.
Observational data are based on synoptic reports with mean stations distance of approximately 16 km that were processed through an advanced analysis scheme (VERA) to 8-km resolution.

MesoVICT Core Case: 20-22 June 2007

Synoptic situation: Region ahead of a trough located over the British Isles, and warm moist air is being advected towards the Alpine Region. This leads to strong convective events on the evening of 20 June in the area north of the main mountain range. A cold front reaches the Alps from the west and moves to the east rather quickly while convective events are again observed ahead of the front (Fig. 1).



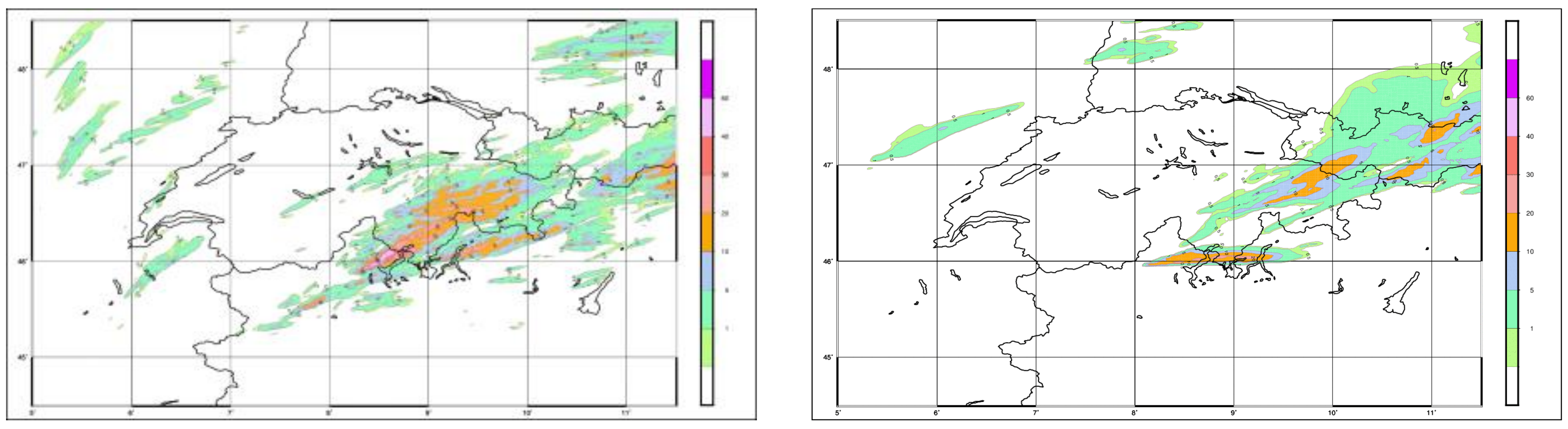


Fig. 2. 12h accumulated precipitation at 21.06.2008 Left: COSMO-1, Right: COSMO-2.

VAST verification software: based on Beth Ebert fuzzy verification IDL code.

Fractions skill score. Decision model is: "A forecast is useful if the frequency of forecast events is similar to the frequency of observed events'. **FSS values for both COSMO forecasts are greater for light rain thresholds and larger scales, with useful skill displayed at spatial scales of around 130km**

Pragmatic approach. The decision model is that 'a useful forecast has a high probability of detecting events and non-events' using BSS to quantify the forecast success. **Only minor improvement of the forecasts versus the reference, which is the sample climatology of the observations over the whole domain.**

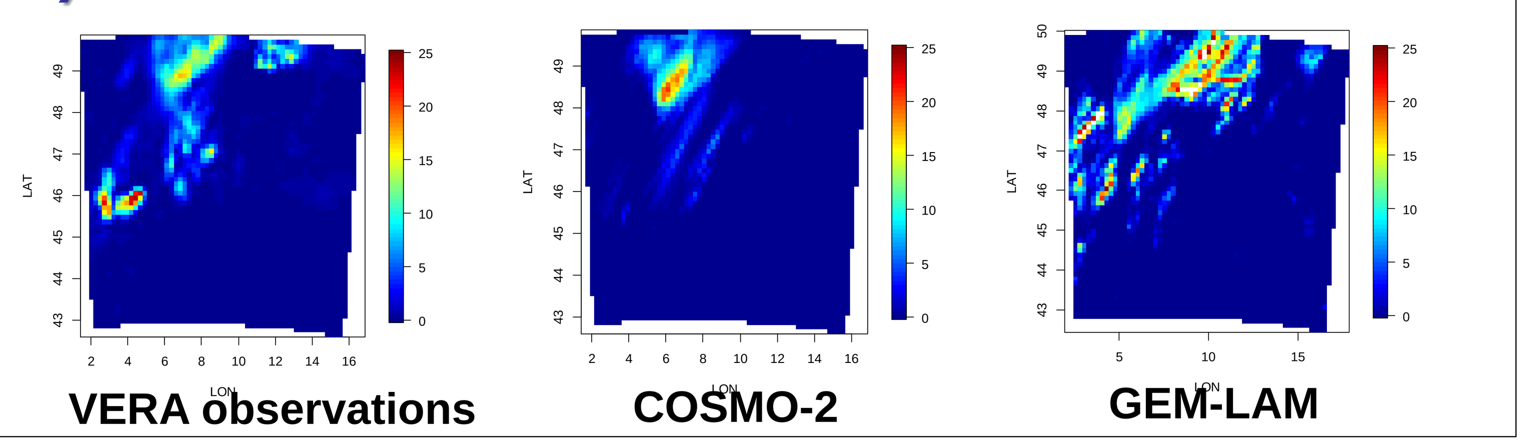
Upscaling method. The decision model is that a 'good forecast has approximately the same mean rainfall amount as the observations'. ETS was calculated and **the scores generally improve with increasing scale and smaller rainfall thresholds, while the relative advantage of COSMO-1 forecasts is demonstrated.**

Application of SAL method (Wernli et al. 2008, 2009) on MesoVICT cases

An Example: 19/7/2007 12h 06-18h precip

Model	S	A	L
COSMO-2	-0.12	-0.55	0.25
GEM-LAM	0.22	0.48	0.20

GEM-LAM (2.5 km, Environment Canada) slightly overpredicts domain values, while COSMO-2 underpredicts them.
COSMO-2 S negative values indicate slightly small or localized objects.
Similar L for both models.

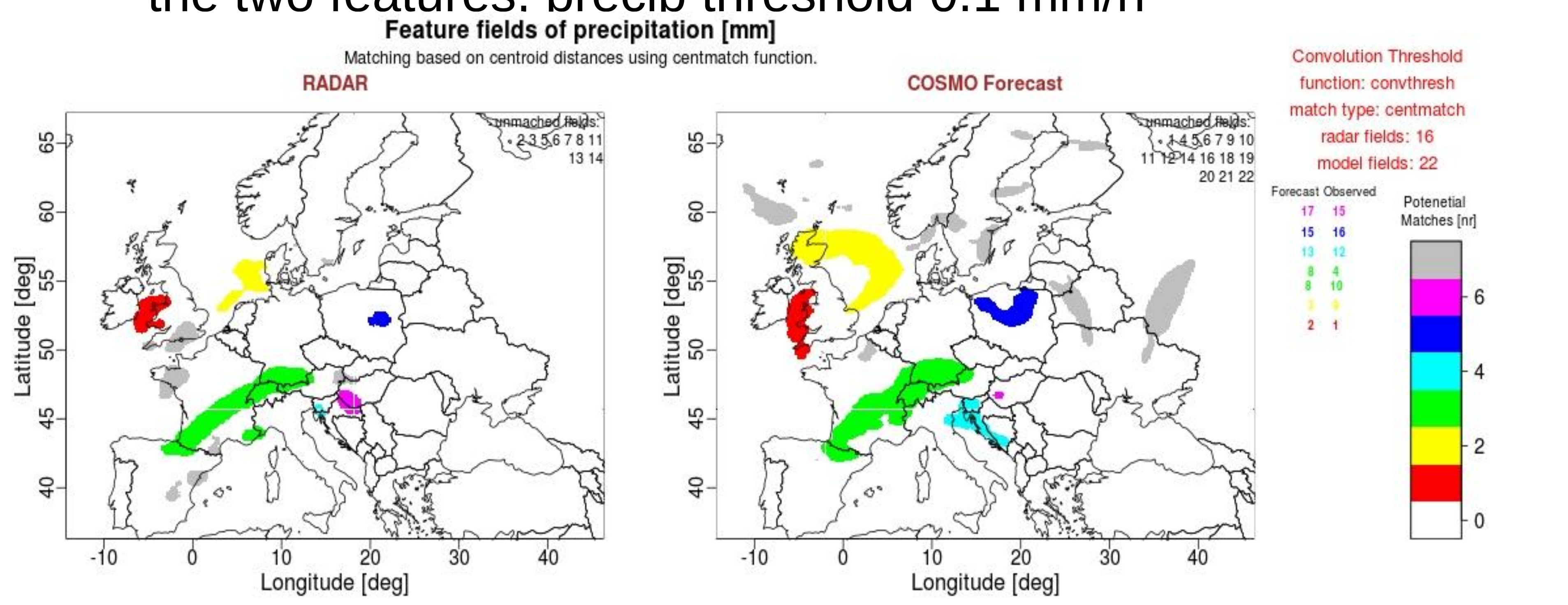


Features-based methods: MODE (IMGW-PIB) and CRA (Roshydromet) using R SpatialVx

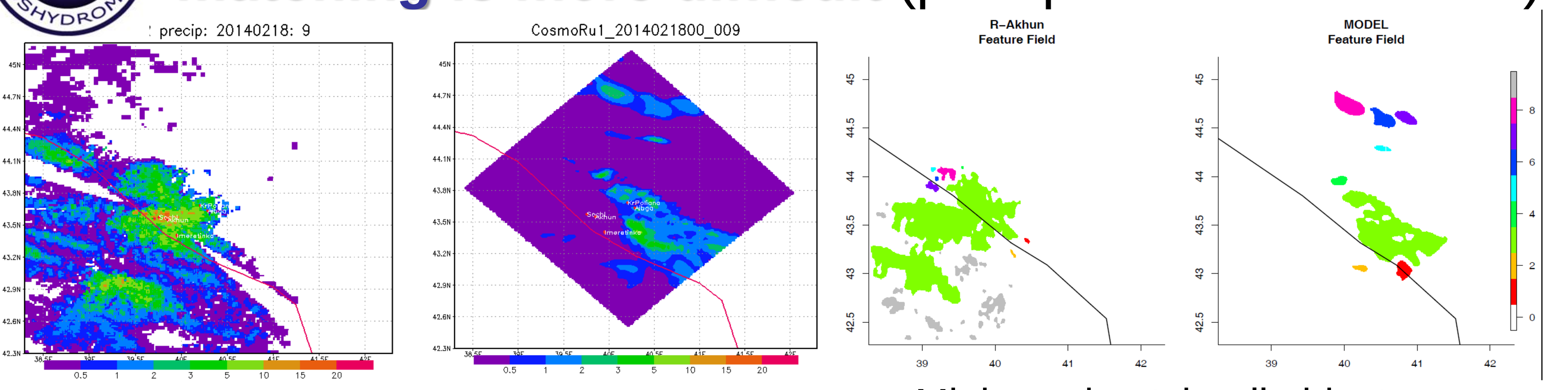
In both methods: The main problem is matching forecast and observed features.
Matching functions in SpatialVx:
deltamm and centmatch: Merge and/or match identified features within two fields using the delta metric method described in Gilleland et al. (2008), or the matching of method of Davis et al. (2006a)
Minbounmatch: minimum boundary separation

7-km COSMO-PL over Europe: matching is quite good

using centmatch with centroid distance D < average size of the two features, precip threshold 0.1 mm/h



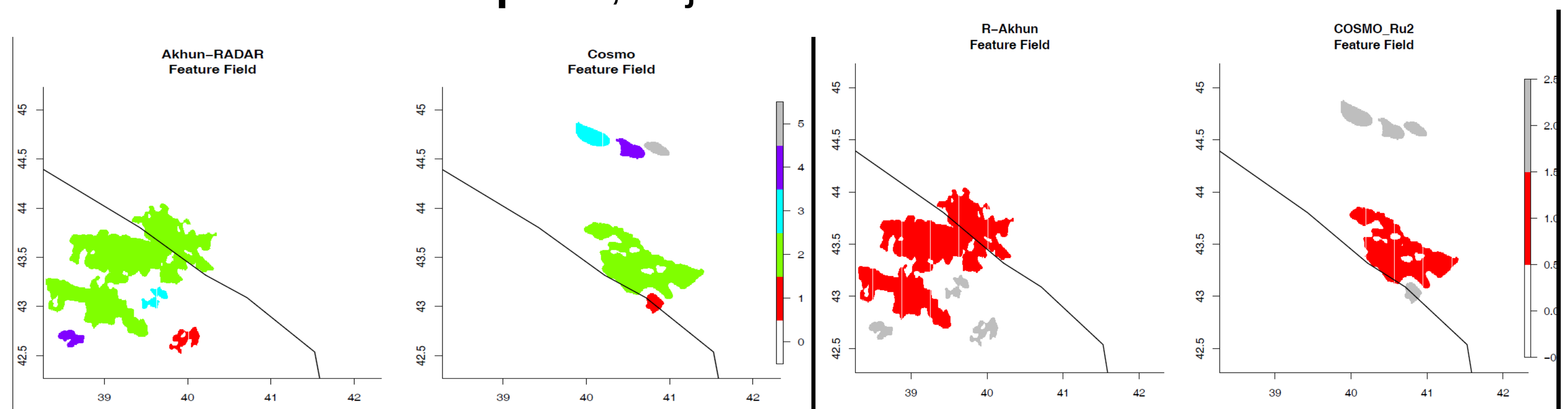
1- and 2-km models in the complex Sochi region: matching is more difficult (precip threshold 1mm/h)



Radar and COSMO-Ru1 fields, 20140218, 09UTC

Minboundmatch, all objects

Useful: min.size option, objects with area ~290 km^2 are cut off:



minboundmatch

Centmatch, D < average size of the two features

Problem: How to divide an object consisting of two parts connected with a thin stripe?