Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Combination of object-based probabilistic nowcasting and NWP ensemble

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The objective is to develop a seamless probabilistic prediction product based on identified objects in all members of nowcasting and NWP ensembles

SINFONY

Seamless INtegrated ForecastiNg sYstem

Pilot project to integrate nowcasting techniques with numerical weather prediction (NWP) to create a seamless forecast from observation time up to 12 h.

Data

Radar data

POLARA Polarimetric Radar Algorithms

- Available every 5 minutes
- 3-D scanning cycle:
  - Near-surface scan
  - Volume scans (10 Elevations)

COSMO-DE-EPS (with KENDA)

COSMO CONSORTIUM FOR SMALL SCALE MODELING

- Rapid Update Cycle (RUC)
- Model initialization every hour
- Prediction for the next 12 hours
- **EMVORADO** (Radar Forward Operator)
  - Generates simulated radar data (5 min)

Object detection and tracking

- Convective cells detected with KONRAD3D
- Same cell detection and tracking method for simulated and observed data
- Direct comparison between simulated and observed convective cells
- Different thresholds can be selected to define a cell

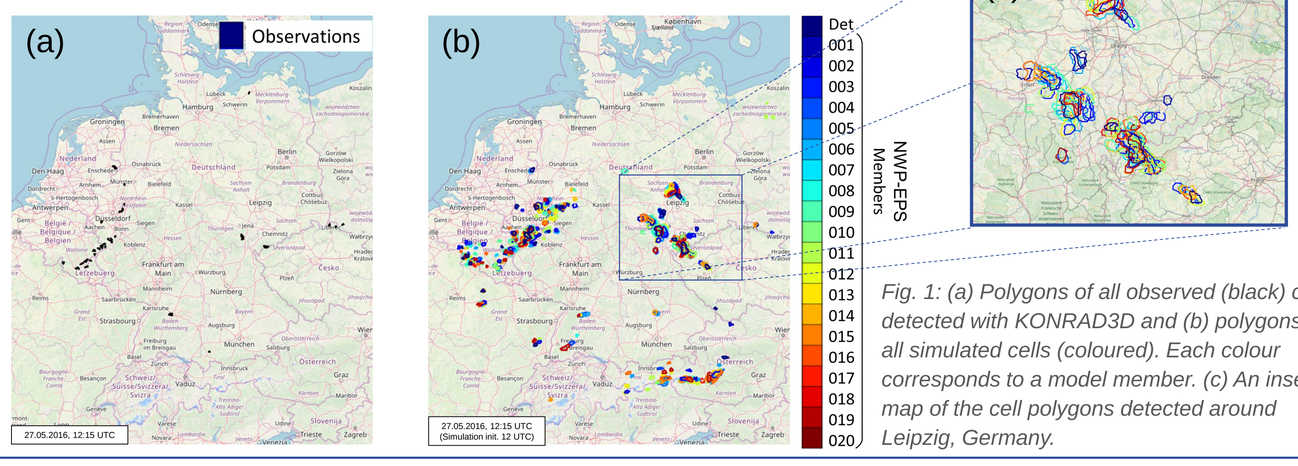

Fig. 1: (a) Polygons of all observed (black) cells detected with KONRAD3D and (b) polygons of all simulated cells (coloured). Each colour corresponds to a model member. (c) An inset map of the cell polygons detected around Leipzig, Germany.

Method to compare cell properties and KONRAD3D thresholds between simulated and observed objects

- Developed to evaluate the model skill in reproducing observed cells:
  - Simulated cells are bigger, less intensive and live longer than observed cells
  - Simulations using 2-moment microphysics scheme better reproduce the lifetime and intensity of observed cells
  - Different KONRAD3D thresholds for simulated and observed radar data could be appropriate for combined product
- It allows the comparison of any cell property provided by KONRAD3D, e.g., MASS, echo tops, areas over 45 dBZ, etc.

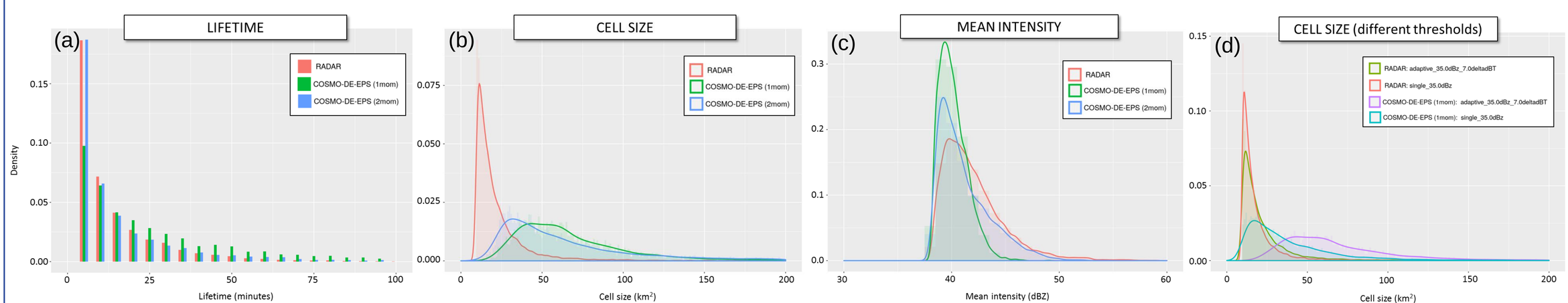

Fig. 2: Probability distribution function of (a) lifetime, (b) cell size and (c) mean intensity of simulated and observed cells. (d) Probability distribution function of cell size of simulated and observed cells using two different KONRAD3D thresholds. The simulated cells are those detected from the simulated radar data of the deterministic run of COSMO-DE-EPS. Based on data from eight days in summer 2016.

Combination method

a) Spatial clustering of simulated cells using DB-Scan method

b) Identification of areas with dense accumulation of simulated cells with cells observed therein

c) Selection of simulated cells from the "most reasonable" cluster (k-means) based on size, maximum intensity, minimum intensity and distance

d) Shift the selected simulated cells to the location of the observed cells

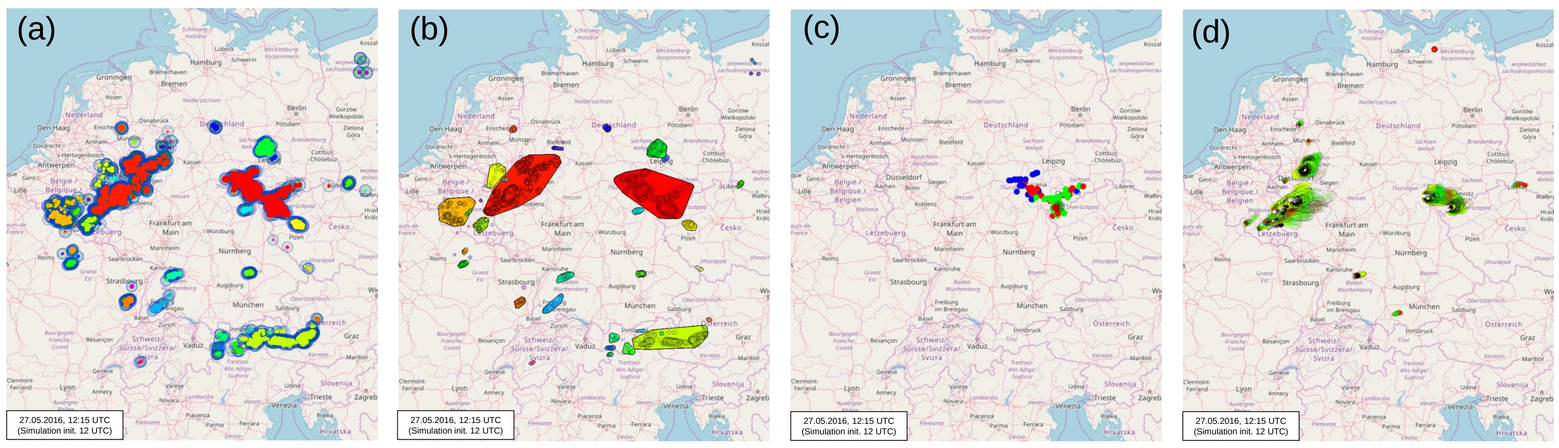

Fig. 3: (a) Spatial clustering of simulated cells based on DB-Scan; (b) polygons demarcating the areas with dense accumulation of simulated cells; (c) an observed cell (semi-transparent grey) surrounded by simulated cells (coloured) that belong to the closest polygon. The simulated cells are coloured based on their "similarity" to the observation: green (most similar), red (second most similar) and blue (less similar). (d) The most similar cells (green) are shifted to the location of the observed cells (white). The trajectories of both are represented with a colour scale from green to red and from white to black, respectively. The colour intensity represents the remaining lifetime of simulated cells.

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