

# SINFONY: A new Seamless INtegrated FOrecasting SYstem for very short range convective-scale forecasting at DWD

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## Motivation and project overview

New internal 4-year project at DWD to develop a seamless ensemble prediction system for convective-scale forecasting from observation time up to +6 h / +12 h forecasts.

**Focus:** Severe summertime convective events (heavy precipitation, hail, wind gusts, etc.)

**Up to now,** the forecast range 1-2 h is covered by purely observation-based nowcasting (NWC), whereas convection-permitting ensemble NWP (COSMO-D2-EPS) only outperforms the quality of NWC after 2 h. New NWP forecasts are available only every 3 hours based on a 20 min data cut-off.

**Moreover,** NWC and ensemble NWP are treated as two separate and independent methods, few common products are currently available for the forecasters.

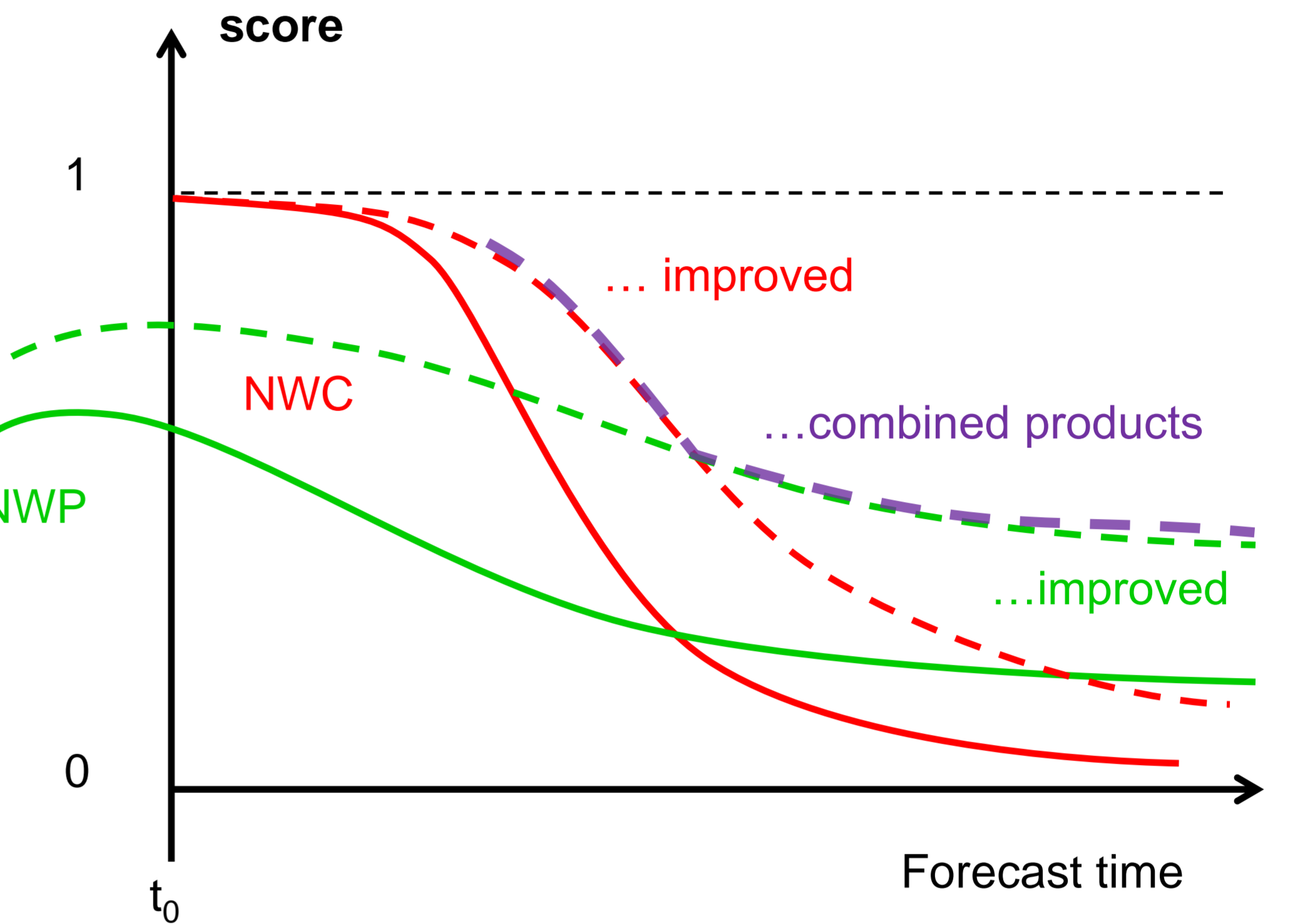
**Goal:** Narrow the gaps between NWC and NWP, on the one hand by further developing both NWC and NWP separately and on the other hand by mutual information exchange and combination of NWC & NWP. Use of high-resolution observational data (3D radar, satellite, GPS-derived moisture, lightning, etc.).

We consider in particular:

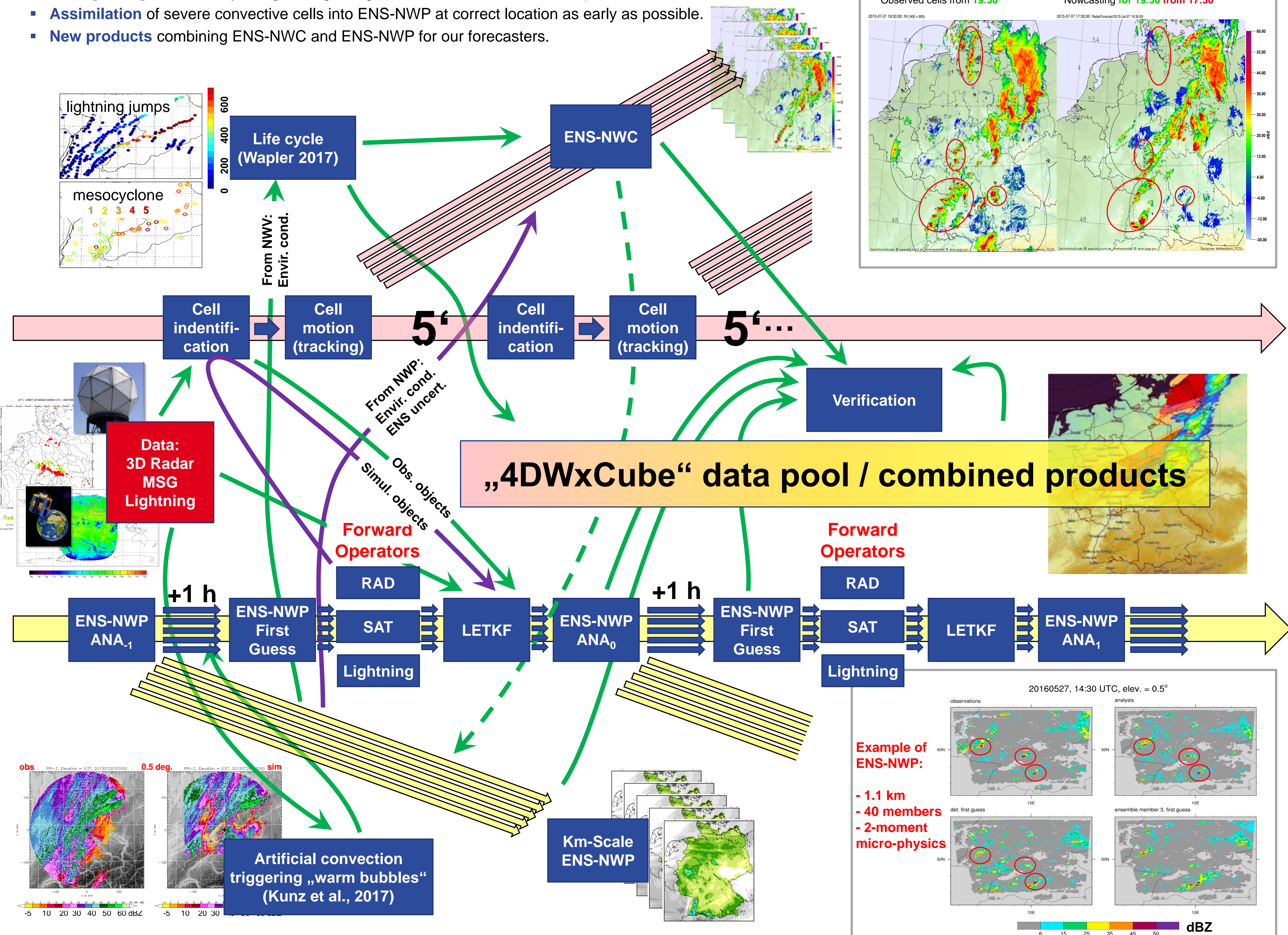
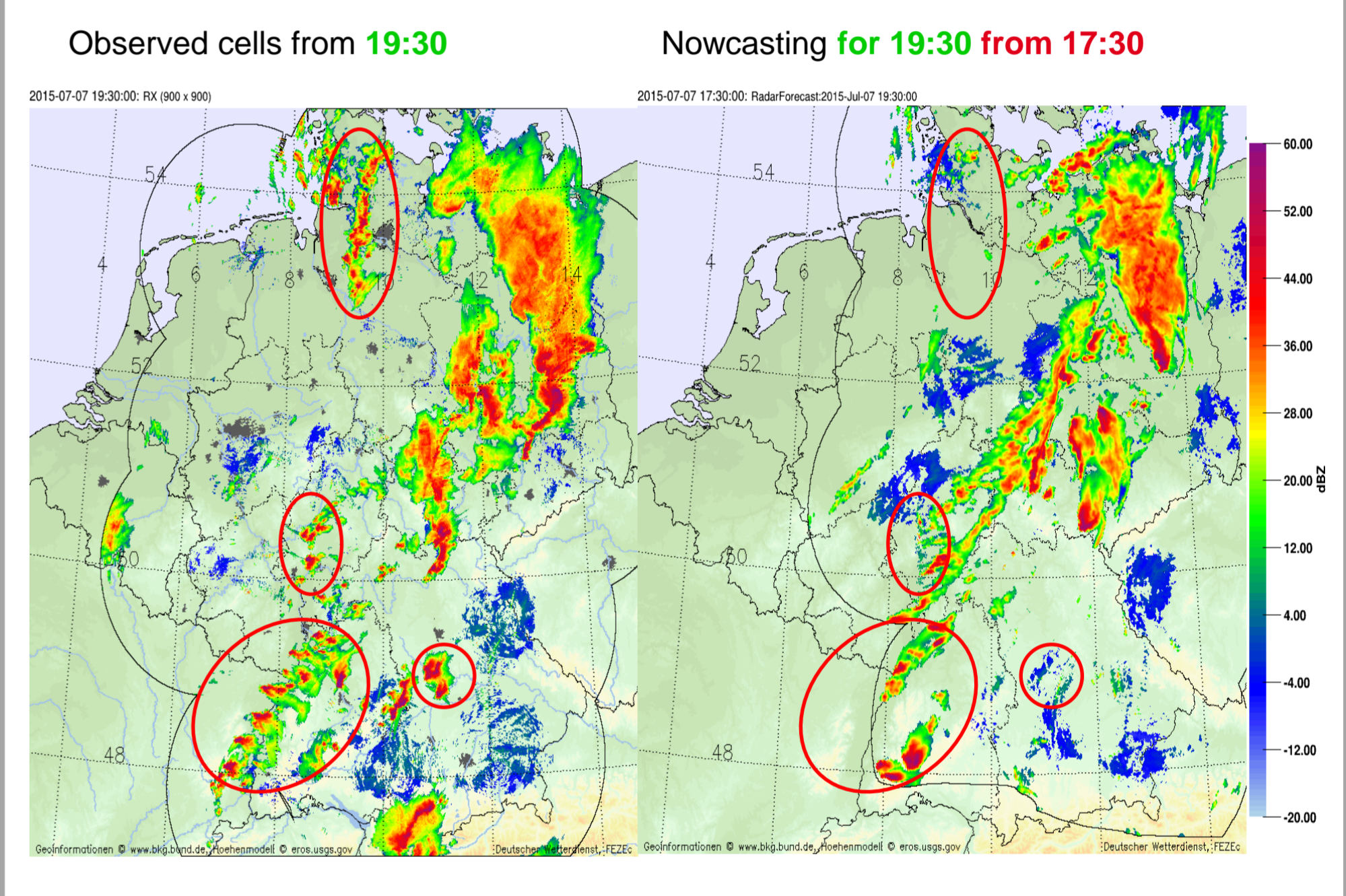
- **NWC ensembles of "fields" and "objects"**, also taken into account uncertainties from ENS-NWP.
- **Life cycle in NWC** (Wapler, 2017) based on radar, lightning and satellite data, and on ENS-NWP.
- **Rapid Update Cycle (RUC) ENS-NWP:** 1-km-scale, LETKF, hourly update, ~40 members, advanced physics (, e.g. 2-moment microphysics including hail, 3D turbulence).
- **LETKF assimilation** (Schraff et al., 2016) in ensemble NWP in observation space of
  - **3D radar data** (Bick et al., 2016; Zeng et al., 2016) - native observations & NWC "objects",
  - **METEOSAT (MSG) SEVIRI IR / VIS** (Scheck et al., 2016),
  - **Lightning** flash density using the Lightning Potential Index as a forward operator,
- **Assimilation** of severe convective cells into ENS-NWP at correct location as early as possible.
- **New products** combining ENS-NWC and ENS-NWP for our forecasters.

## SINFONY concept

Some forecast quality



Typical example of problems with NWC for longer lead times:



## References

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