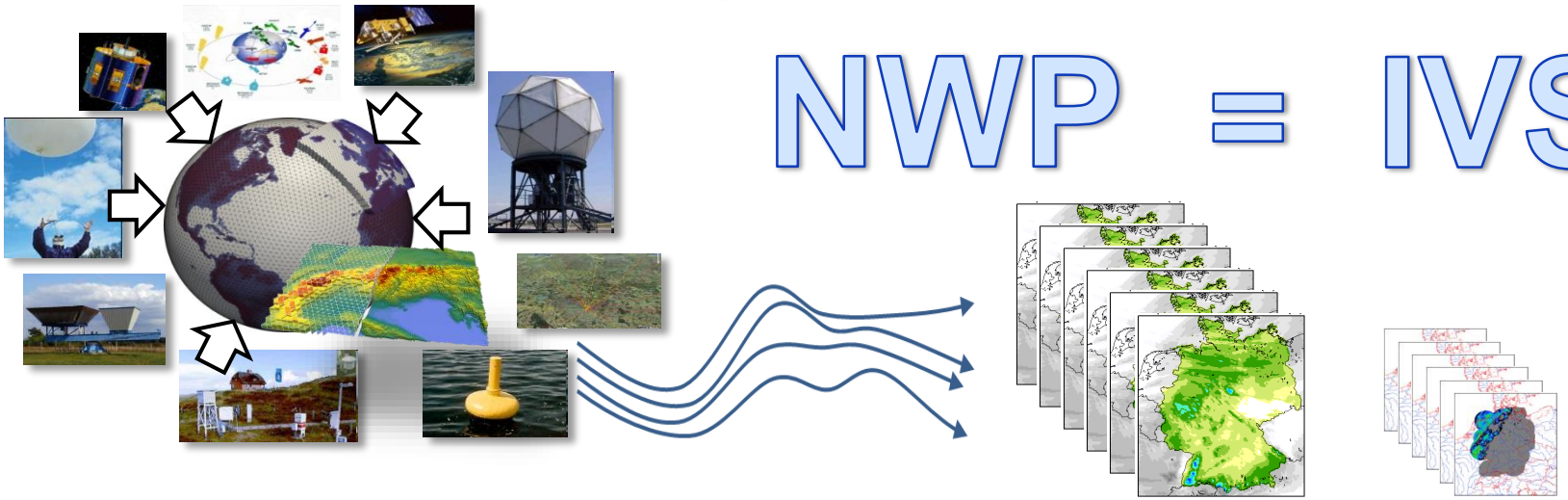
NowCasting x NWP = IVS



Integrated Forecasting System
Integriertes Vorhersagesystem (IVS)

D. Majewski and R. Potthast (DWD, Research and Development)

Integrated Forecasting System (IVS) for Nowcasting and very short range forecasts

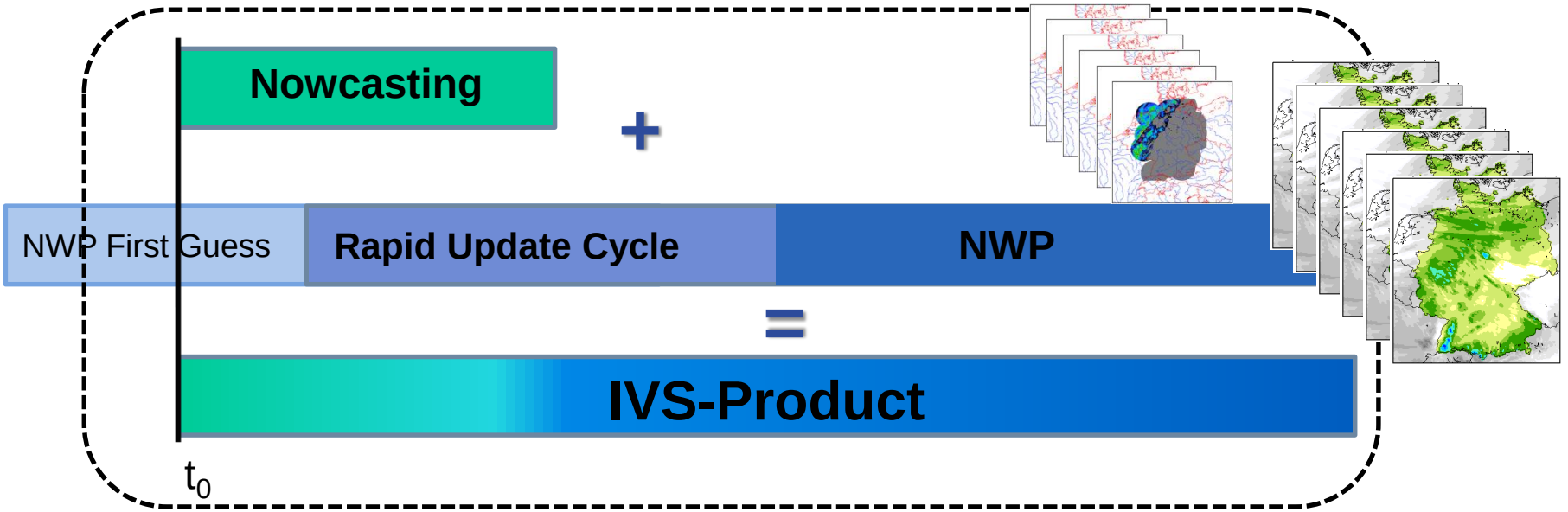
DWD is employing very different approaches for nowcasting (0 – 2h) and very short range forecasts (2 – 6/12 h) .

Nowcasting
Feature based, e.g. detection of convective cells in radar images; estimation of propagation speed and direction; „linear“ extrapolation of detected objects/features.
Update-rate of new forecasts ~ 5 to 15 min.

Very short range forecasts
NWP model based; analysis of the initial state taking as much as possible high resolution observational data into account; solution of the hydrodynamical equations on a high resolution 3D-grid for the atmosphere and the surface/soil.
Update-rate of new forecast ~ 3 h.

Integrated Forecasting System (IVS)
Combination of both approaches to an ensemble-based seamless forecast product for forecast ranges from 0 to 6 (12) h with a rapid update rate (≤1 h).

Seamless Detection and Ensemble Assimilation / Forecasting

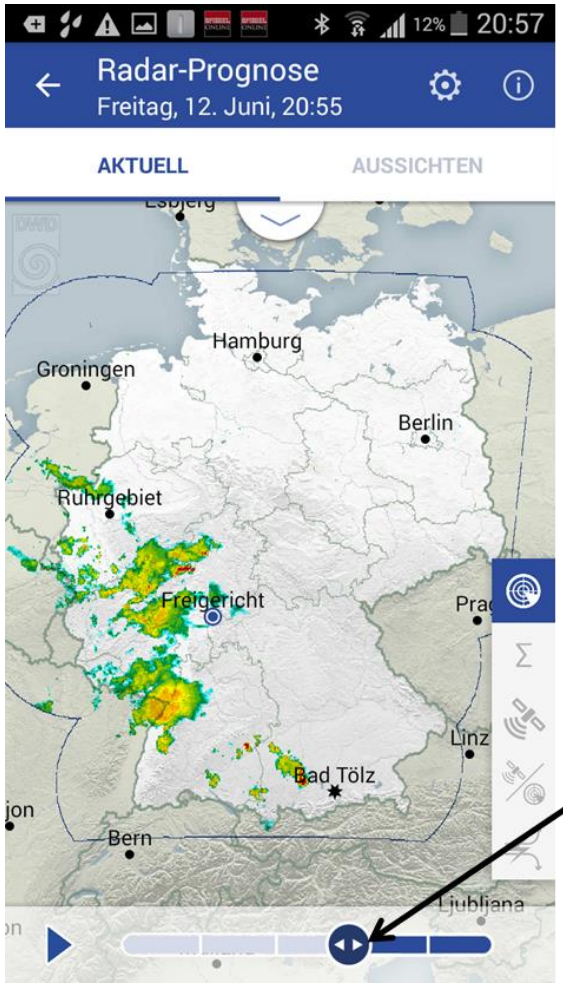


Combination of (advanced) Nowcasting and (improved) NWP

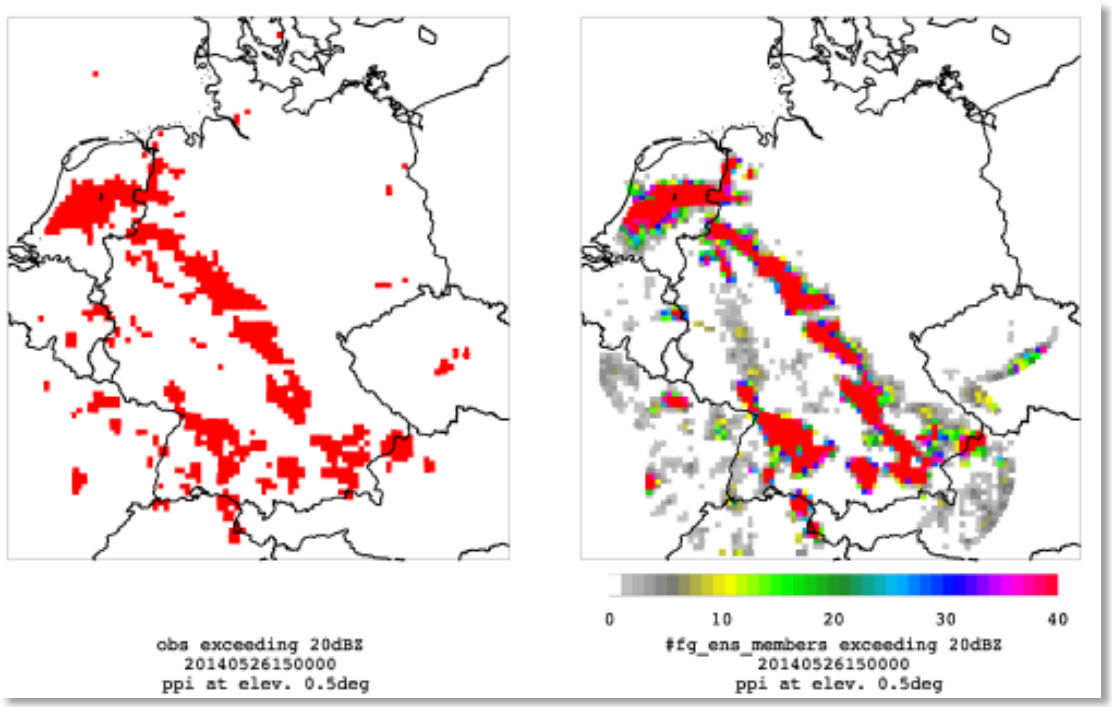
Integrated Forecasting System (IVS)

Consistent products on all scales

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



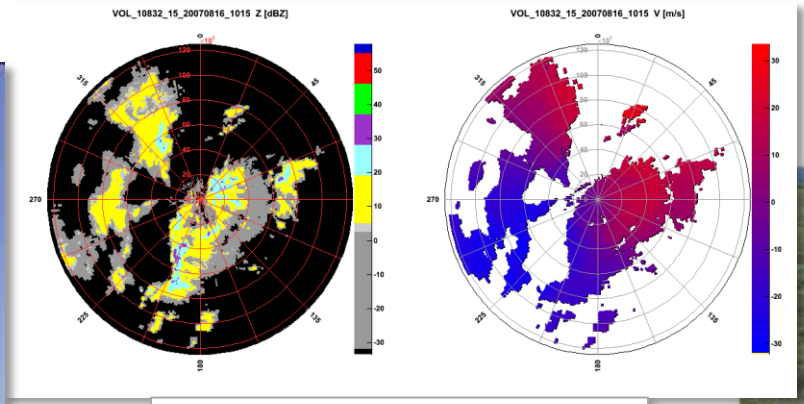
Nowcasting
Radarprognose +2h



RADAR Nowcasting EPS and NWP Ensemble

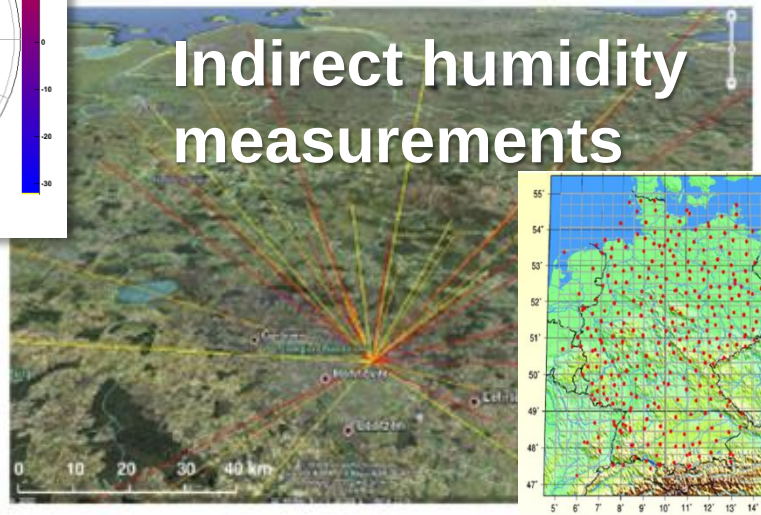
High temporal resolution (1 to 5 min) observations, e.g. Radar, Seviri, GPS, lightning, …

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

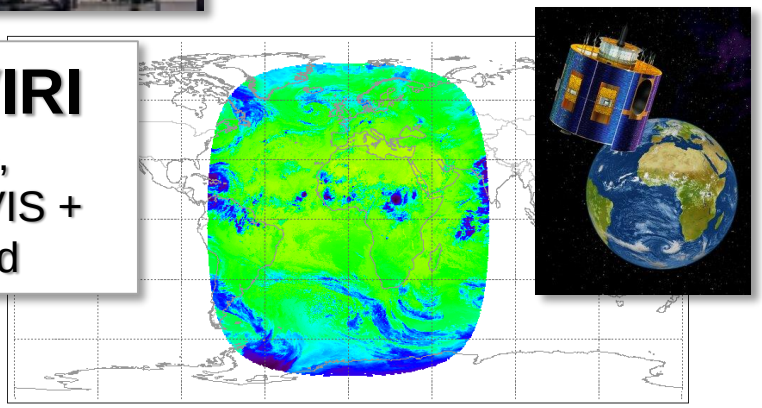


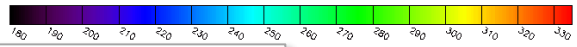
RADAR 3D

Lightning …



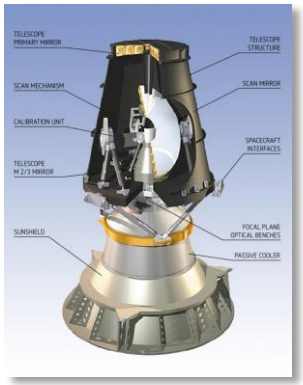
SEVIRI
Visible,
Near VIS +
Infrared

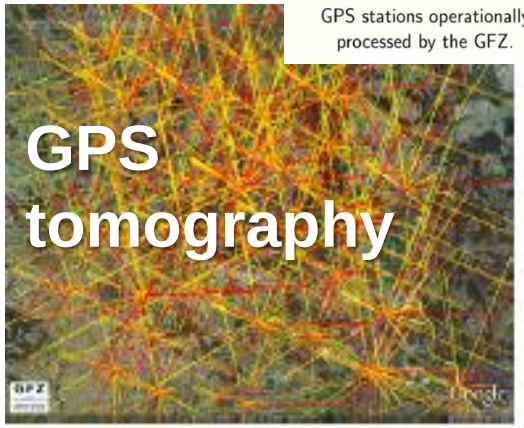




10min **Synop**

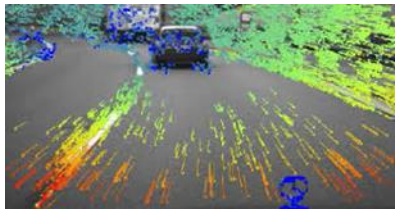
Cameras …





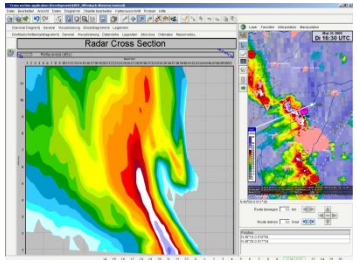
Advanced Nowcasting

- Estimate the **uncertainty of Nowcasting products**
  - EPS for the calculation (on pixel level) of optical flow
  - EPS for the detection and forecasting of objects

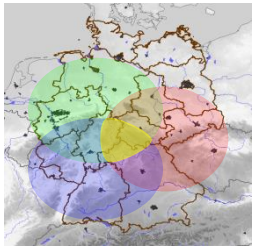


Quelle scs.ch

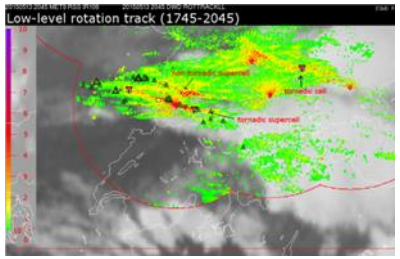
- Earlier **detection of initiation** of severe thunderstorms
  - 3D-detection and tracking of convective cells (KonRad-3D)
  - Combination of radar, lightning, satellite, Synop, NWP data
  - Convergence zones based on doppler wind data
  - Convective Initiation based on satellite data



- Forecasting of the **trend of development**
  - NWP RUC for near storm environment
  - Trend of development according to „ingredients method“
  - Life cycle of convective cells



- Development of new **Level-2 products for the detection of HIW**
  - Gust detection, rotation-track, VIL-track, VII-track
  - Reduce negative impact of wind turbines (renewable energy)
  - Use dual-polarization data, e.g. for rain/snow, hail size



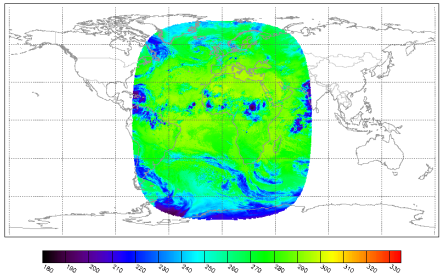
Further Development of convective scale NWP

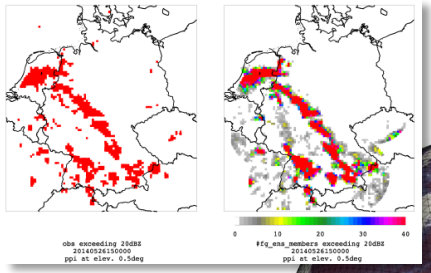
- Assimilation of new **observations**
  - Radar volume data, consistence with LHN
  - SEVIRI Infrared and SEVIRI Near-VIS
  - Screen-level observations
  - Lightning (LPI - lightning potential index)

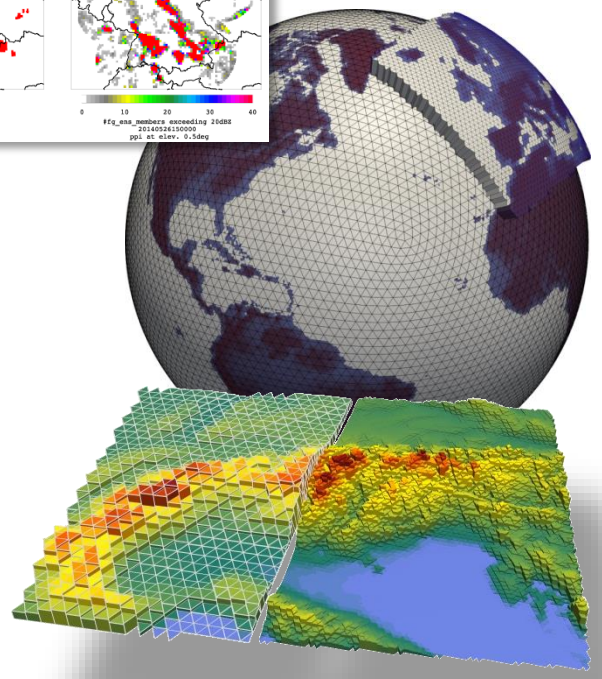
- Further development of **model physics / dynamics**
  - Physical parameterizations
  - Two-moment cloud microphysics
  - Interaction of physics and dynamics
  - Model grid spacing ~1km (or less)

- Development of **Rapid Update Cycle NWP**
  - Data assimilation (RUC-EDA)
  - RUC forecasts
  - Ensemble (features, perturbations, calibration)

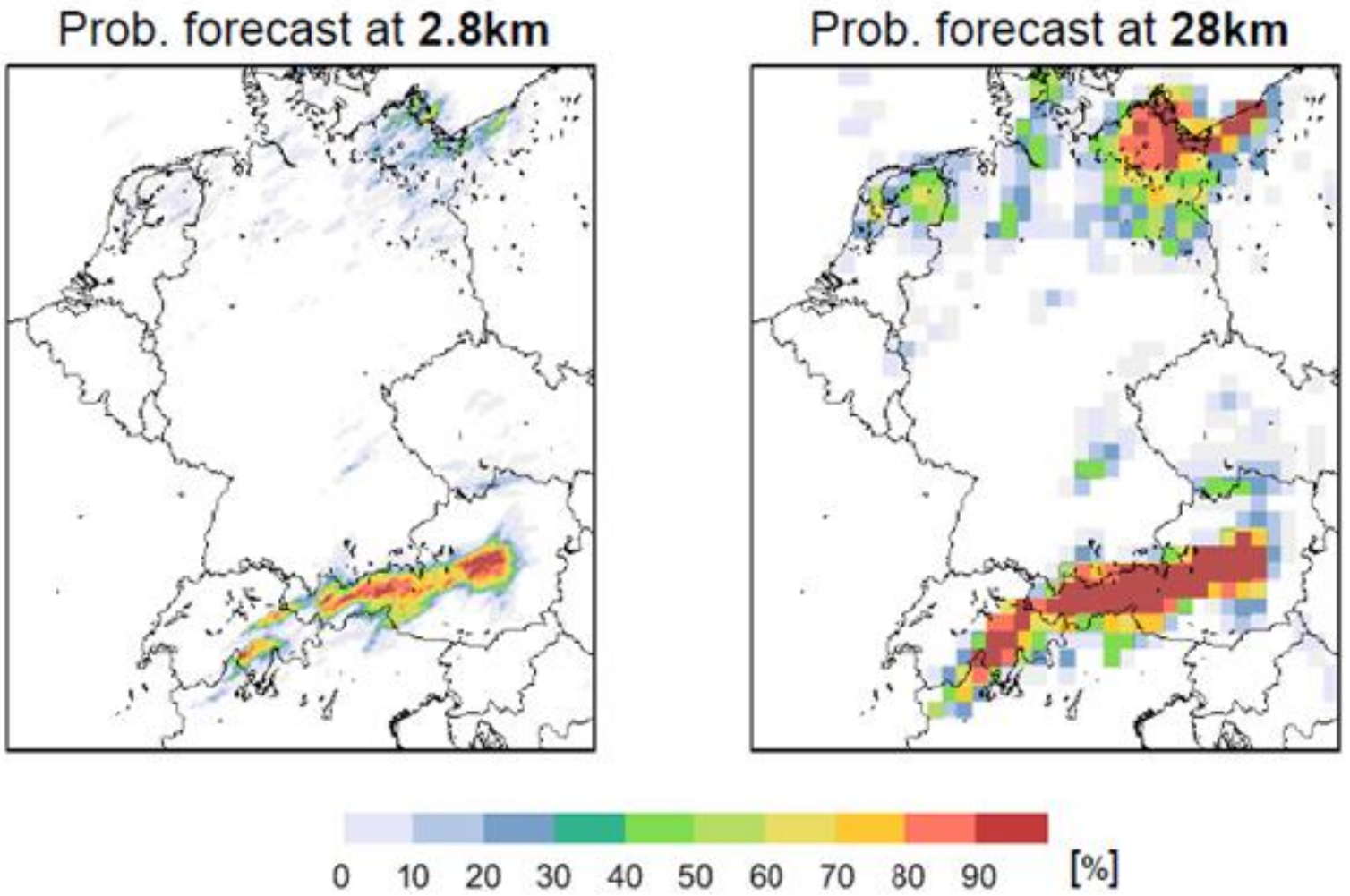
- Development of new **EPS-based products and verification**
  - Detection of HIW, precipitation, gusts, turbulence
  - Consistency between global and regional EPS

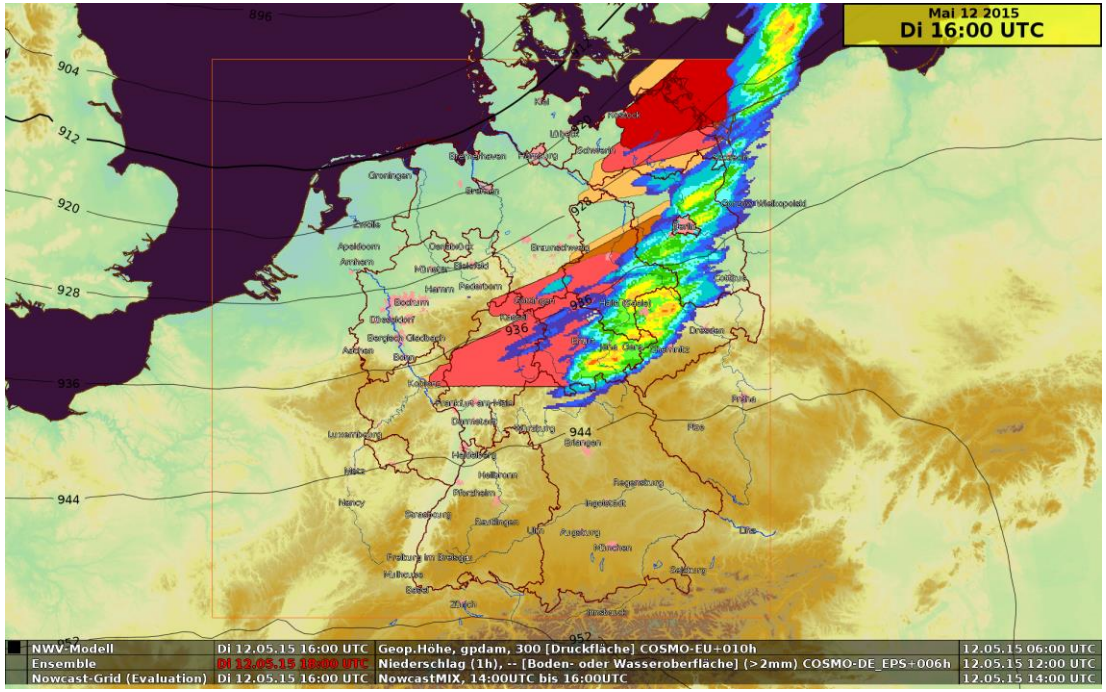






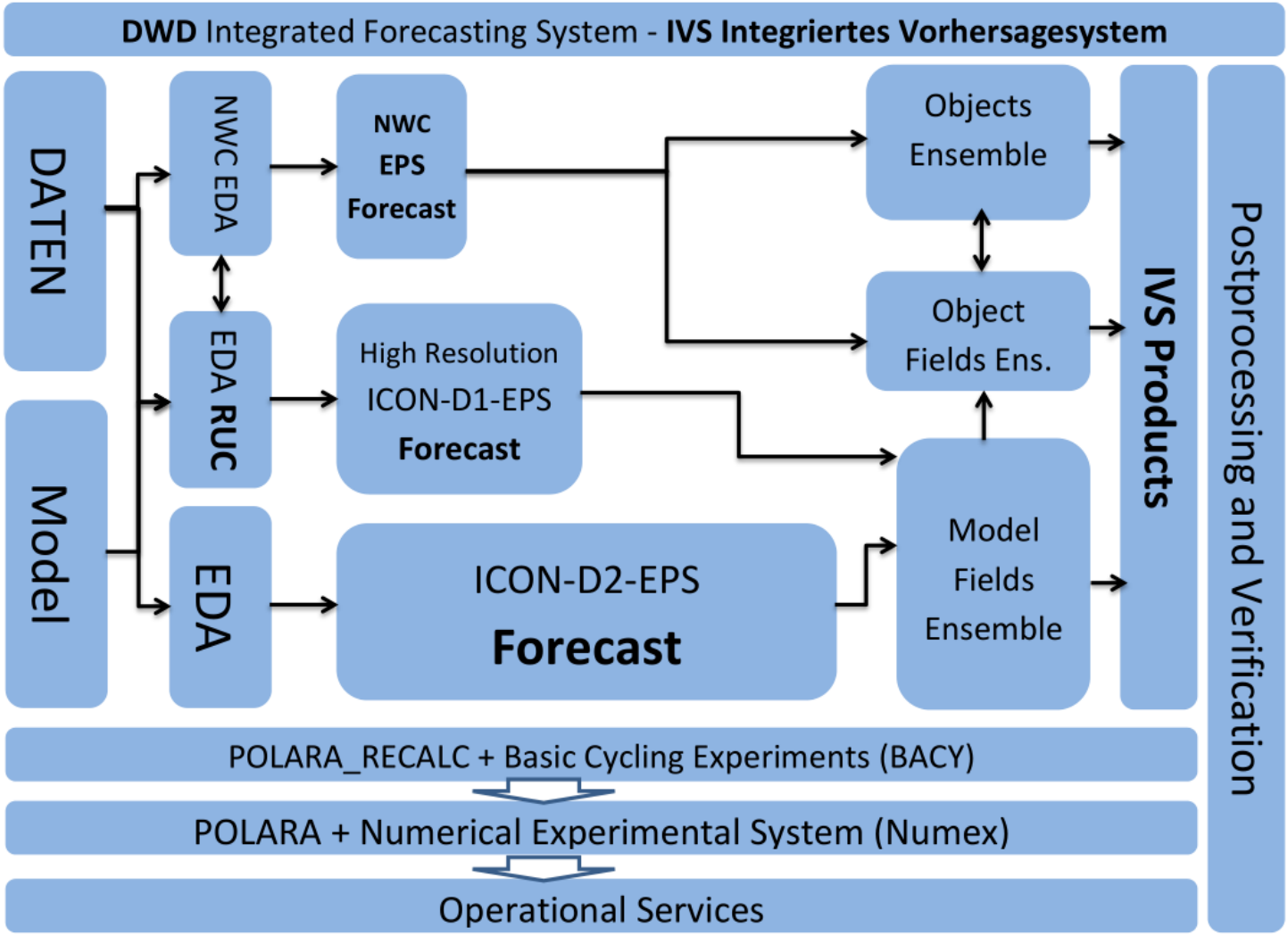
Products: Consistent objects and probabilities



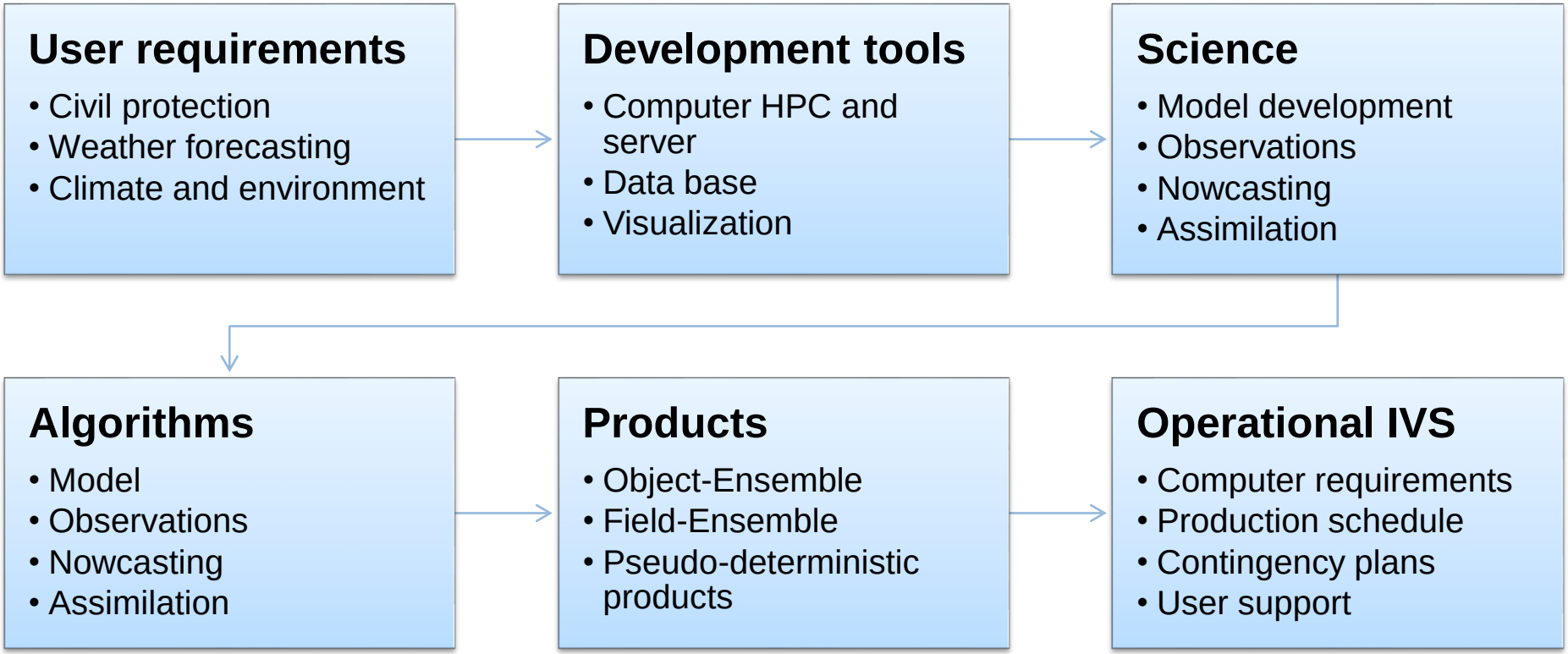


- **Combine products of** Nowcasting and RUC-NWP, RUC-NWP and short range NWP
- Use existing development tools like POLARA-Recalc (for Nowcasting), BACY (NWP)
- Initial **IVS-Products**
  - Probabilities for precipitation > x mm/h
  - Ensembles of weather objects
- Develop **concepts for storing and visualizing** IVS data efficiently in NinJo workstation

IVS components



IVS Development process



IVS research proposal and resource plan

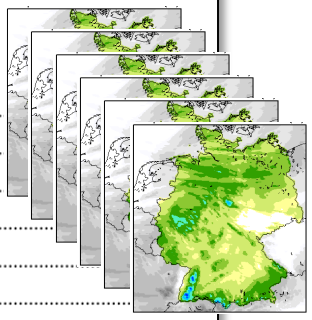
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Grundlegende Ziele und Zusammenfassung – Stand vom 29.2.2016

Integriertes Vorhersagesystem (IVS)
Entwurf Fachkonzept

Autoren: Julia Bachmann, Marcus Paulat, Roland Potthast, Axel Seifert und Kathrin Wapler.
Mit Beiträgen von: Dirk Heizenreder, Detlev Majewski, Michael Buchhold, Susanne Theiß, Bodo Ritter, Michael Denhard, Thomas Hanisch, Andreas Rhodin, und Gerhard Paul.

Inhalt



Research proposal ☺

Resource plan ☺

Paket P1: IVS Gewitter-Objekt-Ensembles

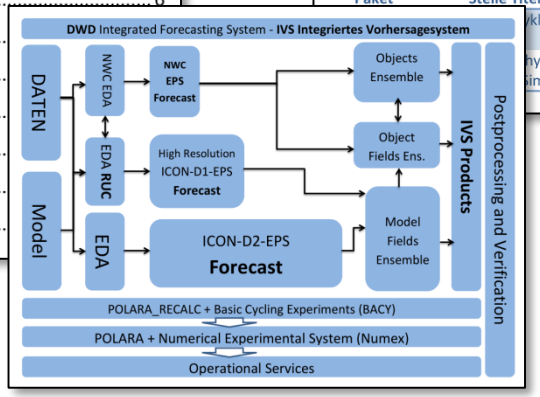
Paket	Stelle Titel	Stelle Art	Bezug
P1 – 1	Entwicklungsumgebung	Neu (identisch mit P4-1)	FE12+FE13+FEZE
P1 – 2	Objekt-Ensemble (NWC)	Neu	FEZE
P1 – 3	Rapid Update Cycle (NWV)	Bauernschubert	FE12
P1 – 4	Produkt Objekt-Ensembles	Neu	FEZE+FE15/14
P1 – 5	Verifikation	Neu (identisch mit P4-5)	FE15
P1 – 6	Visualisierung NinJo	Neu (identisch mit P4-6)	FEZE

Paket P2: IVS Homogenisierung der Datenbasis

Paket	Stelle Titel	Stelle Art	Bezug
P2 – 1	Assimilation 3D-Volumen Radardaten	Dauerstelle zu priorisieren	FE12
P2 – 2	Assimilation Blitzdaten	Neu	FE14/13/12
P2 – 3	Assimilation SEVIRI-VIS/HRV Daten RUC	Neu	FE12
P2 – 4	Assimilation von Objekten des NWC in der NWV	Neu	FE12
P2 – 5	EMF Technologie-Transfer in das IVS-NWC	Neu	FEZE

Paket P3: IVS Homogenisierung der Physik und Modellierung in NWV und NWC

Paket	Stelle Titel	Stelle Art	Bezug
	klus konvektiver Zellen im	Wapler	FEZE
	hysik und Numerik hochauf- simulation	In Ausschreibung	FE13/FE14



Board of Directors + Ministry (BMVI)

The 4-year IVS project will start at DWD in January 2017


Thank you for
your interest!
Any questions?