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Wetter und Klima aus einer Hand

The German In-flight Icing Warning System ADWICE
-
current status, on-going research & development and future challenges

In-Flight Icing Users Technical Interchange Meeting
Washington DC, 25-26 Feb. 2015

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Overview

- ADWICE system
  - Prognostic Icing Algorithm
  - Diagnostic Icing Algorithm
- Verification
- User Products
- On-Going Research & Development
- Single European Sky ATM Research Program (SESAR)
- Future Challenges

ADWICE System

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Prognostic Icing Algorithm (ADWICE PIA)

COSMO-EU (3D) →

- Pressure
- Temperature
- Humidity
- Top and Bottom of Convection

↓

Catalog for icing scenarios

↓

Prognostic Icing Product (PIP)

↓

Icing scenario

↓

Freezing	*Stratiform*
Convective	*General*

Icing intensity (fuzzy logic)

↓

Severe	*Moderate*
Light	

- Updated 4 times a day
- Hourly forecasts up to 24h, 3-hourly until 78h

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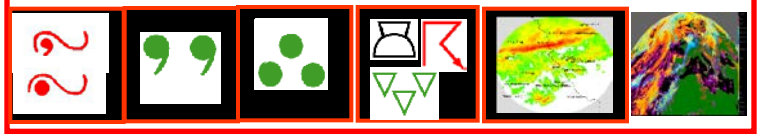
Diagnostic Icing Algorithm (ADWICE DIA)

PIP (3D) as „first guess“

Observational data (2D)
SYNOP/METAR & RADAR +
SATELLITE (www.nwcsaf.org)



Catalog for icing scenarios
(Confirm/reject PIP and identify possible icing risk)

Freezing | *Stratiform*
Convective | *General*

Icing scenario

Severe | *Moderate*
Light

Icing intensity
(fuzzy logic)

Diagnostic Icing Product (DIP)

- Updated hourly!

ADWICE System - Verification

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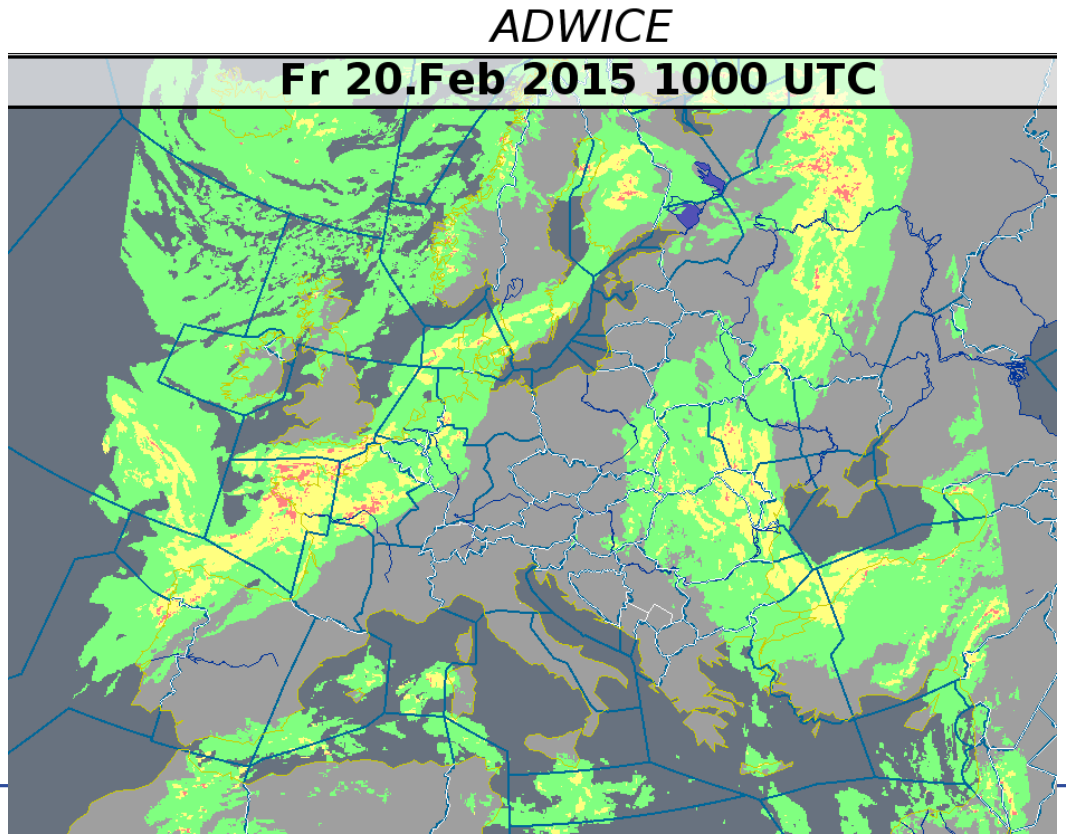
- Comparison: ADWICE vs. PIREPs (Oct.-Dec. 2013)
  - „cube“ of all model-grid-points within ~20km horizontal and 3 GP vertical around PIREP compared with PIREP
  - Neglect icing intensity (only: Icing or No Icing)
  - Problem: only few (472) PIREPS available over Europe, especially “no icing” information missing

	Hit-Rate	1-False-Alarm-Rate	Area under curve
PIP	86,65	66,67	0,7666
DIP	83,23	71,43	0,7733

ADWICE user products

- Operational in use for aviation advisory centres in visualisation tool “NinJo” (Germany & Switzerland) on
  - Model layers (lowest 33)
  - Flight Levels (12 levels, up to FL 300)
  - As composite



ADWICE user products

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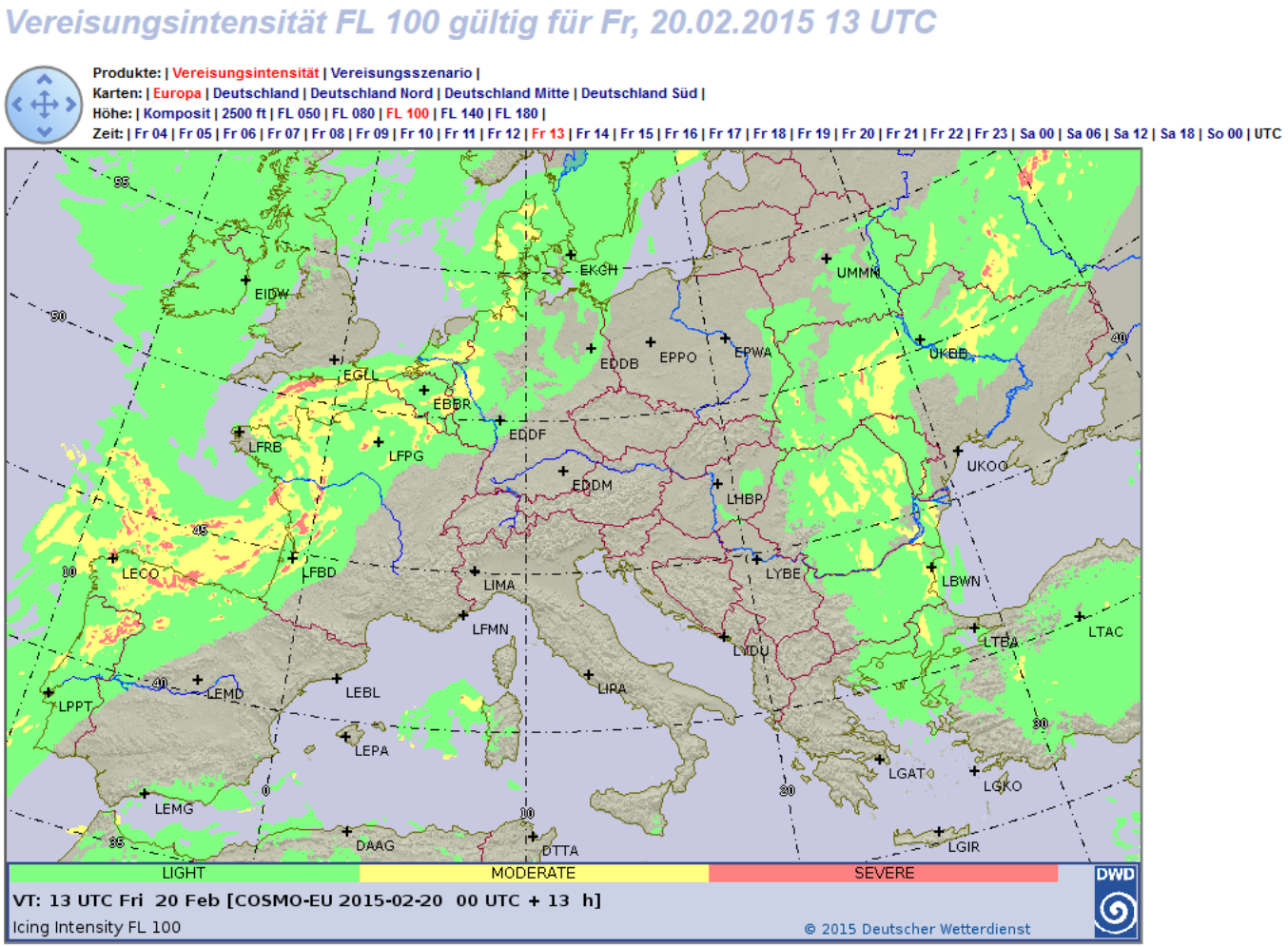
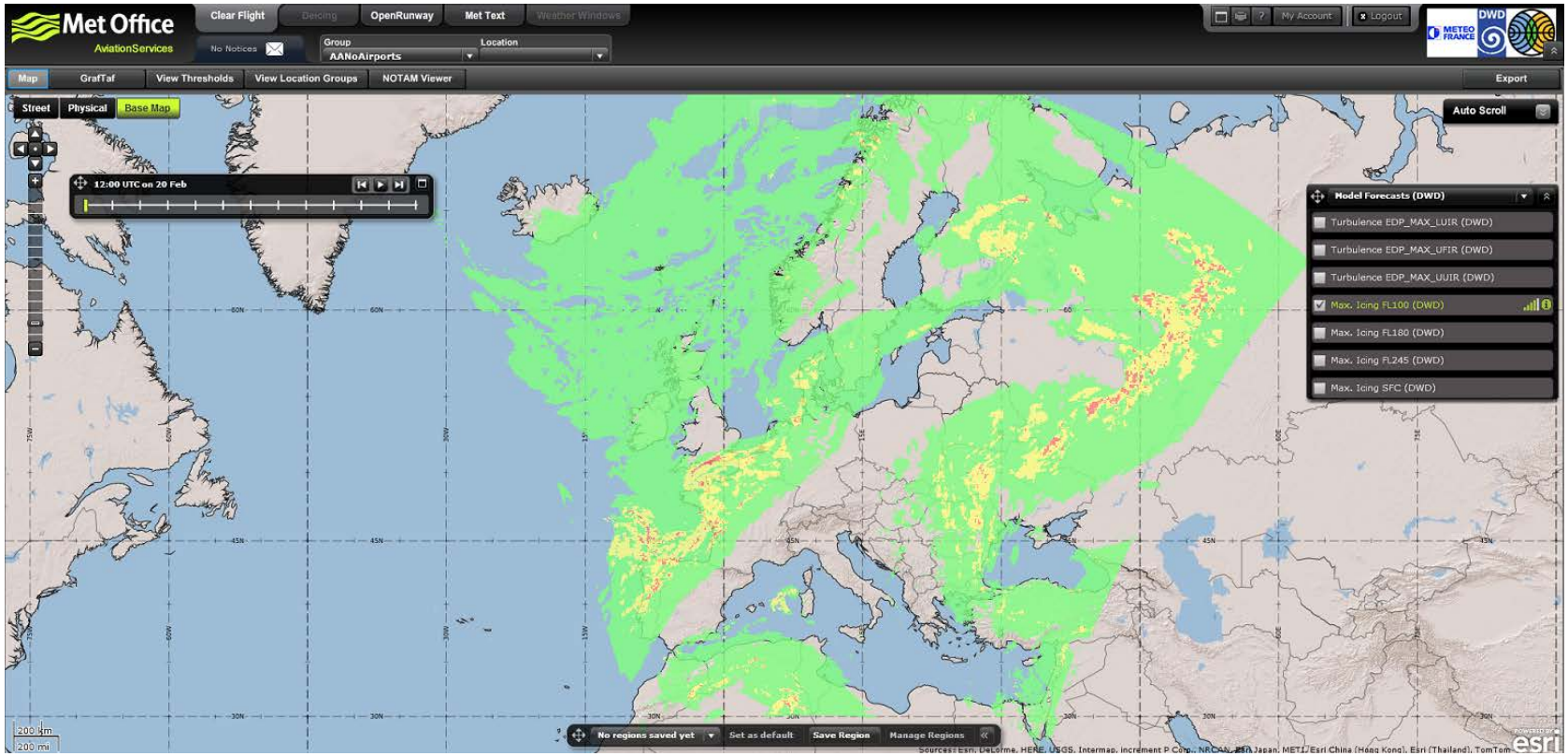
- Self-briefing System „pc-met“ for general aviation (license required): https://www.flugwetter.de



ADWICE user products

- EUROCONTROL: Clearflight-tool (UKMO)
  http://www.metoffice.gov.uk/premium/aviationservices
- Decision support for Networkmanager (account required)



On-going Research & Development

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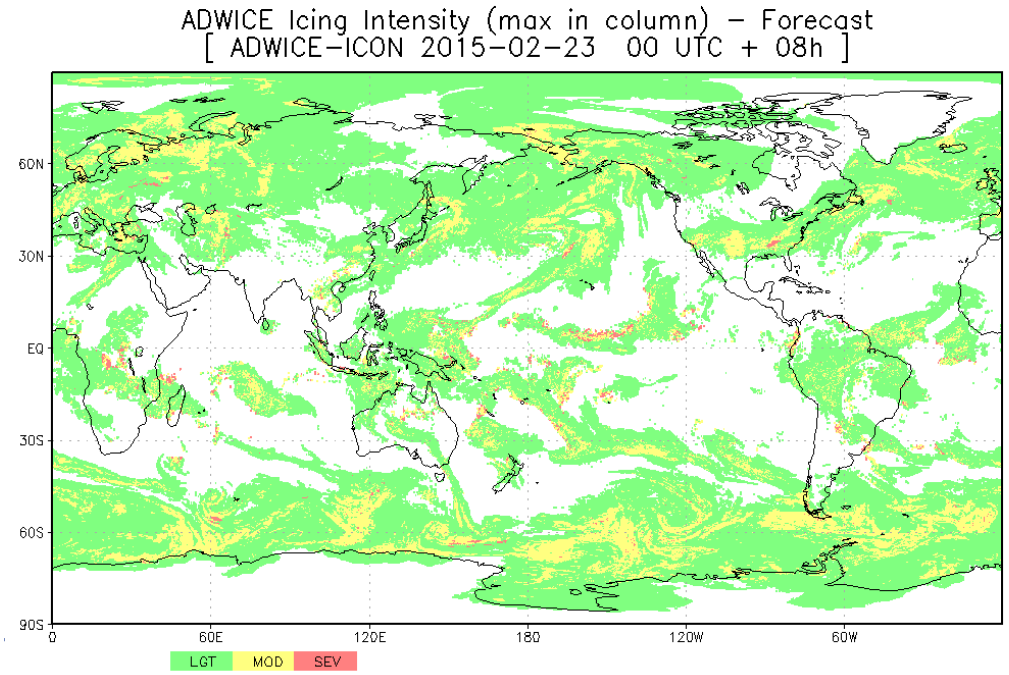
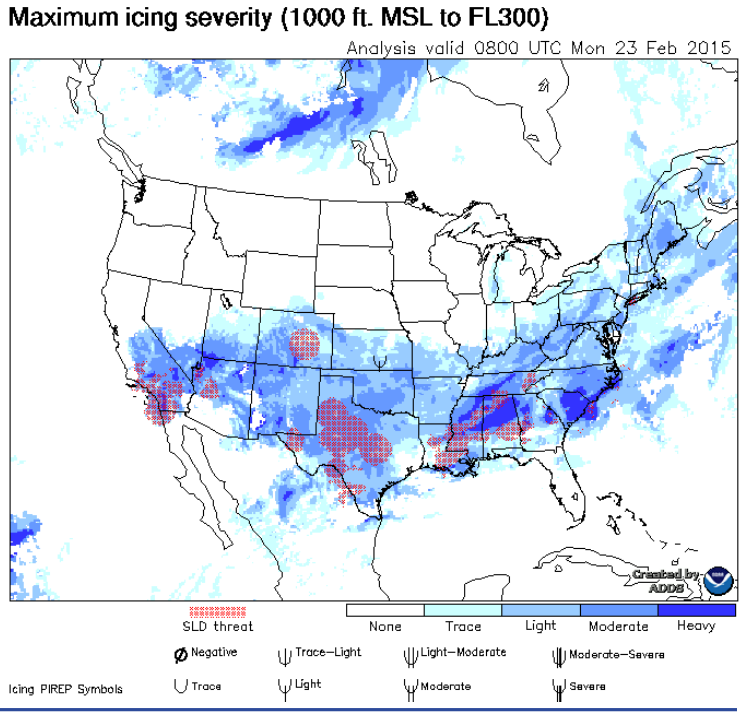
- **Global setup of ADWICE** with ICON model data:
  - on ~0.25° global horizontal grid (planned for 2016: ~0.125°)
  - Icing – Forecasts expected to be operational end of 2015 (verification missing yet → PIREPS?!)
  - Icing – Diagnosis following afterwards





http://www.aviationweather.gov/adds/icing/icingnav

On-going Research & Development

- **(T-)AMDAR study** ongoing with COSMO-EU over U.S.:
  - Additionally used (PANASONICS Tropospheric-) Atmospheric Meteorological Data Reporting system – data (T/AMDAR) as initial input data for COSMO-EU over U.S. (e.g. 50665 additional measurements on 10th of June 2013)
  - one result: reduction of Forecast error of humidity in the boundary layer
  - Question: how is the influence on results forecasting Aircraft Icing by unsing AMDAR/TAMDAR data in NWP?

SESAR Work Package 11.2

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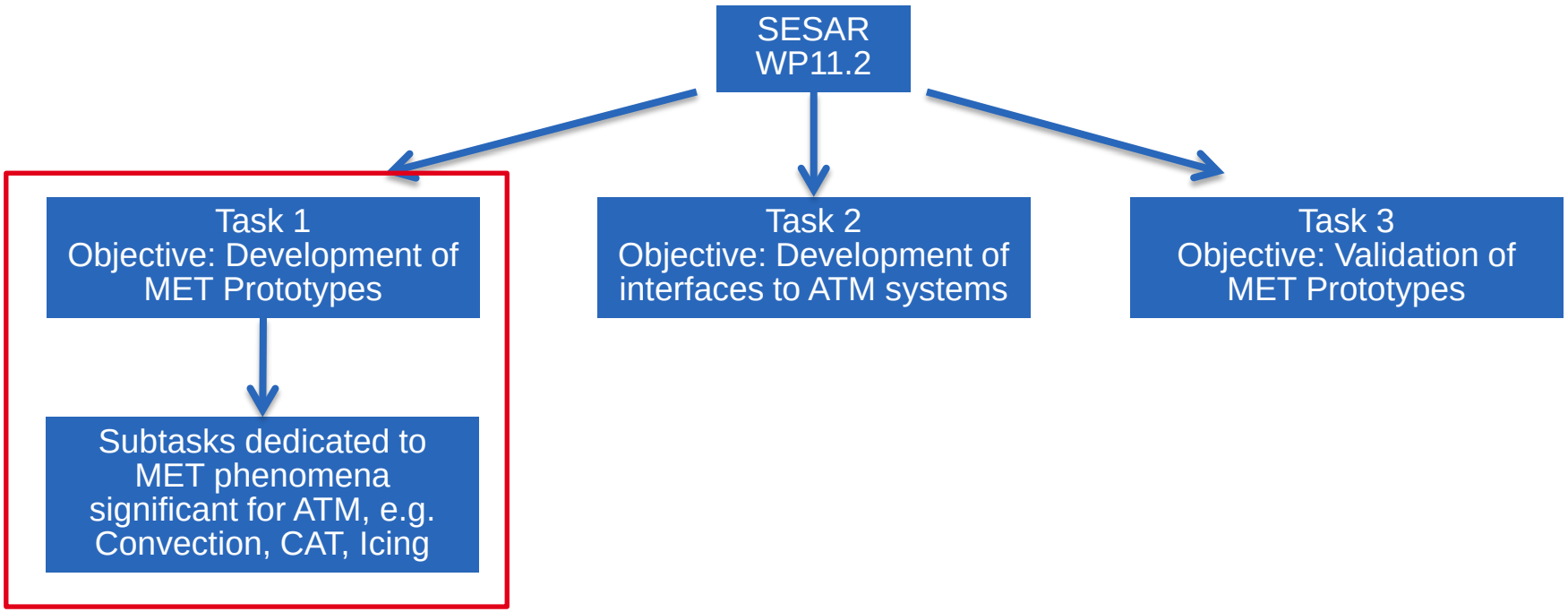
Project Aim:

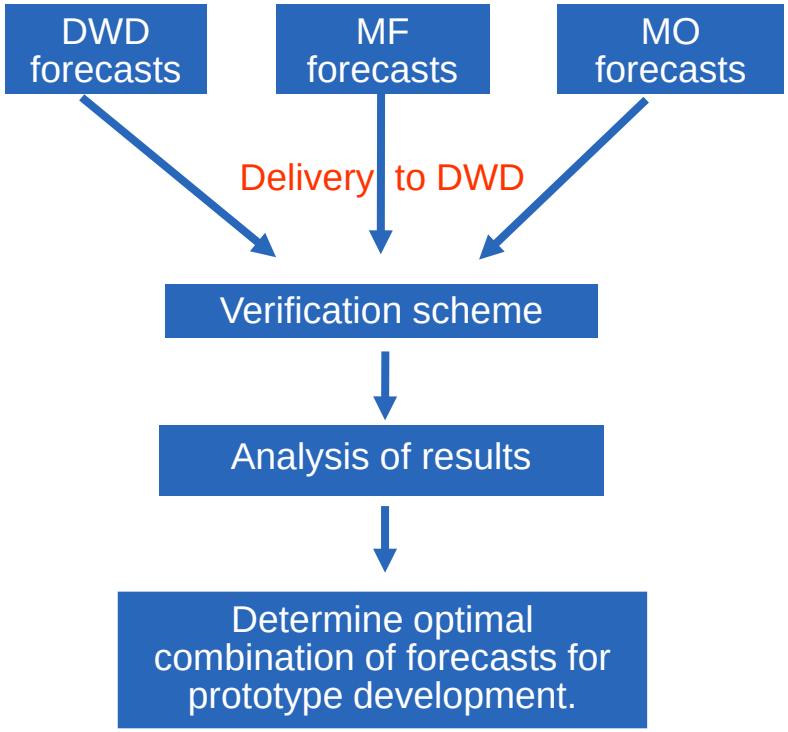
Develop consolidated harmonized forecast products over Europe to increase efficiency of processes related to Air Traffic Management (ATM).



X1.4 Icing Subtask

Objective:

Develop a unified forecast of icing conditions based on a composite of the most advanced existing techniques from DWD, MF and MO.



PEPE, M. S. & THOMPSON, M. L. (2000). Combining diagnostic test results to increase accuracy. *Biostatistics* **1**, 2, pp. 123-140

Future Challenges

- ➔ Ice crystal icing?
- ➔ Icing forecasts for type of aircraft?
- ➔ Combining new remote sensing data / observations with icing-diagnosis
- ➔ Improve liquid water content (LWC) → direct usage of LWC for icing forecasts instead of Temperature & Humidity thresholds
- ➔ What do users really need?

Thank you for your attention!

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