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Tailored and On-time Weather Information for Road Traffic Management

(ID: 24)

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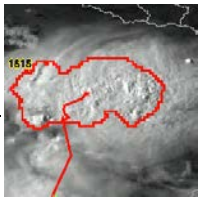
Weather and Traffic

- Adverse weather – no longer a given fate
- Future road management systems require
  - tailored and designed information on adverse weather
  - information sharing
  - translation of weather into impact (categories) - > business cases
  - integration of wx impact in the management processes for decision making
  - on tactical and strategic, local and regional levels / time scales
- Three meteorological approaches are necessary
  - sufficiently dense weather monitoring (profiling) -> diagnosis/analysis
  - very short-term prediction (from now up to 1-6 h) -> now-casting
  - numerical weather prediction (beyond ~ 6 h) -> forecasting

Tailored and On-time Weather Information for Traffic

- Reduce complexity:
  Derive simple objects with attributes that describe the hazardous event on a local level to the users
- The message must be self-explaining, unambiguous and consistent
- The message must be tailored and detailed to the needs of the different users
- The impact of weather on traffic must be determined
  derive business cases with end users (e.g. major transportation companies)

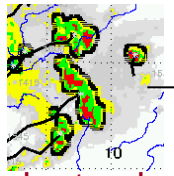
Weather Forecast User-oriented System Including Object Nowcasting


Cloud tracker

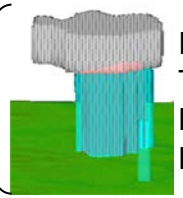
POLDIRAD

Lightning

Surface Analysis


Radar tracker

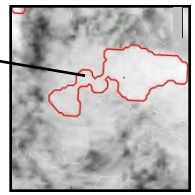
weather object specification oriented at user requirements


Initiation
Track
Nowcast
Forecast

forecast validation

forecast validation

Object Comparison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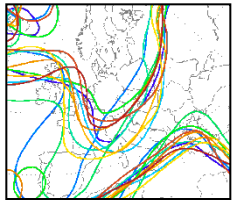
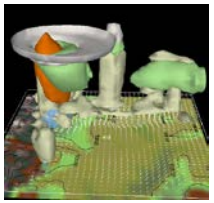
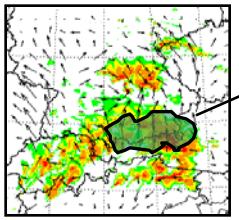
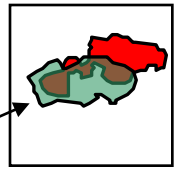
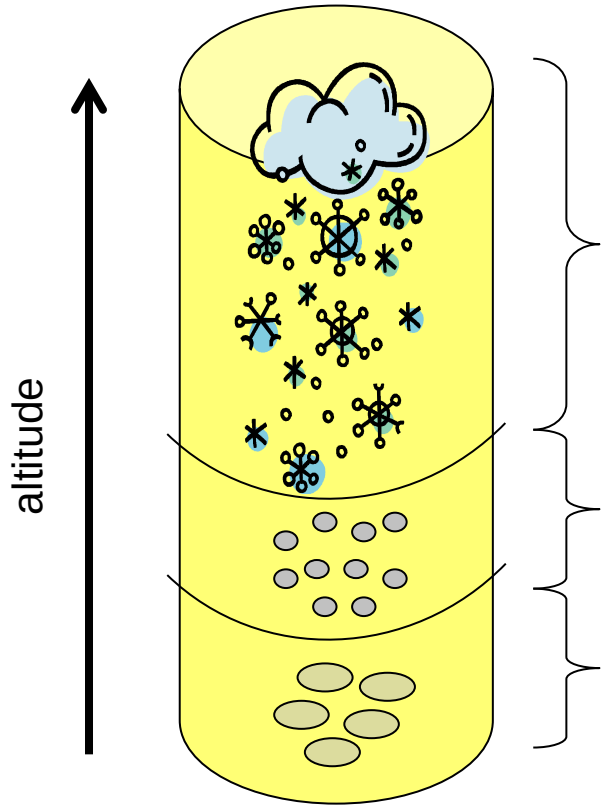

COSMO-DE & Ensemble


Local forecasting


SYNRAD


Object Comparison

Definition of a Winter Weather Object



SNOW - POLDIRAD,
AMDAR & COSMO-profiles

FZRA - Advanced Diagnosis and Warning System for Icing Environments

RAIN - MRR, Parsivel, SYNOP, GFS, SWIS

- AMDAR → temperature & humidity profiles
- POLDIRAD → hydrometeor information (volume, high res.)
- PARSIVEL → size and fall speed of particles
- MRR → Raindrop size distribution and rain rate

Nowcasting concept

Analysis

- Use all available local data with high refresh rates
- Apply fuzzy logic

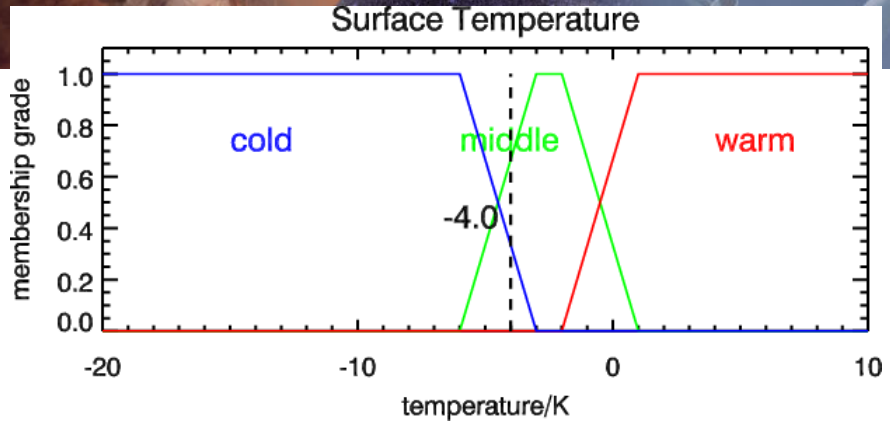
} WWO

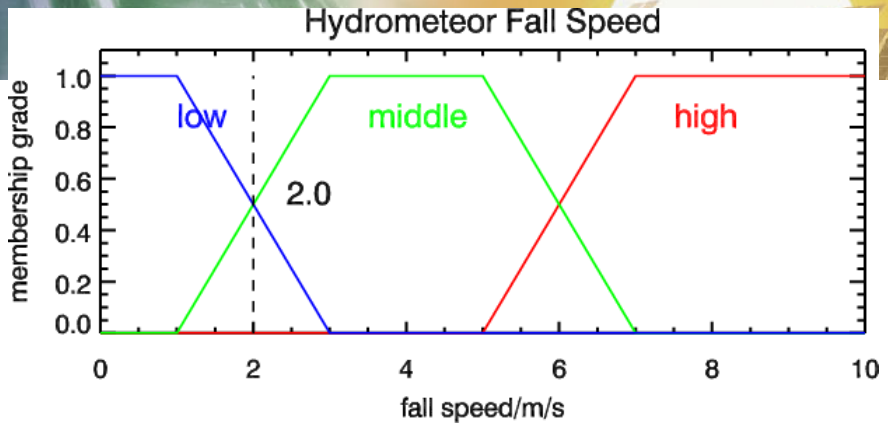
Trend

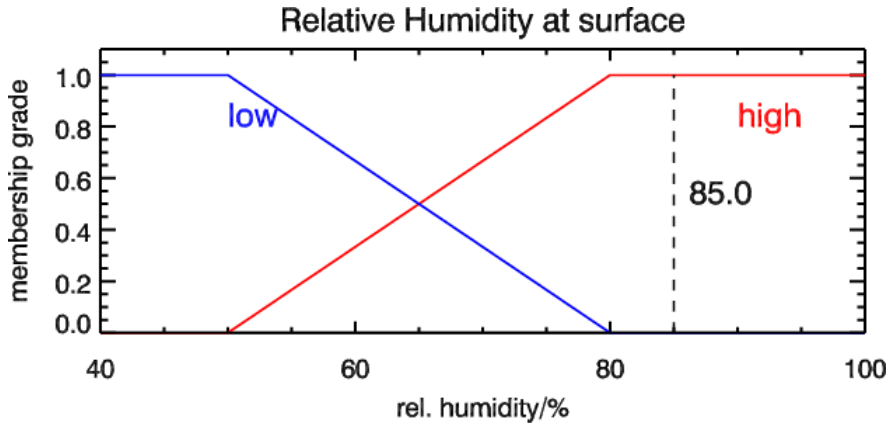
- Take into account changes of local measurements
- Use forecast data of COSMO*MUC* for trend estimates
- Take into account diagnostics at surrounding stations:
  advection of upstream weather

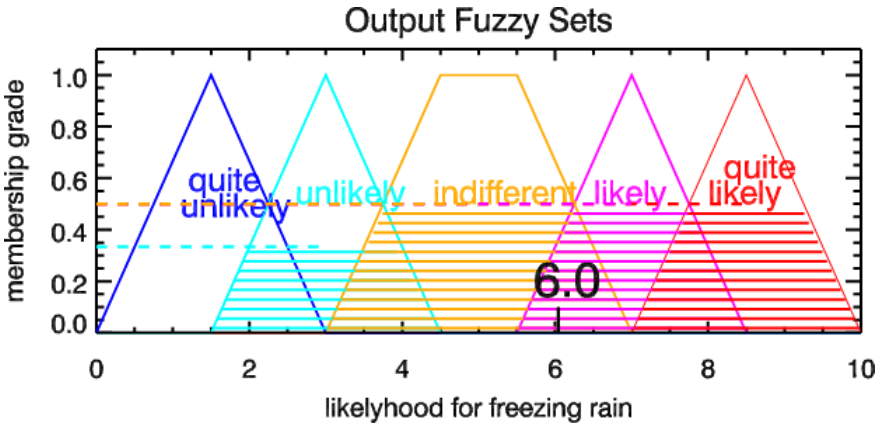
Nowcast

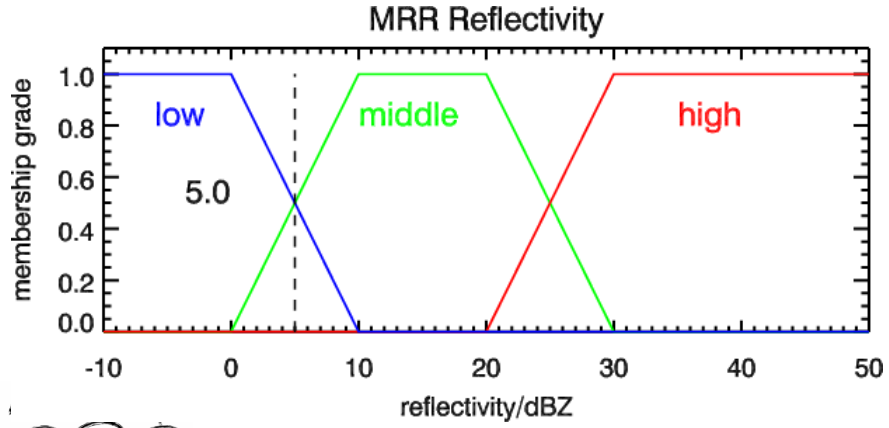
Combine analysis with trend to estimate conditions up to 2 hours





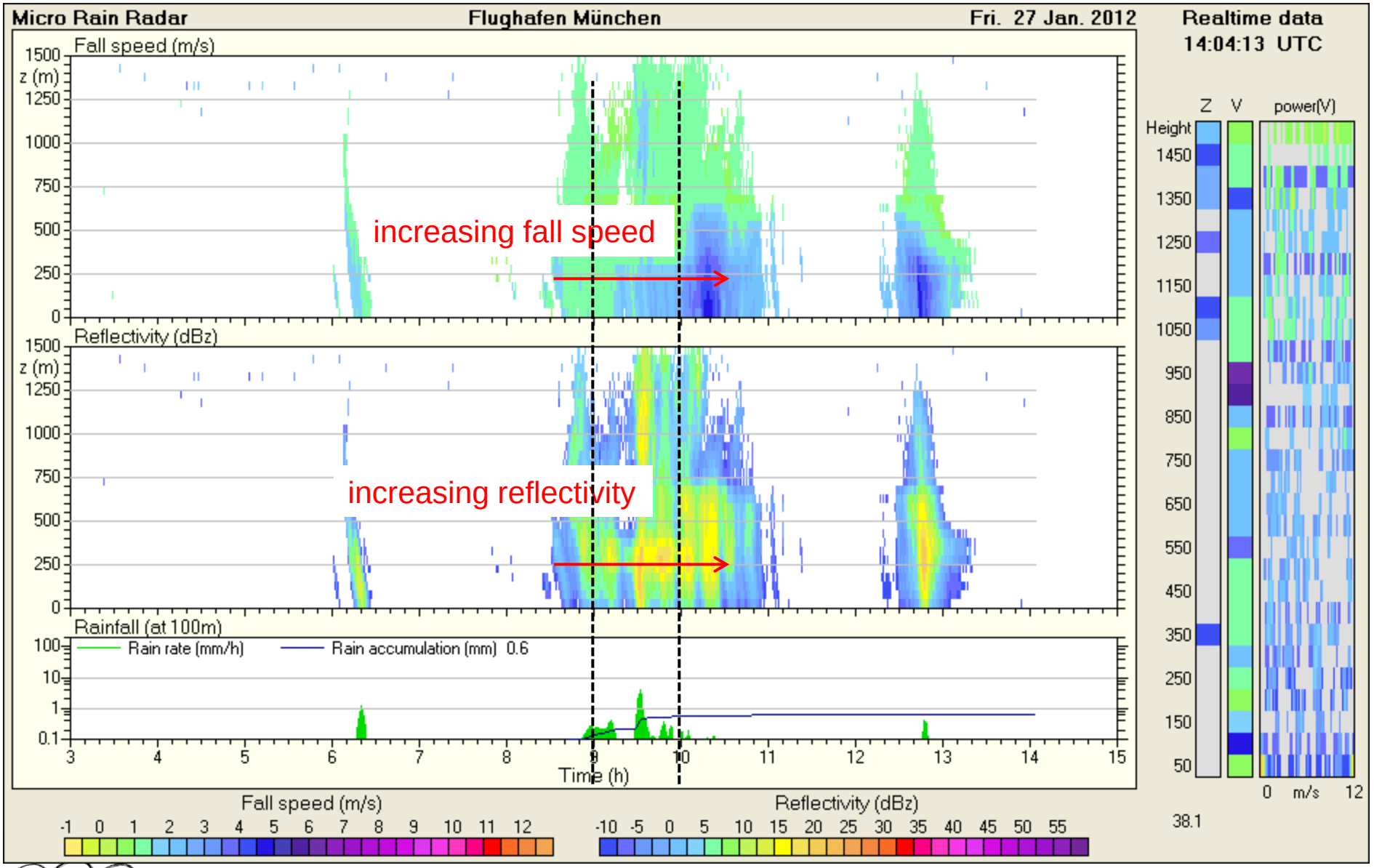


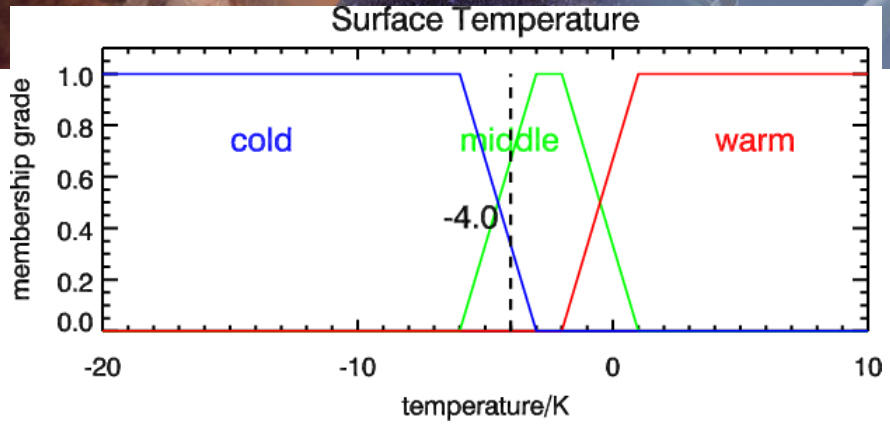


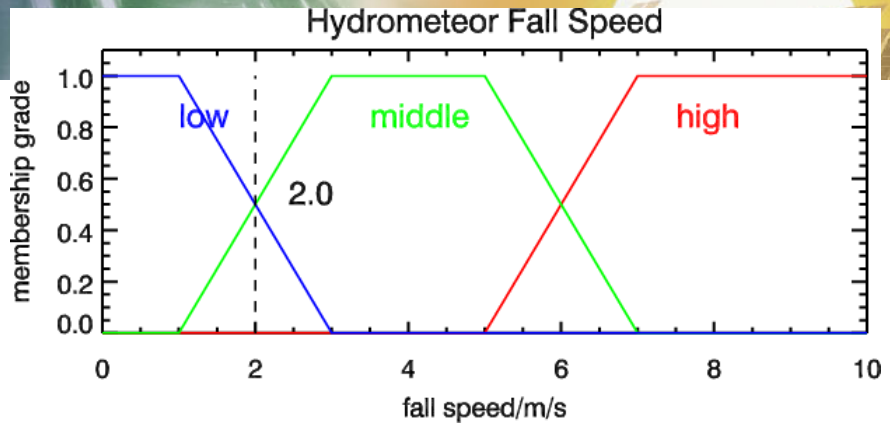


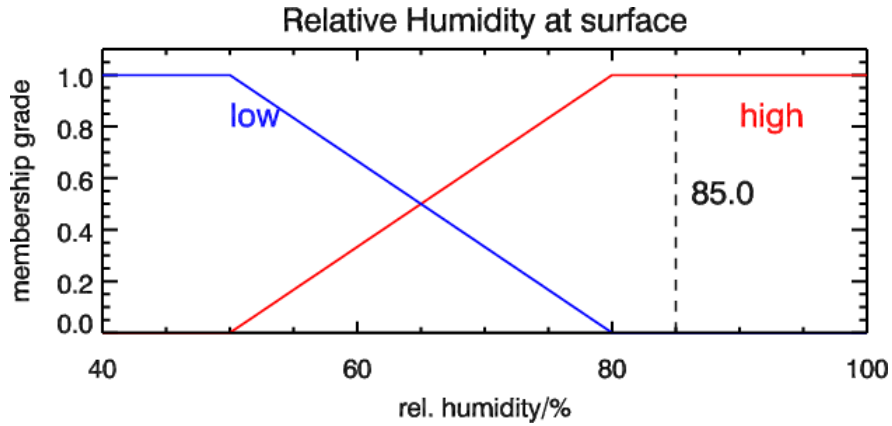
09:00 UTC

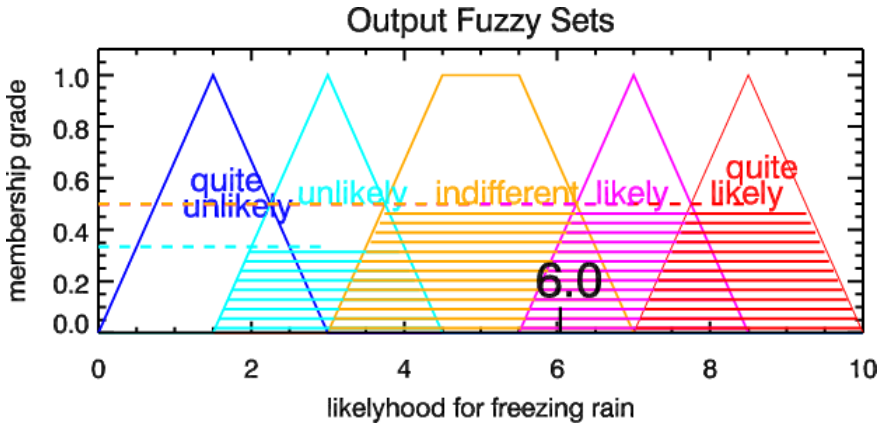
The fuzzy-logic approach

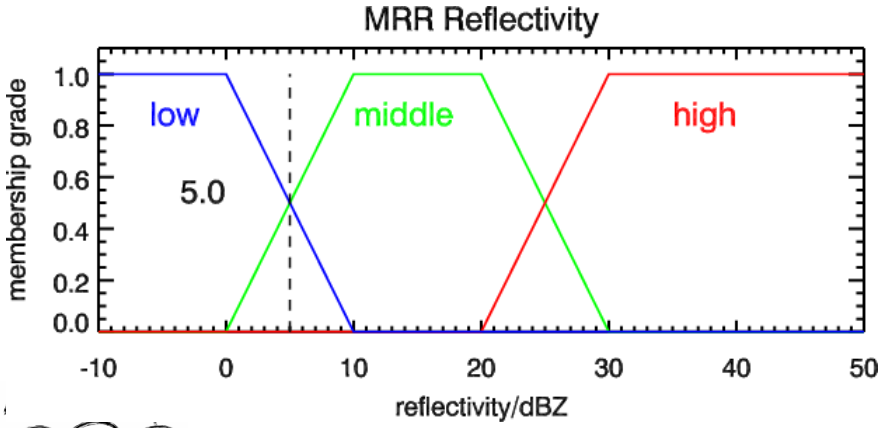

Micro Rain Radar
Flughafen München
Fri. 27 Jan. 2012
Realtime data
14:04:13 UTC
Fall speed (m/s)
z (m)
increasing fall speed
Reflectivity (dBz)
increasing reflectivity
Rainfall (at 100m)
Rain rate (mm/h)
Rain accumulation (mm) 0.6
Time (h)
Z
V
power(V)
Height
0 m/s 12
38.1
Fall speed (m/s)
Reflectivity (dBz)





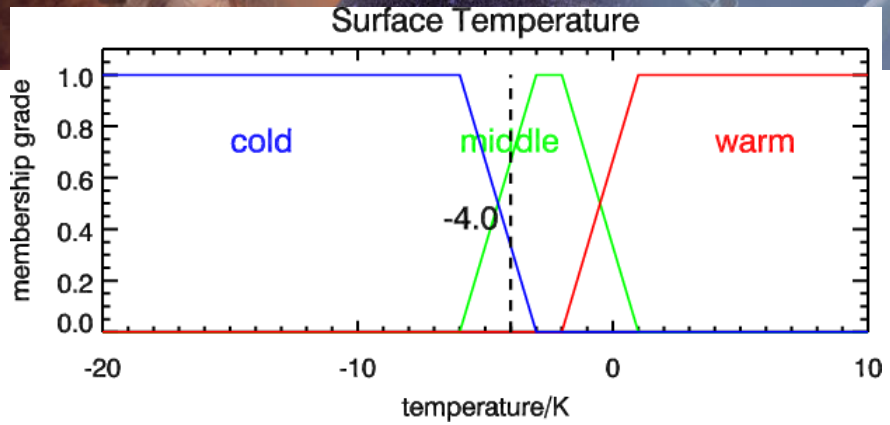


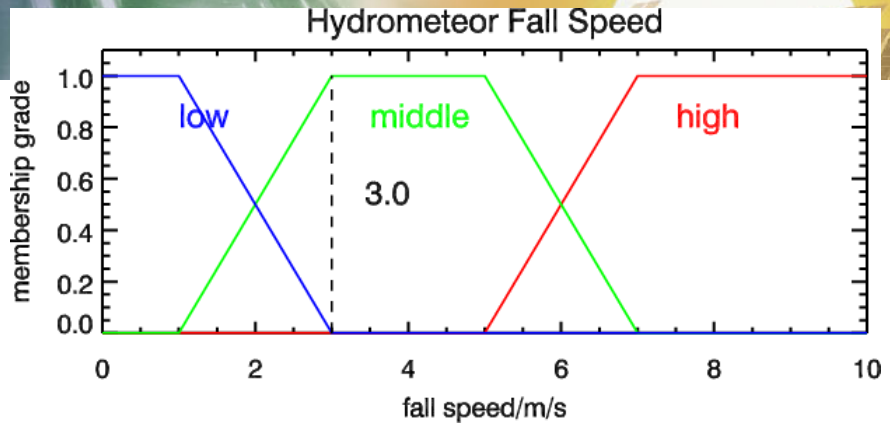


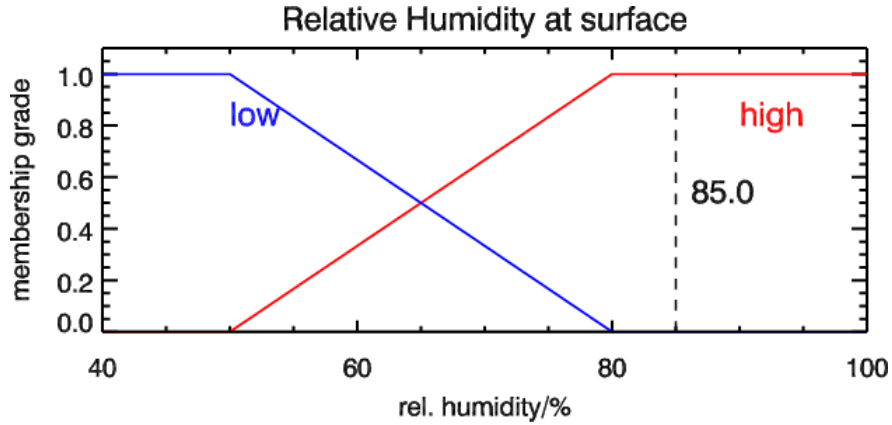


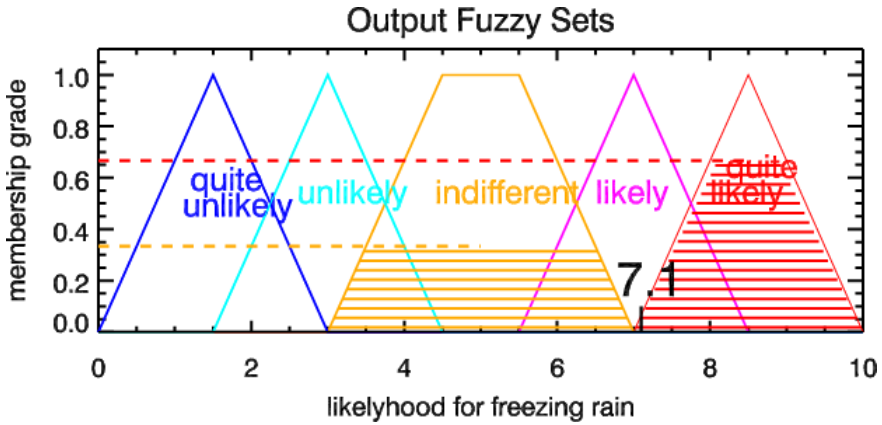
09:00 UTC

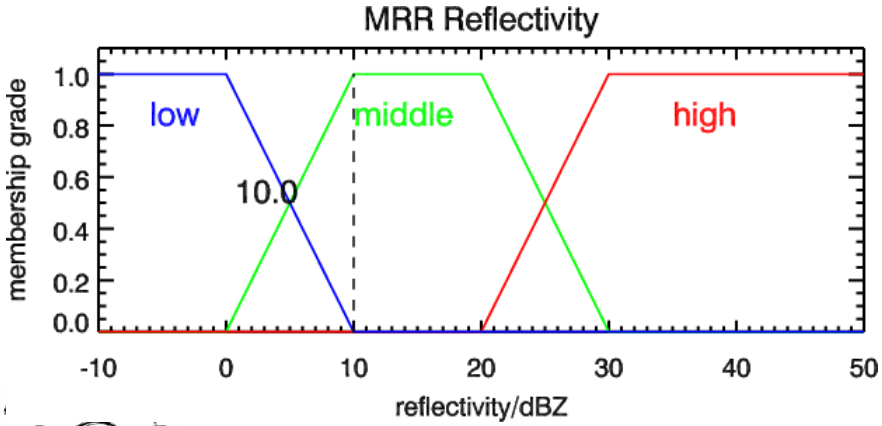
The fuzzy-logic approach





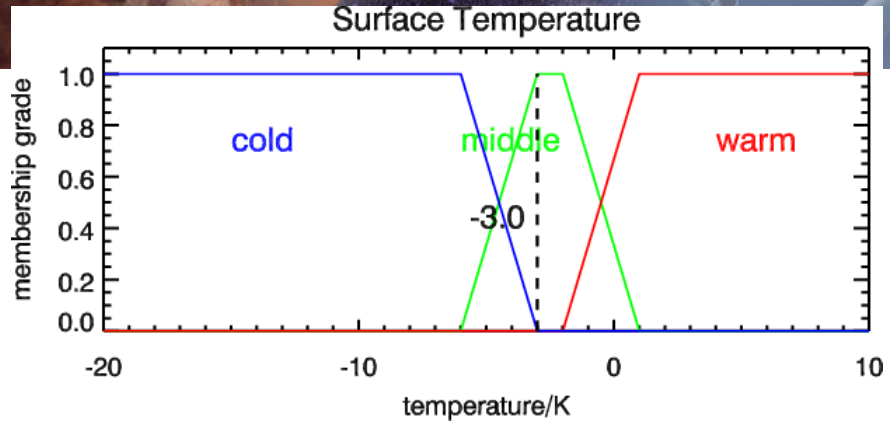


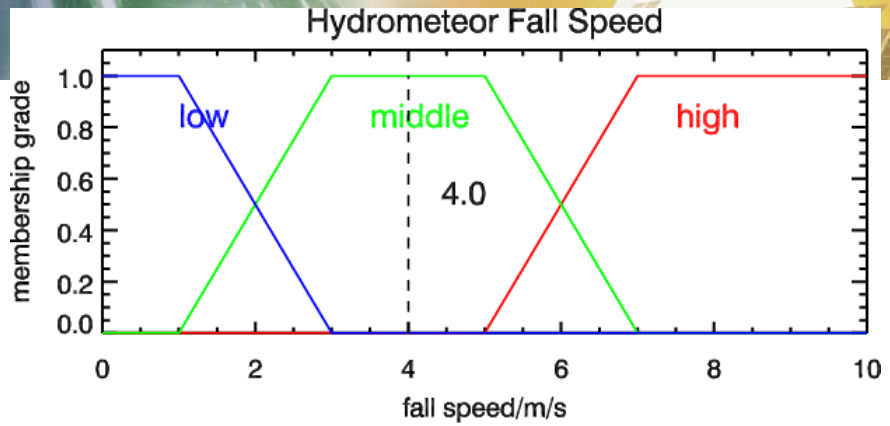


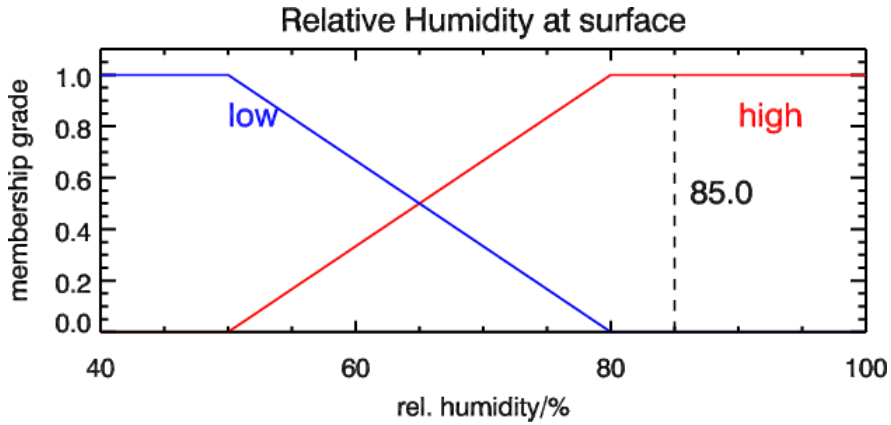


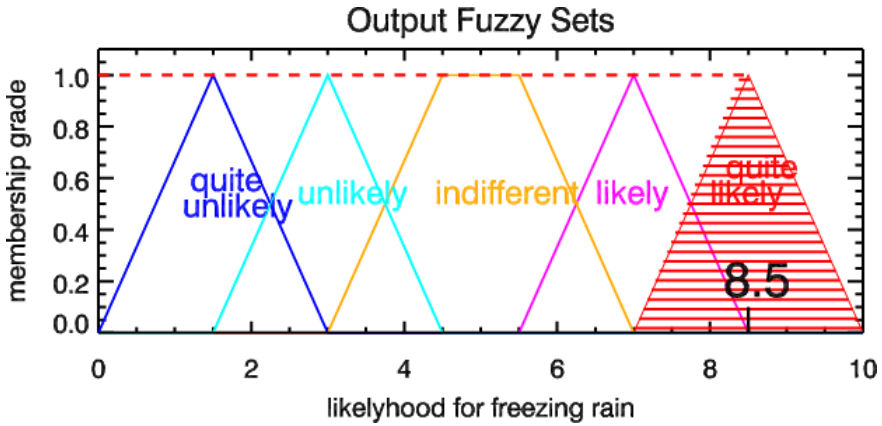
09:30 UTC

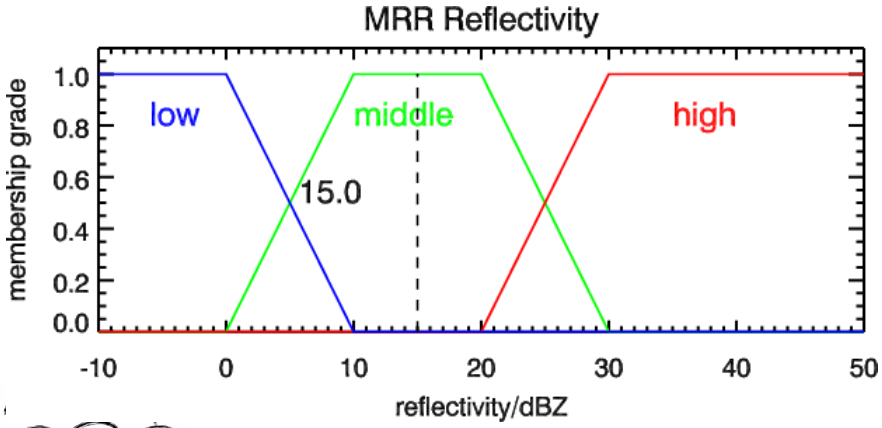
The fuzzy-logic approach











10:00 UTC

The fuzzy-logic approach

Summary

- A nowcasting concept for winter weather conditions has been developed
- The concept is based on winter weather objects
- Analyses and trends of local observations are combined with COSMO*MUC* forecasts and advection of upstream observations
- A fuzzy-logic approach combines the data with different weights

- To do: translate the winter weather objects into impact for traffic
- Build confidence, create trust, train and educate