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METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

Challenges of aeronautical weather forecaster in winter time at high latitudes

Airlports and Airlines Winter Operations
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Prevailing conditions at high latitudes in winter

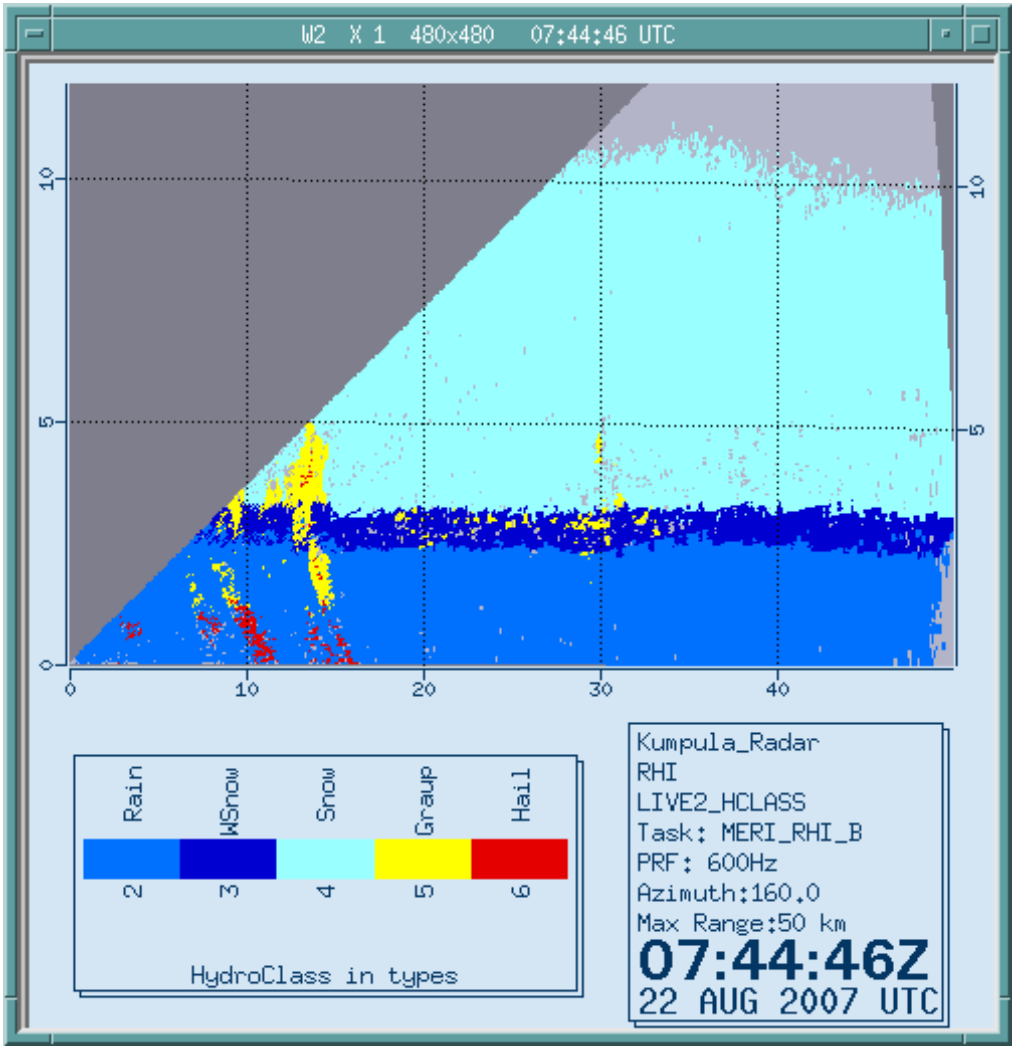
- **Darkness. Period of little day light starts at high latitudes in the end November, and ends after mid January.**
- **High relative humidity: conditions near saturation point, air temperature and dewpoint very near each other.**
- **Form of precipitation varies: several types of precipitation; rain, sleet, snow, FZRA, SG…**
- **Temperature: No diurnal variation in temperature – but big variations are possible! Temperature zero-level can exist in above layers, but not in surface**
- **Wind. Winter storms, blizzards. Statistically winter is more windy than summer.**

Does a meteorologist wish a high pressure or low pressure in winter time?

- **Polar front generates continuously low pressures that cross North Europe and Skandinavian countries**
- **Lows have a big size, they are long lasting phenomena**
- **NWP, satellite pictures, radar, ground observation catch lows well. Significant weather like blizzards can be forecasted days in advance...**
- **Significant/severe weather doesn't necessarily mean the utmost difficulty to forecast.**
- **The question is: how to handle uncertainty? In which part of forecast it appears, where is the weakest point today? Especially precise place and timing are sometimes poorly forecasted, because of insufficient support of numerical models.**
- **Potential impact of weather could be forecasted in more informative way with probability forecasts, that give more options for user to consider. Do we have right products for users?**

Dual polarisation radar

makes differences between forms of precipitation



High pressure in winter time

- **Weather can change greatly and rapidly : SKC Cavok tempo 0300 FZFG VV002**
- **Conditions can change in 10 minutes, in whole area or only locally. No rules at all!**
- **Signifiant weather (cloudbase or horisontal visibility) are often poorly forecasted.**

At high latitudes, during wintertime no convective clouds (cumulus, cumulonimbus), but stratiform clouds…

Stratus has a very low cloudbase

Stratus can be very local

http://komfortabc.hu/ido/felhoatlasz/site3b.php

Stratocumulus

http://mmem.spschools.org/grade5science/weather/stratocumulus.html

EFRO in wintertime

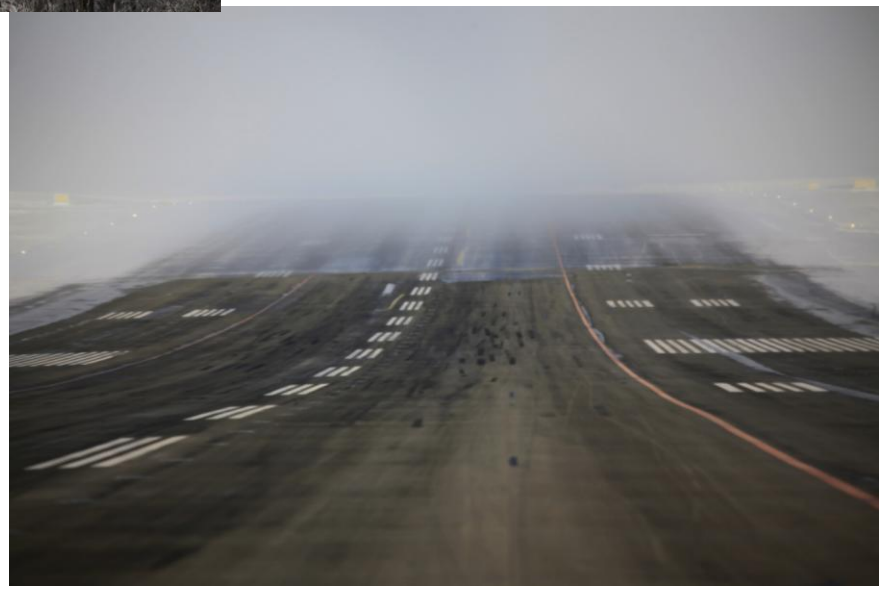


Photo: Tapani Kuoksa

Tools to solve high pressure challenges

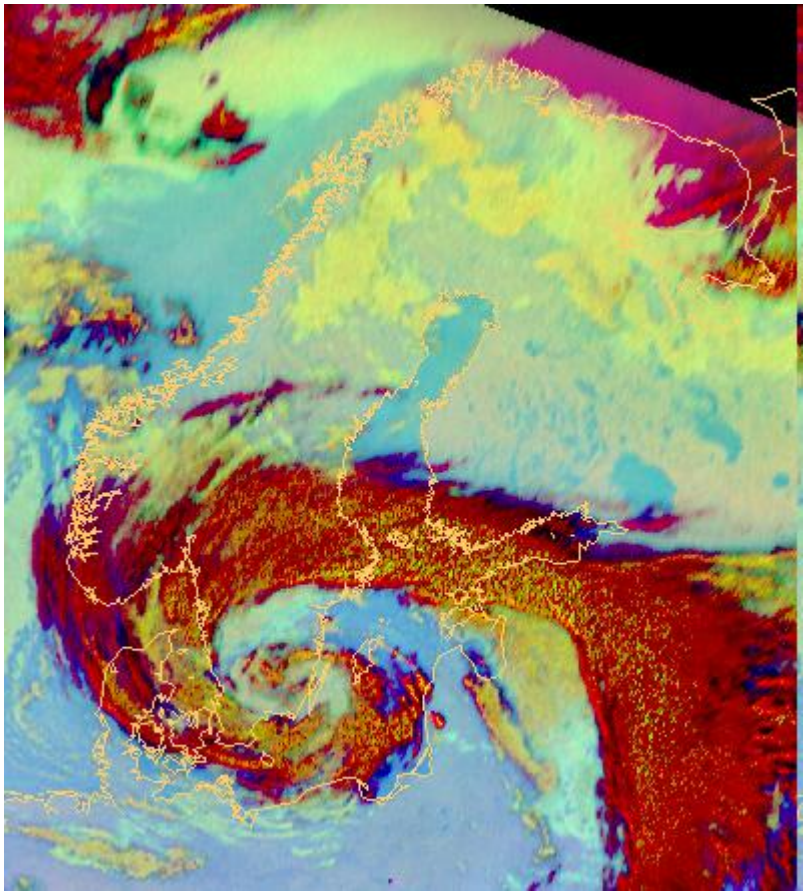
RGB- satellites can observe in darkness, can differ cloud types, observe large areas frequently and have high resolution, provide a meteorologists with detailed picture of prevailing conditions.

No NWP support in small scale: Most detailed computer model grid in NPW is some kilometres! LVP starts often when horisontal visibility is less than 1500m. Limits to amend TAF are 150m (meters!), 350m, 600m, 800m, 1000m, 1500m…

Radar makes frequent observations but cannot see low clouds typical in winter high pressure

Surface observations (Metars, synoptical obs.) are too local, including nearest 8km circle around observation place.

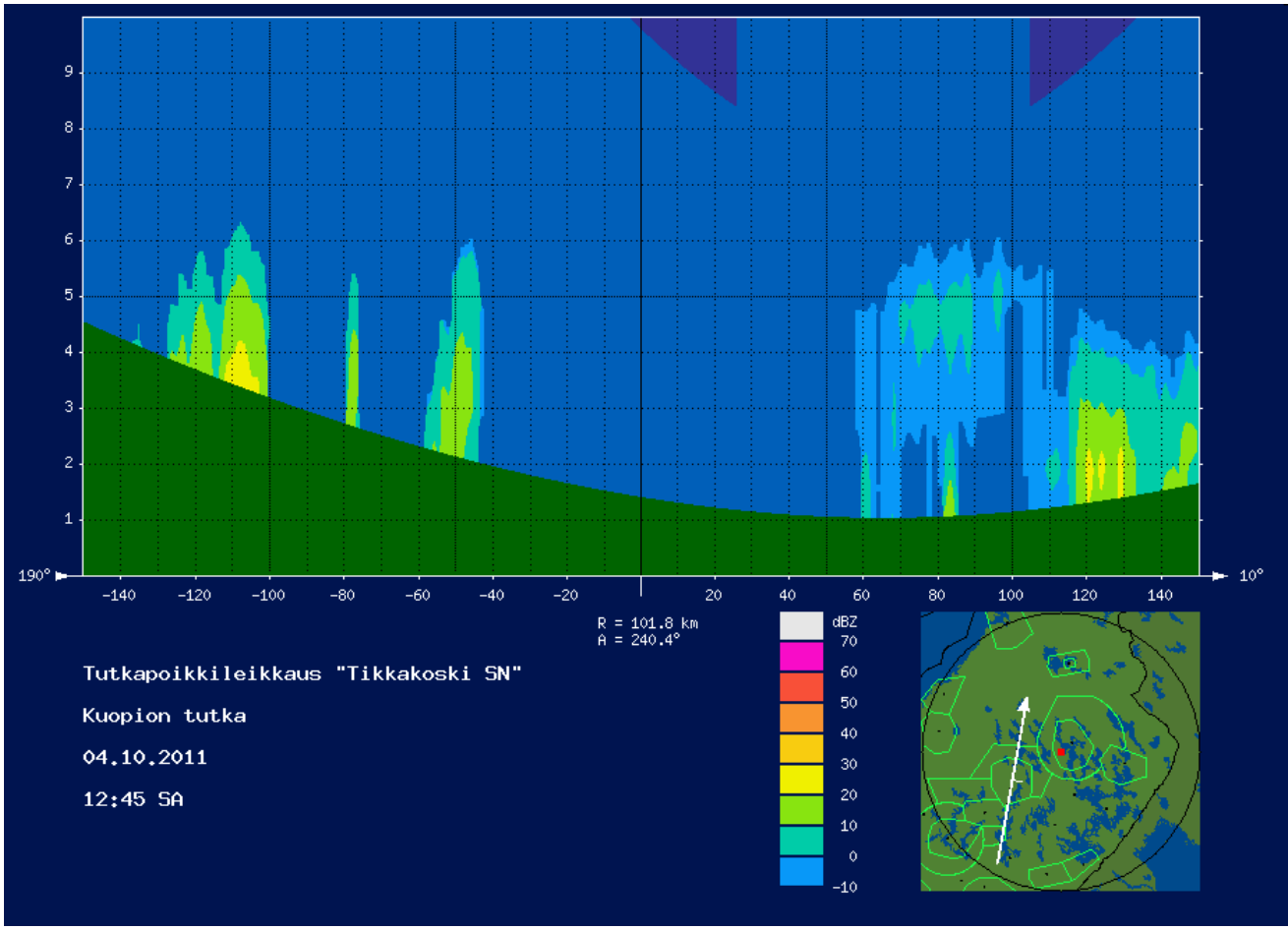
Applications: Cloud Analysis, Fog, Contrails
Time: Night-Time
Area: Scandinavia
Interpretation:
This is gamma corrected version of composite NightMicrophysical-eumetsat for warm fog
Night-time fog appears in light greenish colours
Thick Cb clouds at night appear in sprenkled yellow-red colour (noise in channel IR3.9)
Thin Cirrus clouds appear in dark bluish colours
Water clouds with larger drops have greater red component



Example 5.8.2008 00.00 UTC
Red: Difference IR12.0 - IR10.8
Green: Difference IR10.8 - IR3.9
Blue: Channel IR10.8

Only thick clouds can be seen in radar in distant areas

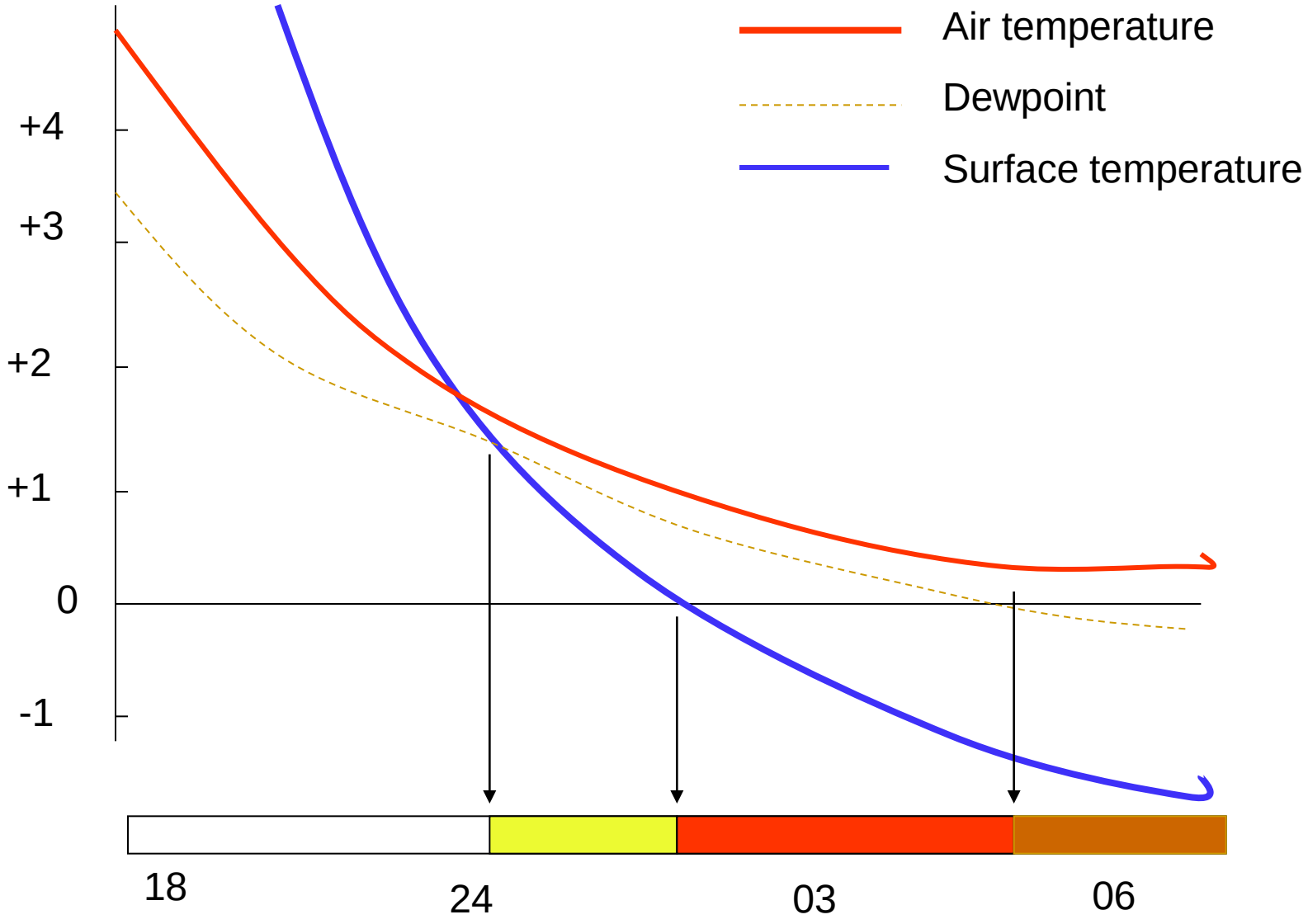
(Green area : the blind spot)



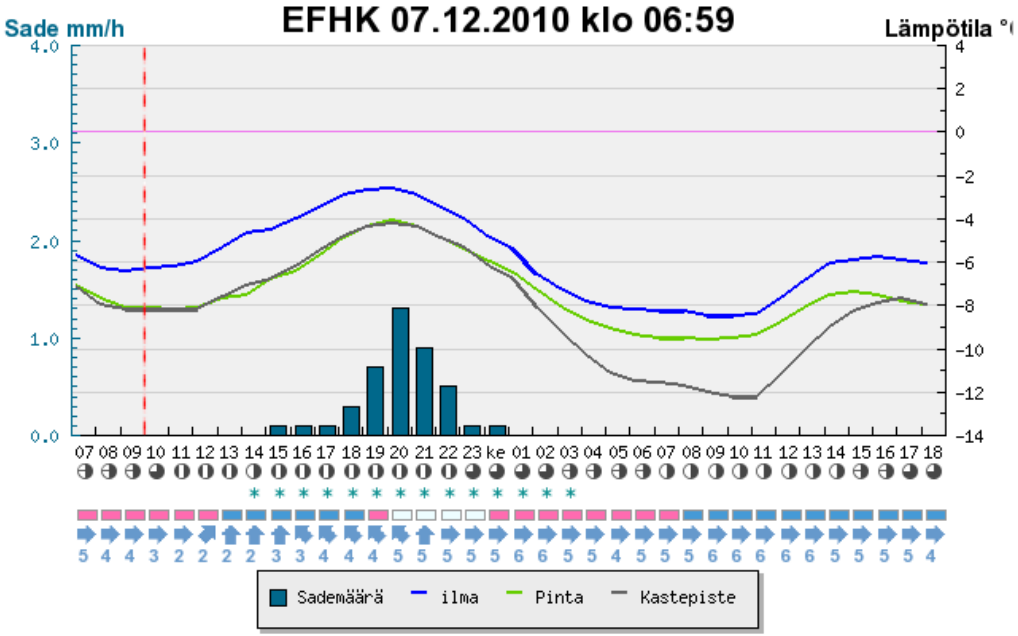
Runway friction and ”black ice”

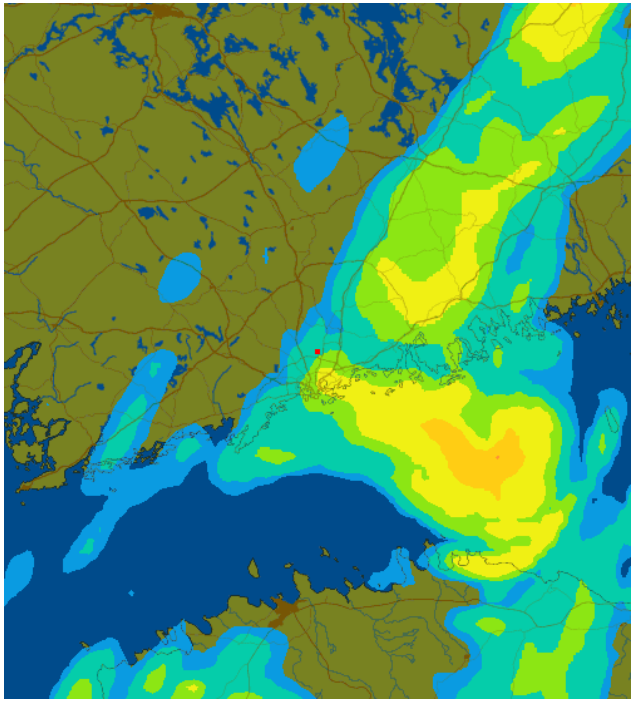
- **How there can be ice on the road, even there has been no rainfall and in termometer in 2 meters hight there has been +2 ºC during whole night ???**

Temperature in calm, cloudless night



Weather observation





- Actions with in 24 h — Warning
- Actions with in 8 h — Warning and getting resourses (contractors)
- Actions with in 1 h — Get resourses (stand by personnel) and activities planning
- Actions during bad weather — Execution, execution, execution

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Eumetcal course is coming…

- **These conference presentations were most useful in meteorological training via Eumetcal organisation.**
- **The coming course ”Forecasters meet aviation users” could utilise your presentations in order to create more understanding in airport environment and different personnel working at airports.**
- **Next year the course will be updated and repeated, are you willing to develope it further?**

- **If you are interested in cooperation, please, contact Leena.Upola@fmi.fi**

Thank you!