PNOWWA* Webinar on Nowcasting of Snow

11:30 Snow nowcasts with extrapolative methods. Case studies and lessons learned.

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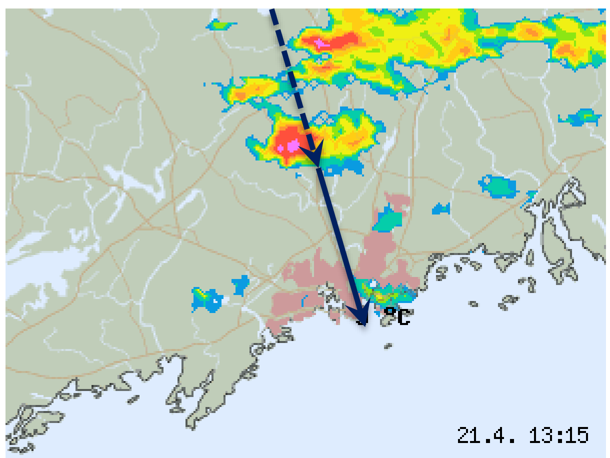
Nowcasting with extrapolation of radar images in PNOWWA

Common principle:

Time= distance/speed

Example:



storm 75 km away,

moving 50 km/h

arrives in 90 minutes

15	30	45	60	75	90	105	120	135	150	165

.....dry............. snow...maybe

Task split in two

- Calculate the motion vectors and their uncertainty
- Move the radar image with the vectors, assess uncertainty

In PNOWWA we have tried three methods for both.

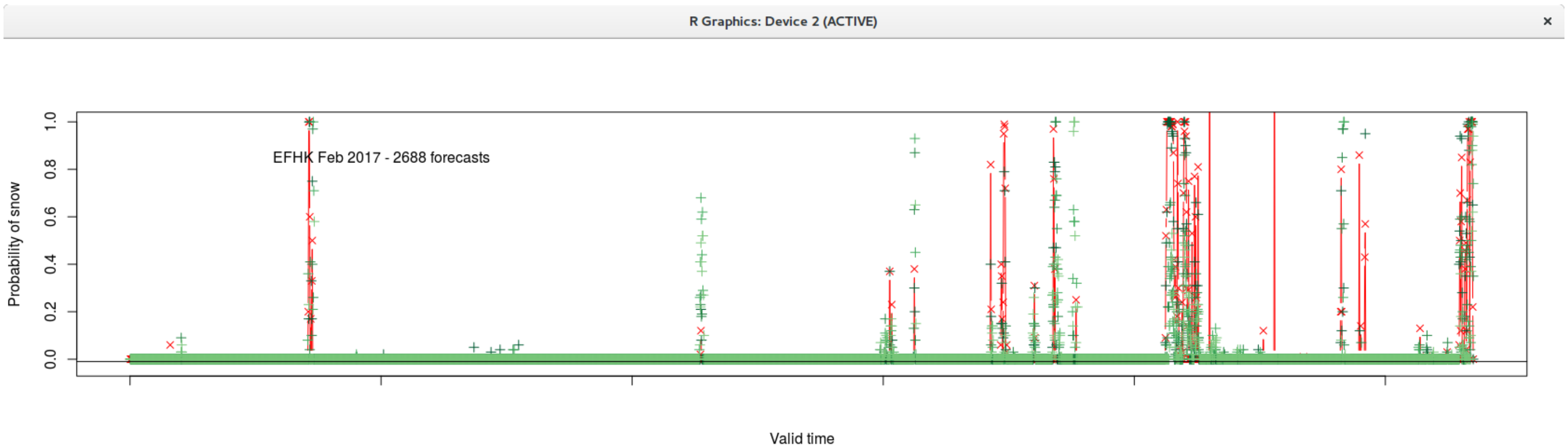
- Simple one from 1990s (Andersson & Ivarsson 1991)
- Operational one from Finnish Met Institute (Hohti et al 2000)
- New ones in research (Proesmans et al, Pulkkinen et al.)

- References:

- Andersson T, Ivarsson K (1991) A model for probability nowcasts of accumulated precipitation using radar. J Appl Meteorol 30:135–141 DOI: http://dx.doi.org/10.1175/1520-0450(1991)030<0135:AMFPNO>2.0.CO;2
- Hohti H., J. Koistinen, P. Nurmi, E. Saltikoff, K. Holmlund , (2000) Precipitation Nowcasting Using Radar-Derived Atmospheric Motion Vectors. Proceedings of ERAD – the First European Radar Conference. Bologna, Italy.
- Proesmans, M. L. Van Gool, E. Pauwels, and A. Oosterlinck (1994): Determination of optical flow and its discontinuities using non-linear diffusion, in *3rd European Conference on Computer Vision*, ECCV'94, 1994, Vol. 2, pp. 295–304.

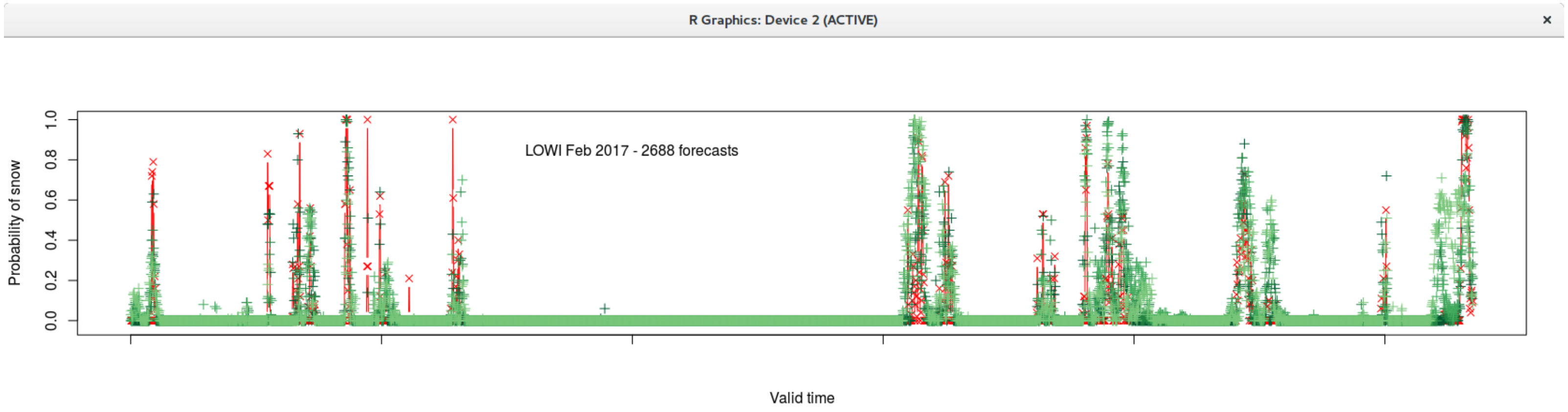
- Pulkkinen S., J. Koistinen, A-M Harri (2016): Consistency-Driven Optical Flow Technique for Nowcasting and Temporal Interpolation ERAD the 9th European Radar Conference

The simple one was used in first demos, and it performed quite well !

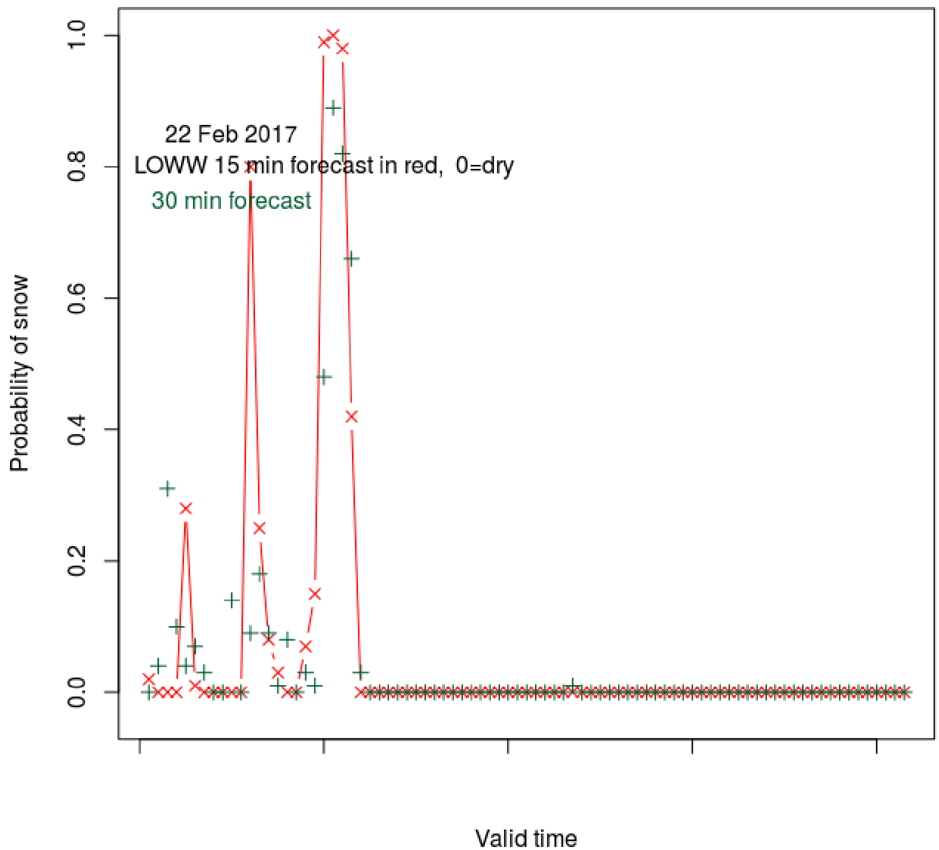


EFHK
Red: Observations (15 minutes)
Green shades: 30-120 min forecasts

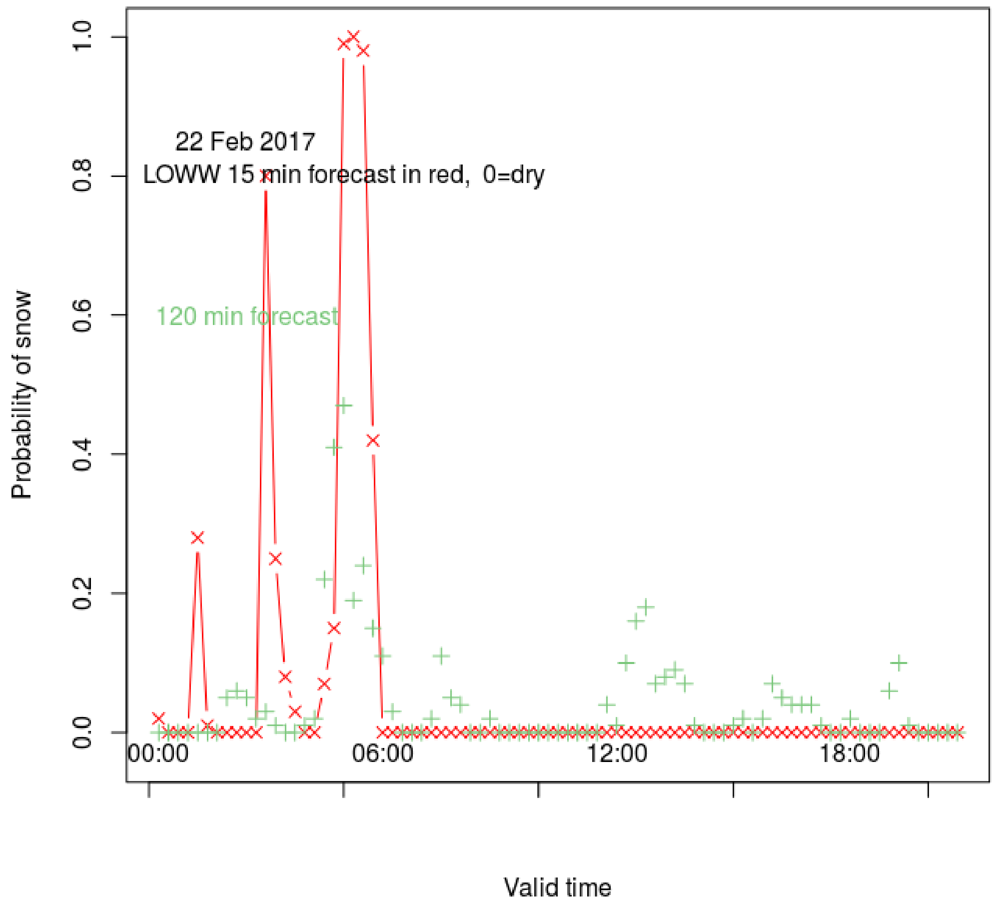
LOWI


R Graphics: Device 2 (ACTIVE)
LOWI Feb 2017 - 2688 forecasts
Probability of snow
0.0
0.2
0.4
0.6
0.8
1.0
Valid time

30 min forecasts are usually brilliant

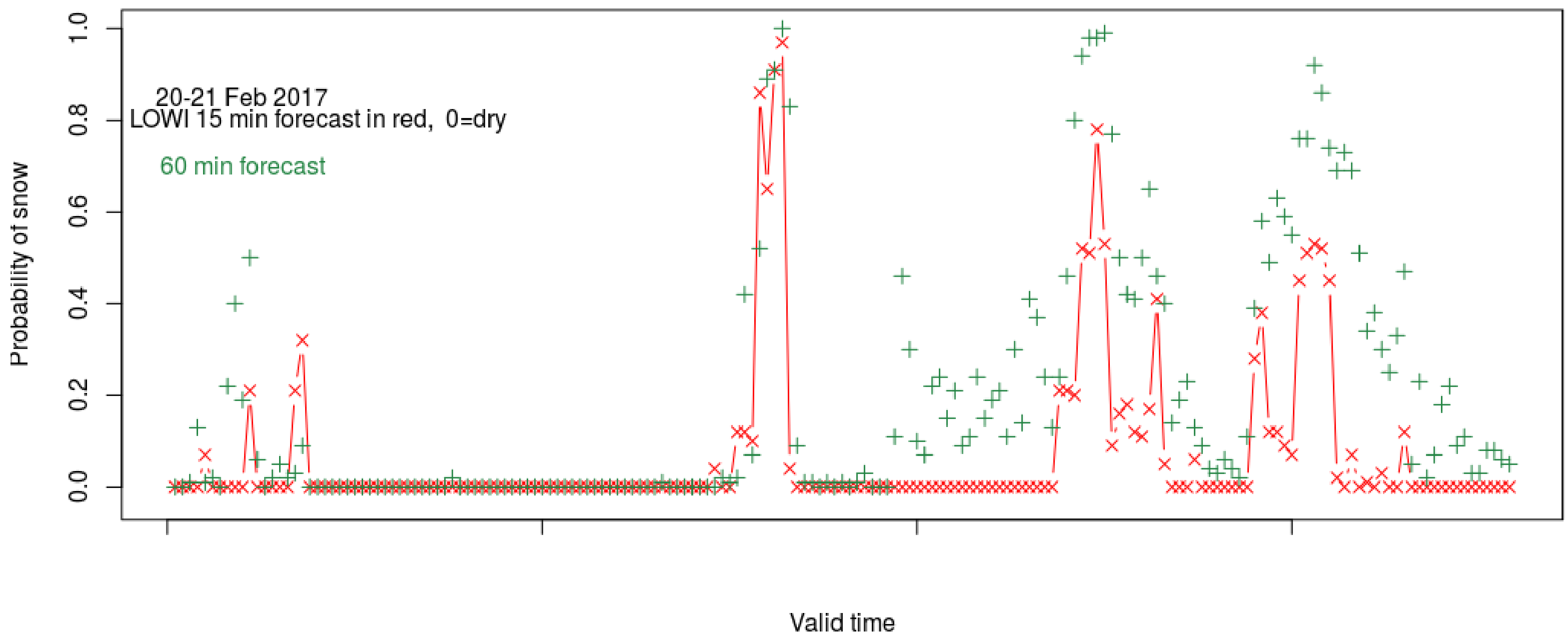


Longer forecasts have often small probabilities for snow that never comes



The "probabilistic observation" is the frequency of radar pixels over a threshold indicating snowfall at the airport. It can be seen as indicator of how large fraction of the first 15-minutes period it is snowing.

60 minutes shows some skill



This was validation radar to radar

Radar to airport has still challenges:

- Radar only sees snow which is falling from the clouds
- Visibility may be low also for drifting snow
- ..or fog

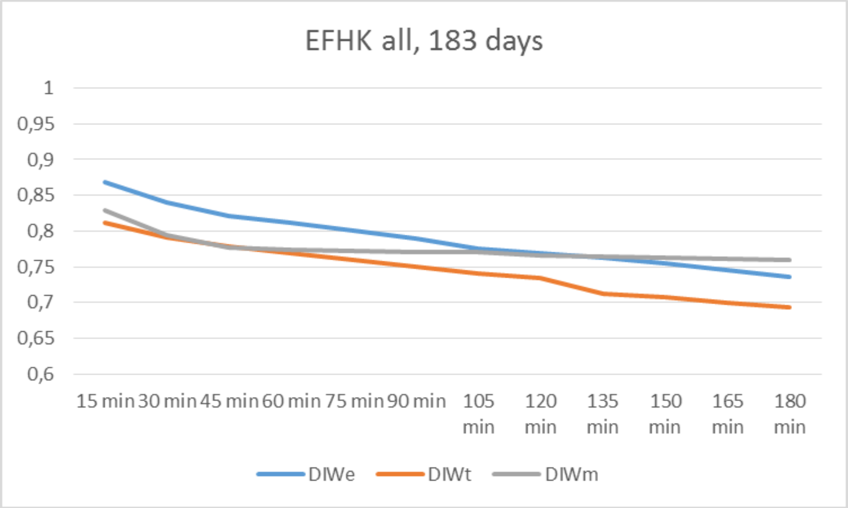
- For operational use, we recommend merging this with TAF for DRSN and FG

Have we compared to models ?

Feb-March 2015, Dec 2015 - Feb 2016, 183 days

Radar better than model for 2 hours

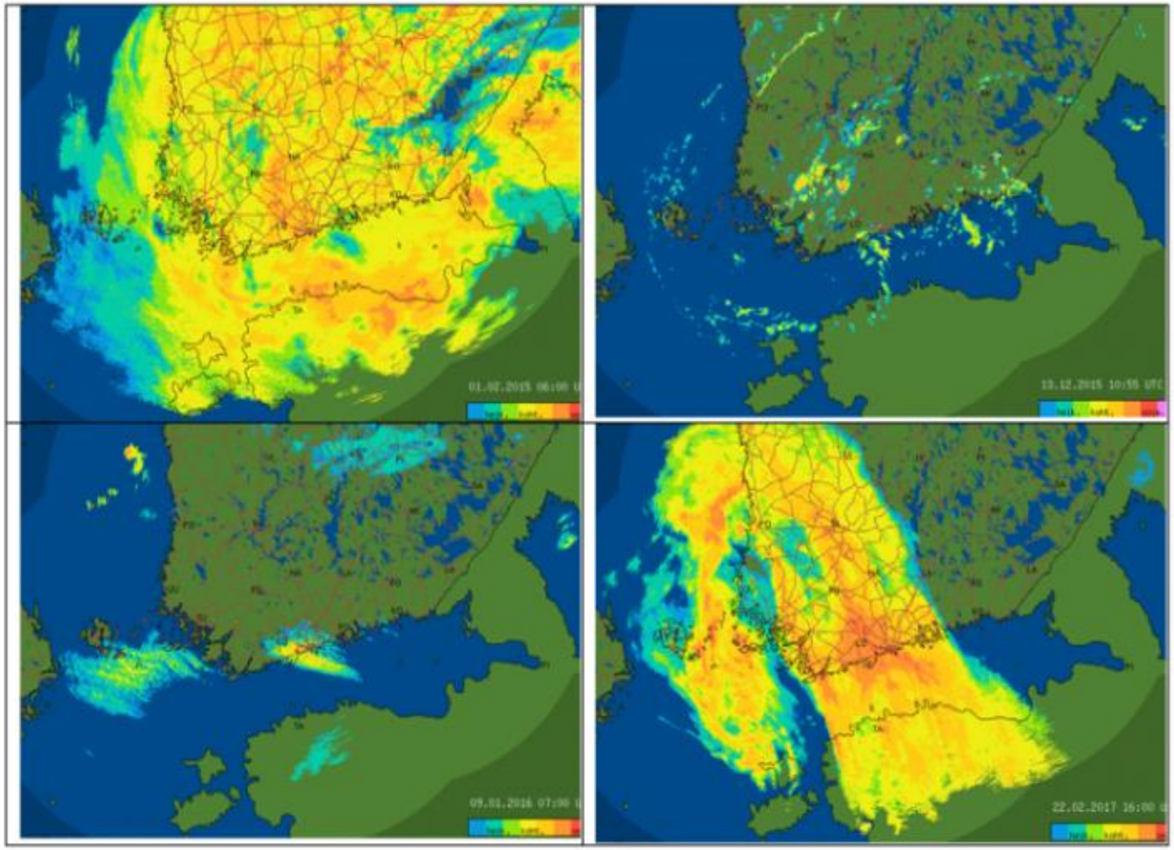
(Parameter Deicing weather DIW, verified as Hit rates HR)



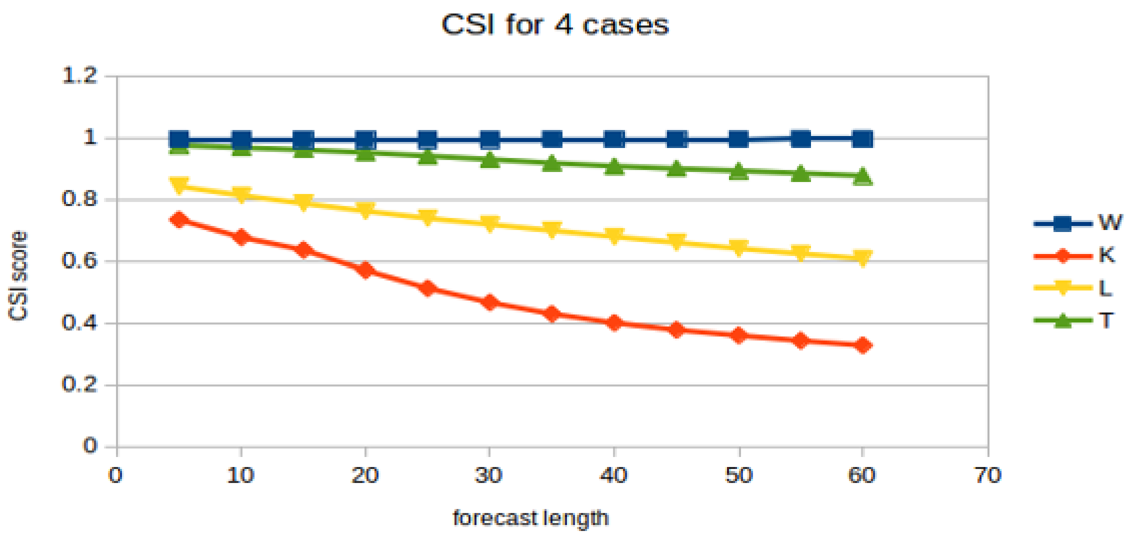
Blue: Radar
Gray: TAF
Red: Model

Verification scores with the new systems

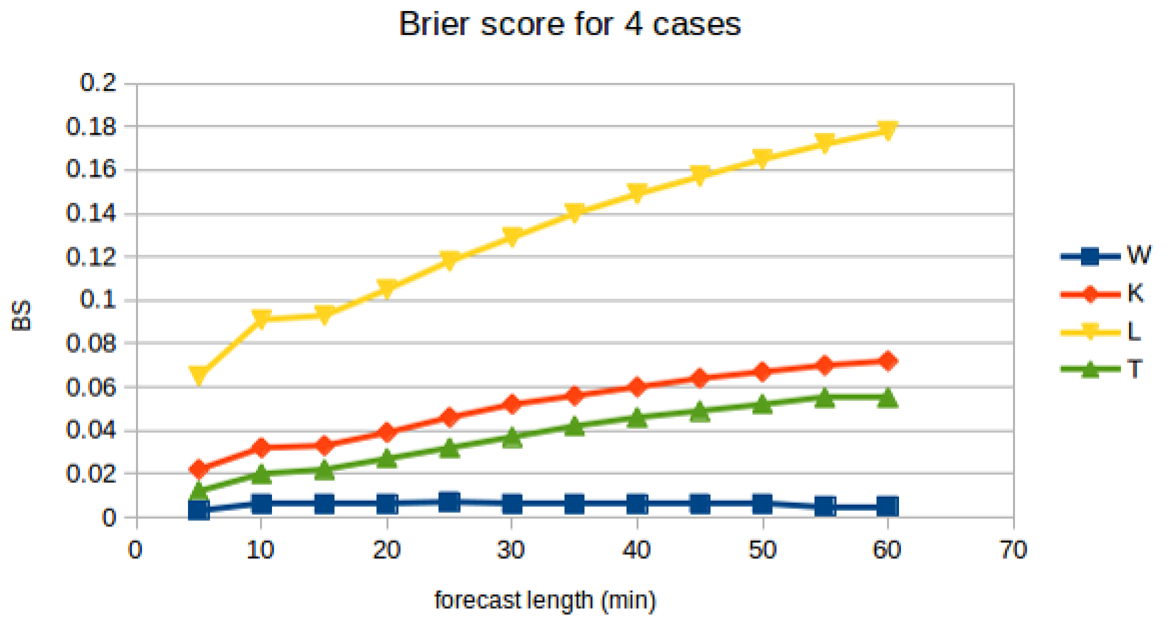
Wide
Showers
Lake-effect
Front



CSI Critical success index: Wide is easiest to forecast, showers (K) most difficult



Brier score also



Come see us at
Sesar Innovation Days in Belgrad

Pulkkinen et al: Improving snow nowcasts for airports

…and also the papers by Juntti et al. and Harri et al.

PNOWWA Probabilistic Nowcasting of Winter Weather for Airports

Thank you very much for your attention!

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