



FEPS-project at SMHI

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The project started after we asked ourselves these questions:

- How should we use all products from ECMWF (EPS, deterministic models, EFI)?
- How can we (meteorologists) "sell" probabilities to the community?
- Is the community ready to deal with probabilities?


Background

- Integrate ensemble forecasts into the production process, both technically and methodology
- Make future development concerning ensemble methodology easier.

SMHI Weather Service Today...

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- Deterministic forecasts – on both short- and medium range
 - We're using the last/second last deterministic forecast run
 - × **Only** a few probabilities so far (freezing rain and thunderstorms)
 - EPS or any other ensembles haven't turn operational in the forecast database yet. But the hydrological production is using it.
 - We have empirical probabilities for a few parameters such wind gusts, precipitation.
 - "On demand" - based on the deterministic forecast

The hit rate today

A cartoon meteorologist character with a speech bubble. The character is a simple line drawing of a person with a large head, wearing a red dress with black polka dots and a white collar. The speech bubble is white with a black border and contains the text: "What's happening? Has the meteorologist become more uncertain?".

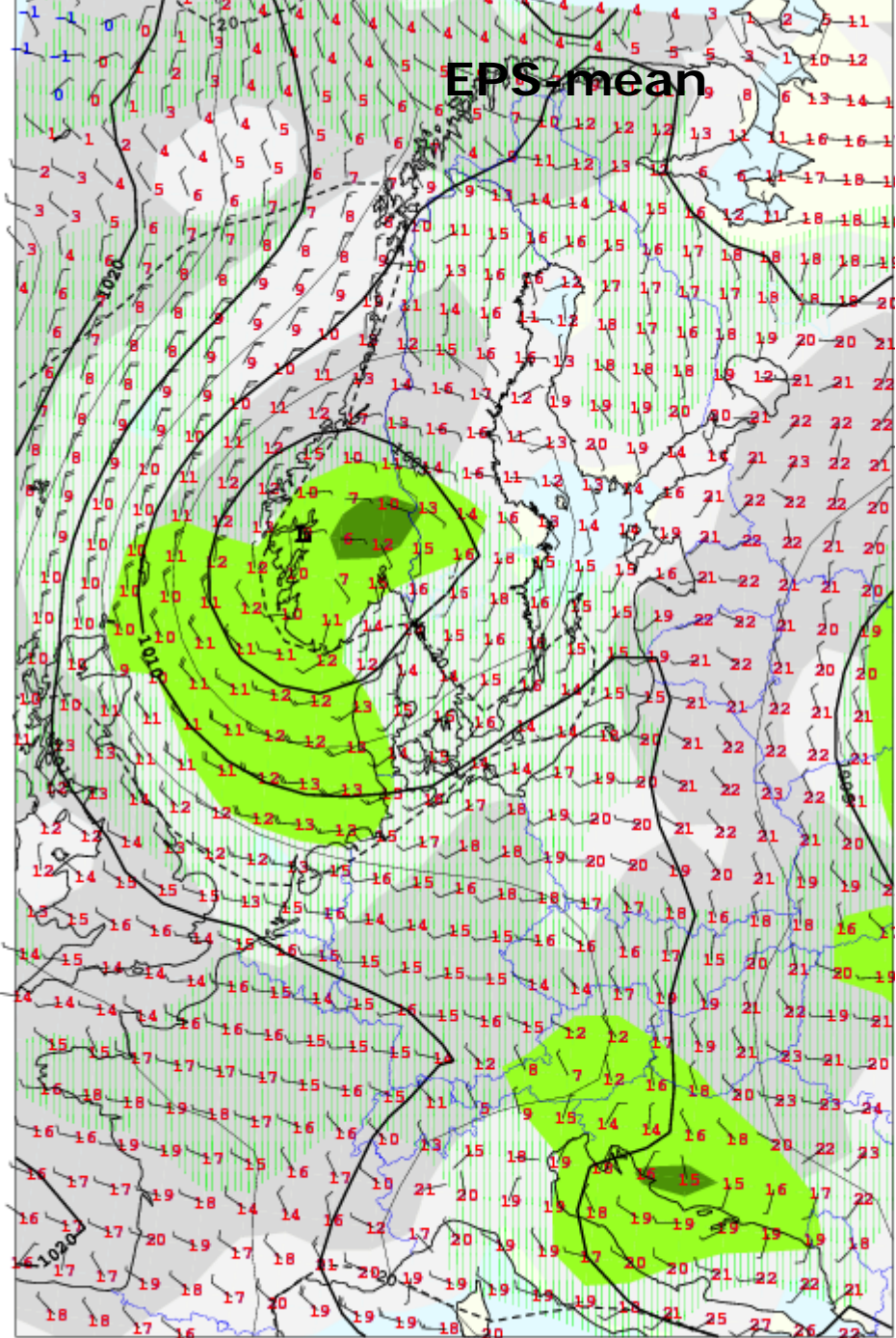
What's happening? Has the meteorologist become more uncertain?

- The value of the deterministic forecast increases if you add probabilities to the forecast.
 - Forecasting details should be related to how certain the forecast is.
 - ◇ A certain situation = more details
 - ◇ An uncertain situation = less details
- The loss of information is saved by using probabilities

This reduce jumpiness, which contribute to the forecasts reliability.

Different types of ensembles

- EPS-system from ECMWF
- Time weighted (Lagged) Ensemble, using the 4 last runs from T799.
- Poor Mans Ensemble, using deterministic runs from different models (ECMWF, Metoffice, NCEP)



The FEP project at SMHI

- Map and present system- and method solutions for ensemble fcsts.
- Describe suitable solutions (technical- and methods) for different types of ensembles.

Extent. Short- and medium range fcsts.



Important keys within FEP-project

- Try to get something that can be introduced step by step
- Use scenarios as guidance to describe technique and costs
- Create conditions to test which methodic to use
- Build on existing architecture

The Scenarios

1. An addition to the current system
2. High Impact Weather
3. A wide selection of probabilities

Common Conditions

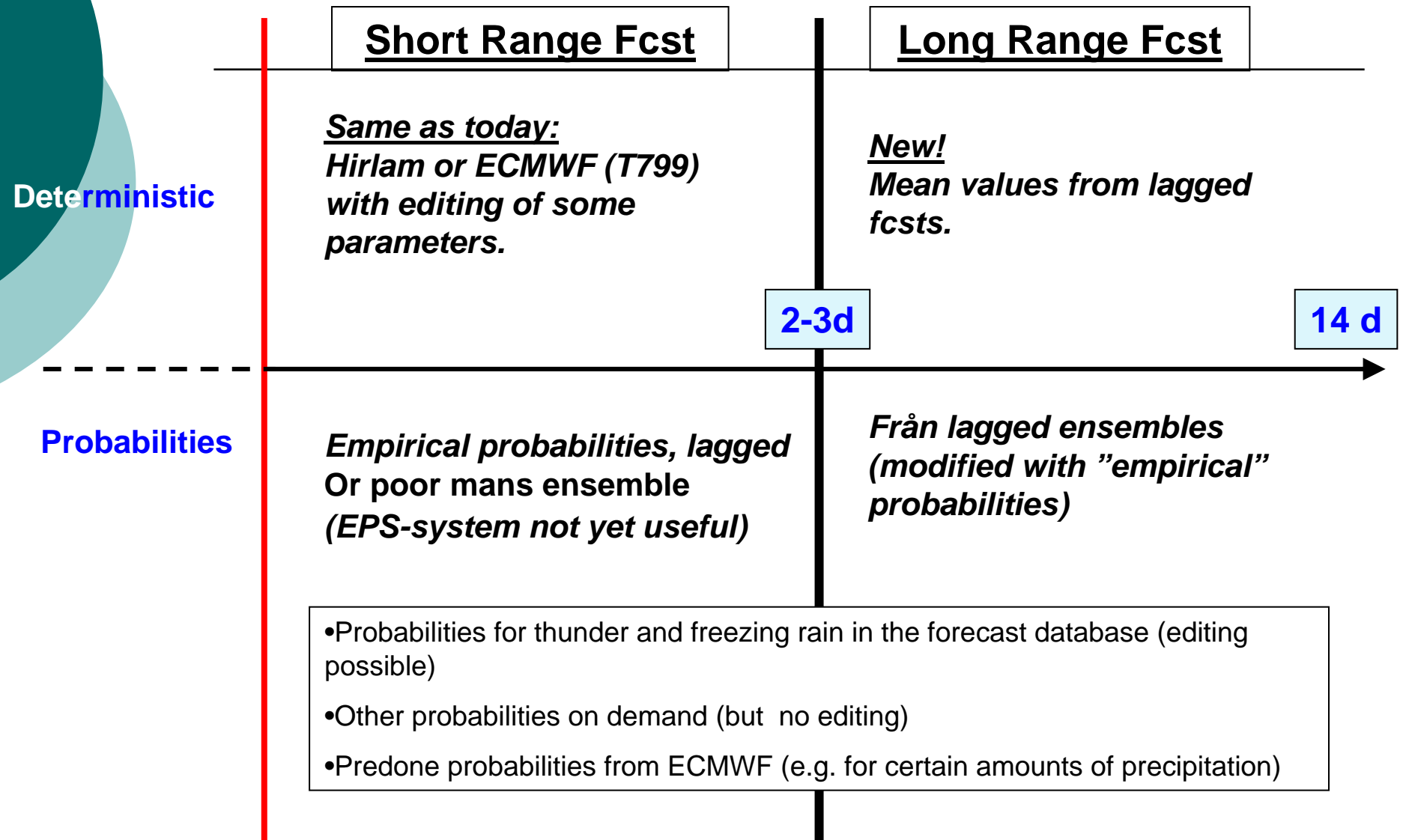
General:

- Transition from short range to medium range after 2-3 days (depends on weather).
- Forecast database extends from 10 to 15 (or 30) days.

Expected benefit:

- Reduce forecast errors and jumpiness
- Reduce risk of publishing unlikely extremes
- Increase value of information as the deterministic value gets reduced significance relative the probabilities

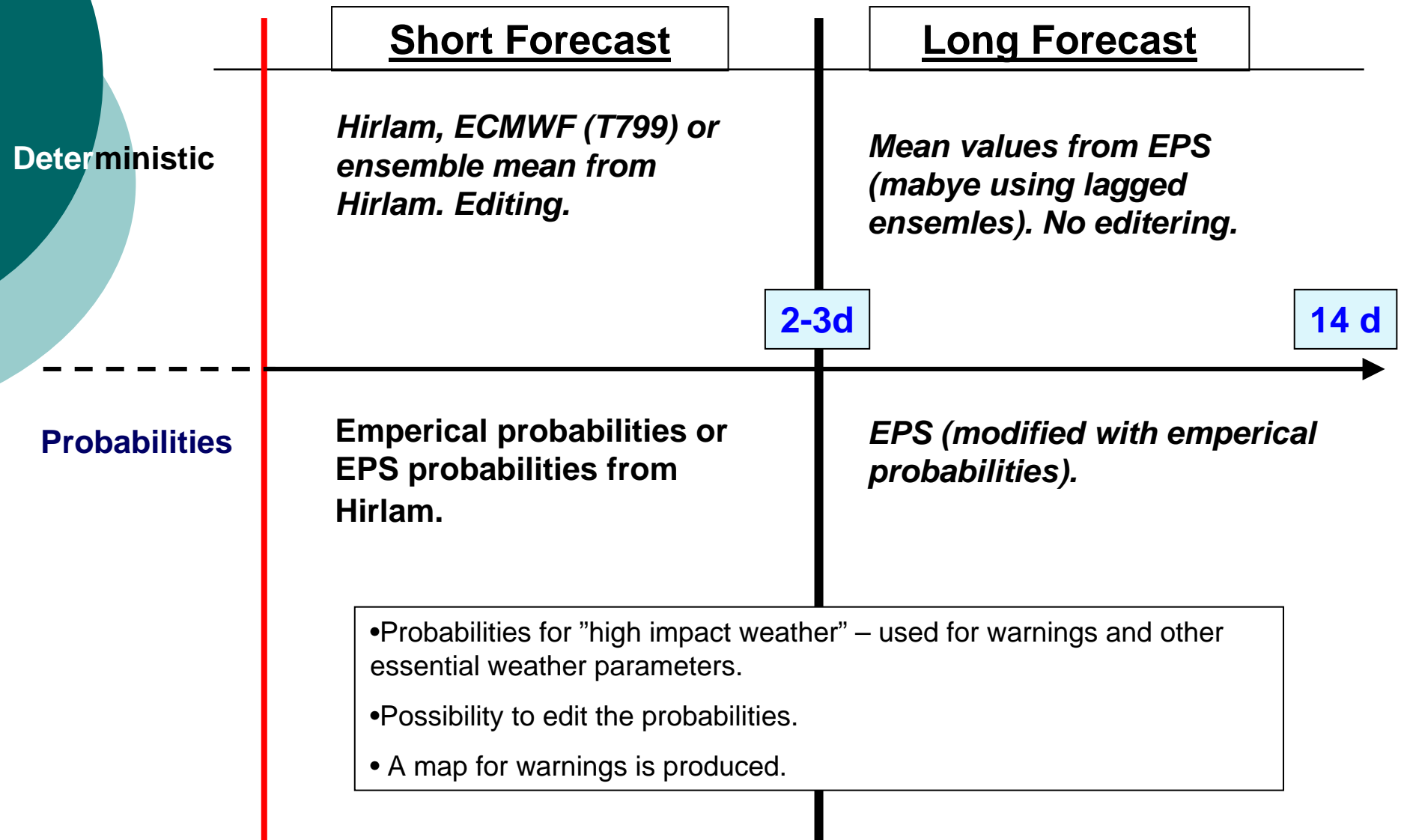
Scenario I – close to today's system



Advantage/disadvantage - scenario I

- + Same set of parameters and same horizontal resolution
- + Simple operative environment, easy to implement – minimal costs for development
- + Open the door for introducing probabilities in larger extent
- Rough probabilities – but could be completed with empirical methods.
- Less focus on risks with "High Impact Weather".

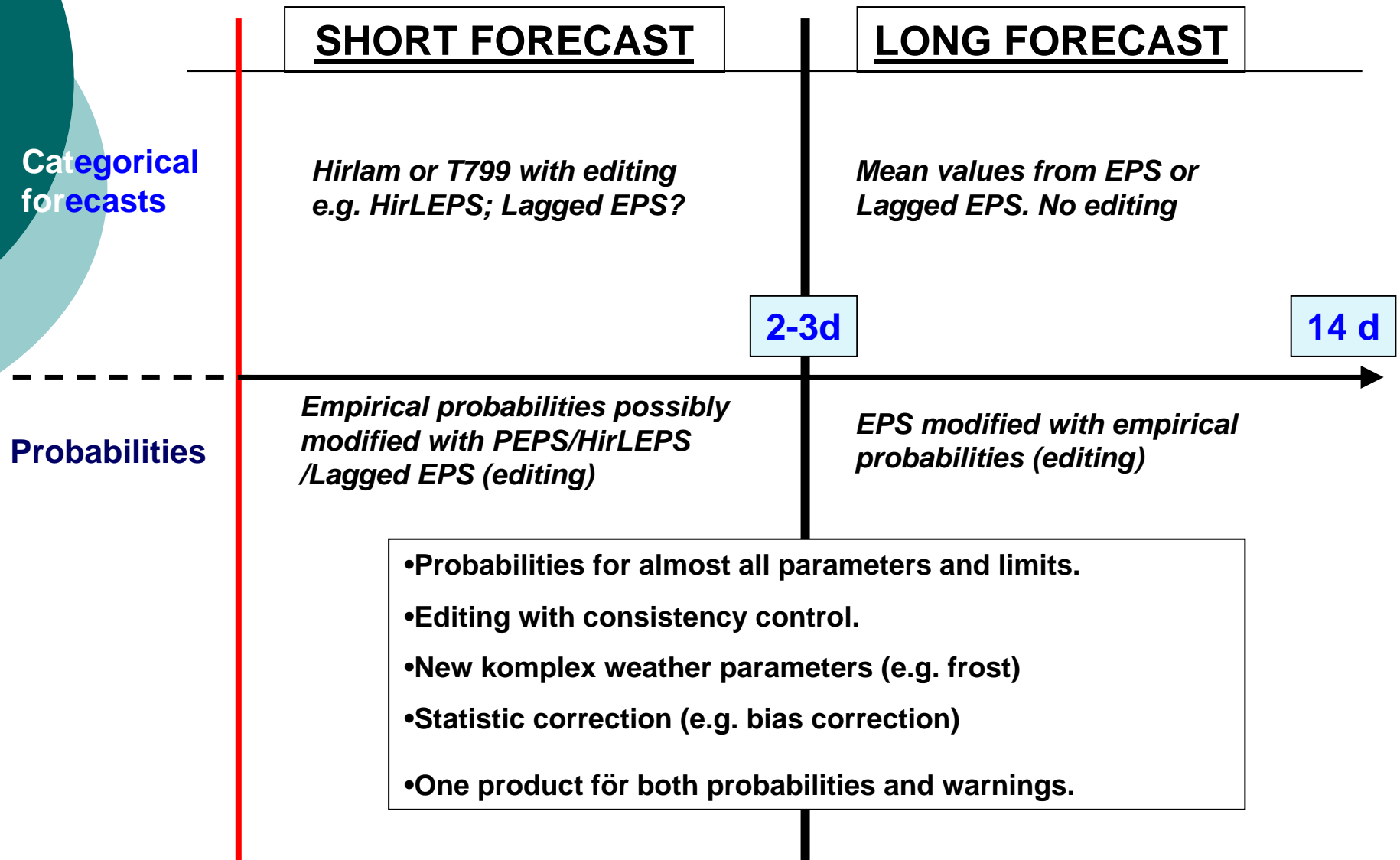
Scenario II – "High impact weather"



Advantage/disadvantage - scenario II

- + Gives a possibility to get an improved probability based warning service.
- + The methods in scenario II can pretty smoothly be rebuilt to scenario III.
- The scenario is limited to just "High impact weather"
- Extensive method development must be demanded concerning probabilities.

Scenario III – wide range of probabilities



Advantage/Disadvantage - Scenario III

- + The access of weather parameters in EPS, fulfil most of the demands on the long time range.
- + Scenario III is a generalization of scenario II.
- The market and community must be prepared to deal with probabilities.
- Extensive method development must be demanded concerning probabilities.

Deterministic forecasts

	<u>SHORT FCST</u>	2-3d	<u>MED/LONG FCST</u>	14 d
Scenario I	<i>Hirlam or ECMWF T799 with editing of some parameters.</i>		<i>Mean values from Lagged Ensembles. No editing.</i>	
Scenario II	<i>Hirlam, ECMWF T799 or ensemble mean on Hirlam with editing.</i>		<i>Mean values from EPS or Lagged ensembles. No editing.</i>	
Scenario III	<i>Hirlam, ECMWF T799 or ensemble mean on Hirlam</i>		<i>Mean values from EPS or Lagged ensembles. No editing.</i>	

Probabilities

	<u>SHORT FCST</u>	2-3d	<u>MED/LONG FCST</u>	14 d
Scenario I	Empirical probabilities from Lagged Ensembles or Poor Mans Ensemble		Lagged Ensembles (modified with empirical probabilities)	
Scenario II	Empirical probabilities Or Ensemble probabilities from Hirlam		EPS (modified with "empirical" probabilities).	
Scenario III	Empirical probabilities from some kind of ensembles		EPS (modified with "empirical" probabilities).	

Conclusions in the FEP project

Beslut: Go to scenario II, via scenario I. Later, take sight at scenario III.

Motivation:

Scenario I We gain a lot (basic principles), good to start with, easy to implement but NO final goal.

Scenario II We have to work with the methodology before taking this step.

Scenario III Final goal – but demands much more work with methodology than scenario II.



Questions?