



UBIMET

Climate Change Adaptation Strategies

UBIMET

INSTITUTE FOR UBIQUITOUS METEOROLOGY

- International Meteorological Institute
- Founded in 2004 by a meteorologist and a chemist
- Global scope / headquarters in Vienna, main branches in Melbourne, New York & Munich
- More than 400 employees from over 15 countries
- Supplier of meteorological alarm and forecast systems for railways (ÖBB, DB)
- Member of UIC IRRB (International Rail Research Board)



EURNEX

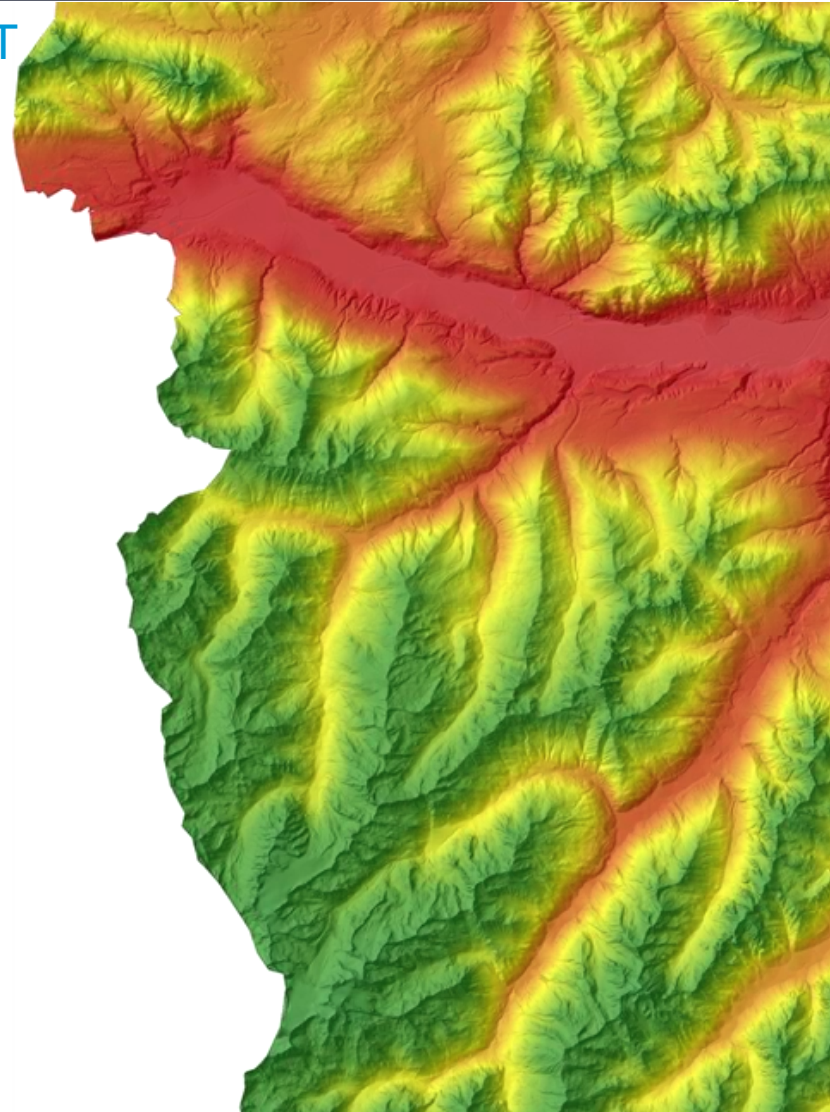
RAIL RESEARCH NETWORK (EUROPE & CENTRAL ASIA)



Rail Weather Forecast & Alarm Systems

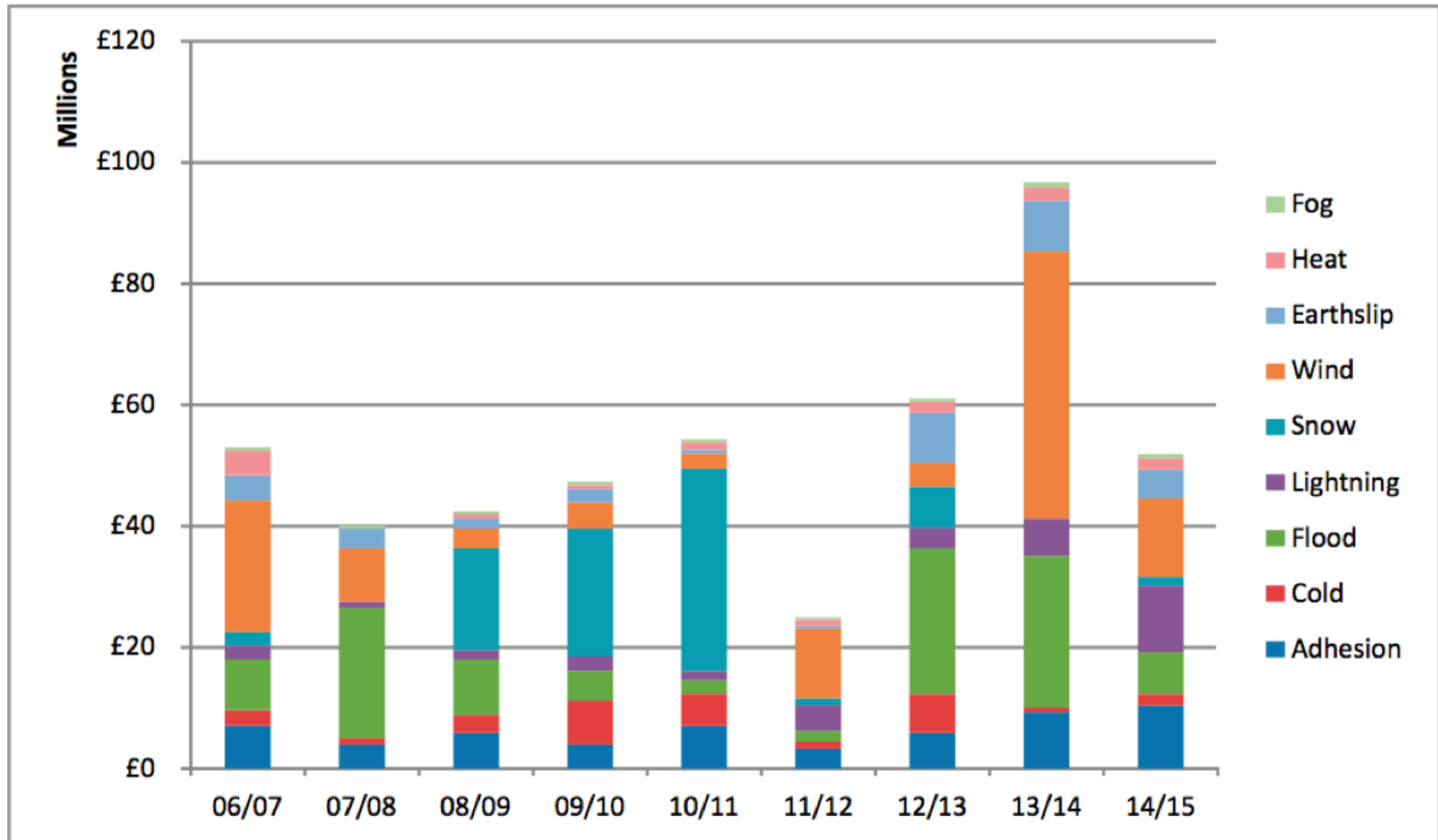
10 YEARS OF RESEARCH & DEVELOPMENT

- Special weather model for infrastructure operators
- Agile, adaptive and self-learning meteorological model
- Topographic resolution of 250m
- Considers local weather phenomena related to surface topography (e.g. cold-air pools in valleys, local wind systems)
- Continuous development in cooperation with national and international network operators and organizations.



Weather Impact on Rail Transport

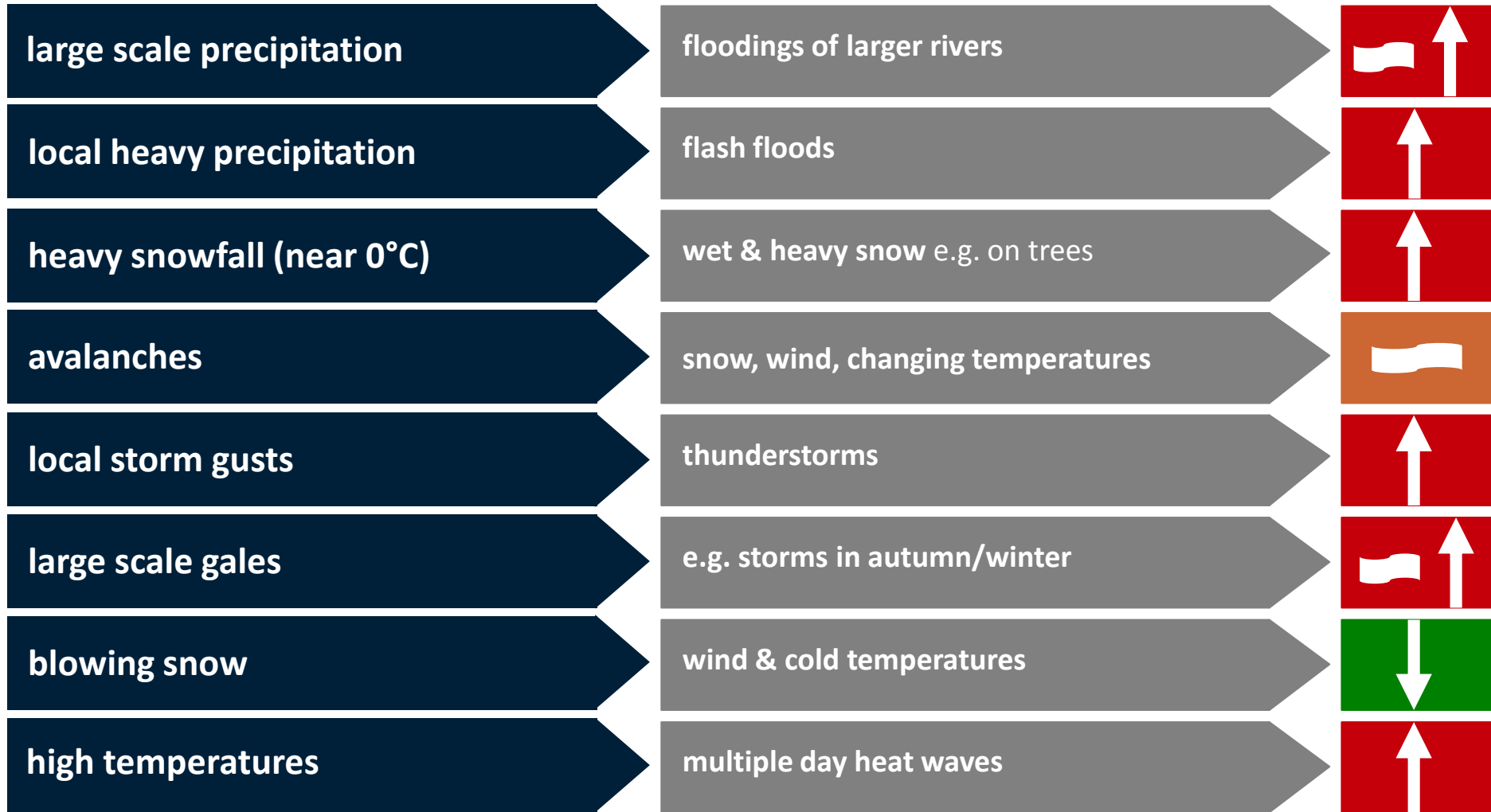
WEATHER RELATED COSTS FOR UK NETWORK RAIL > 60 MIO €



NetworkRail Climate Change Adaptation Report 2015

Climate Change Study

AUSTRIAN FEDERAL RAILWAYS & AUSTRIAN ROAD ADMINISTRATION



In 2005 the Austrian Federal Railways asked UBIMET to implement a nationwide meteorological monitoring system



ÖBB infra:wetter

GOALS OF THE RAIL WEATHER INFORMATION & WARNING SYSTEM

- Highly precise weather forecasts along the railway lines
- Severe Weather Warnings for the safety of railway operation
- Exact snow forecasts for the planning of winter services



+

INCREASE OF SAFETY

1st year: rescue of trains before flooding

+

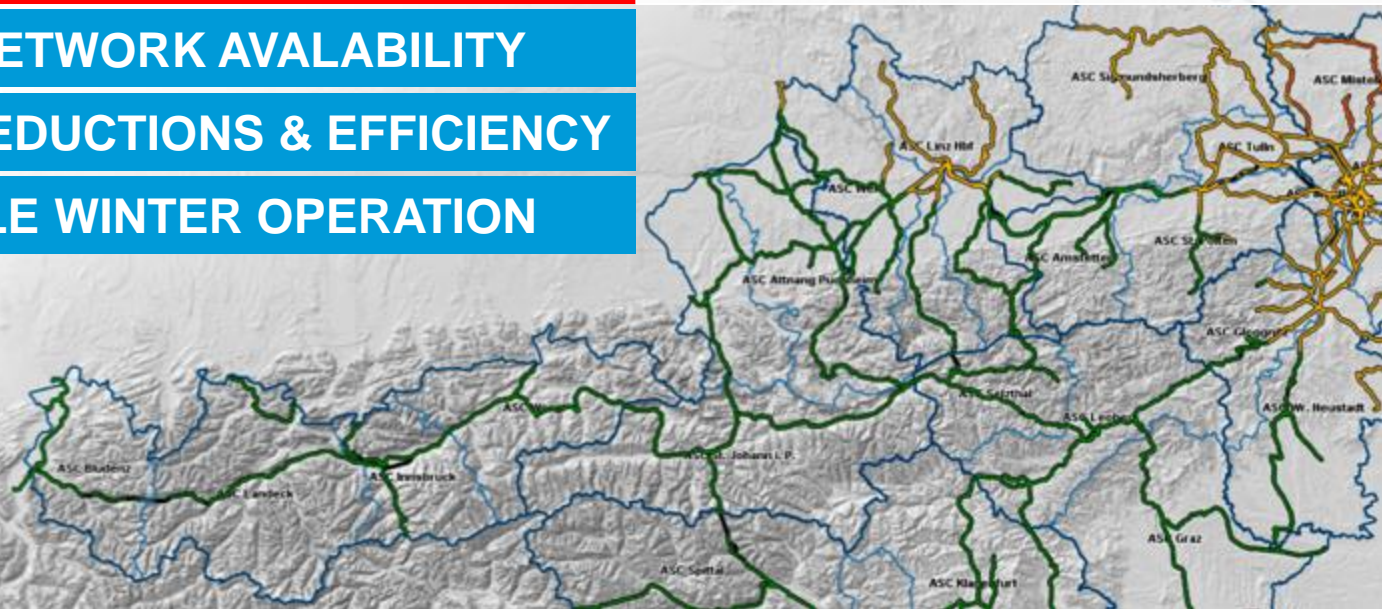
MORE NETWORK AVAILABILITY

+

COST REDUCTIONS & EFFICIENCY

+

RELIABLE WINTER OPERATION



ÖBB infra:wetter

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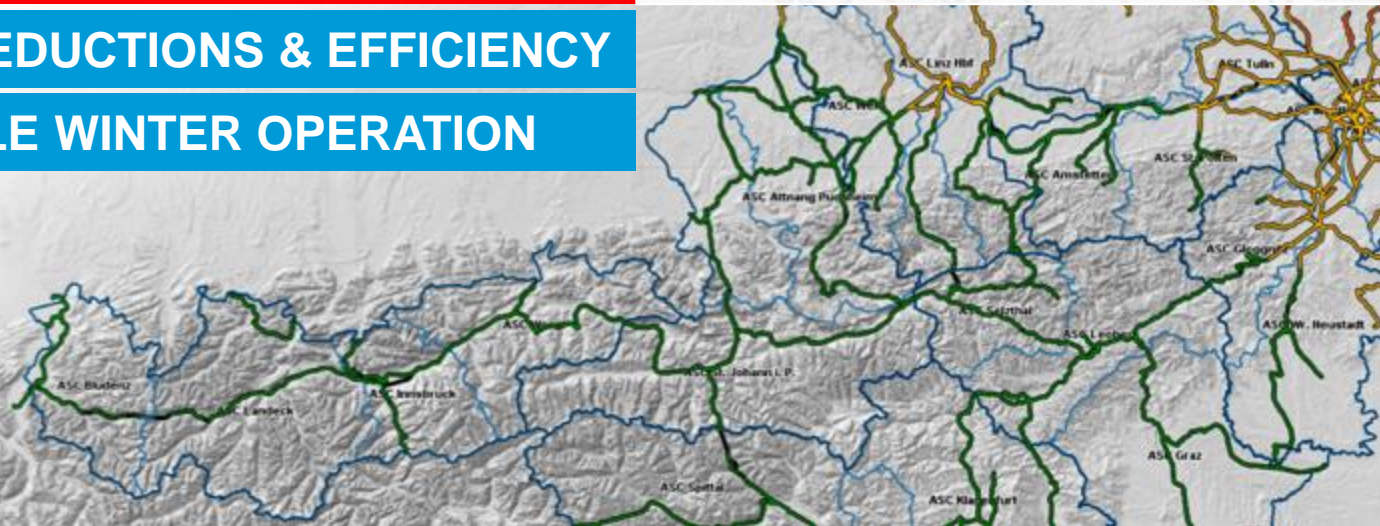
+ INCREASE OF SAFETY

+ MORE NETWORK AVAILABILITY

+ COST REDUCTIONS & EFFICIENCY

+ RELIABLE WINTER OPERATION

5% less delays since system introduction



ÖBB infra:wetter

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+

INCREASE OF SAFETY

+

MORE NETWORK AVAILABILITY

+

COST REDUCTIONS & EFFICIENCY

+

RELIABLE WINTER OPERATION

More reliability with less workforce



ÖBB infra:wetter

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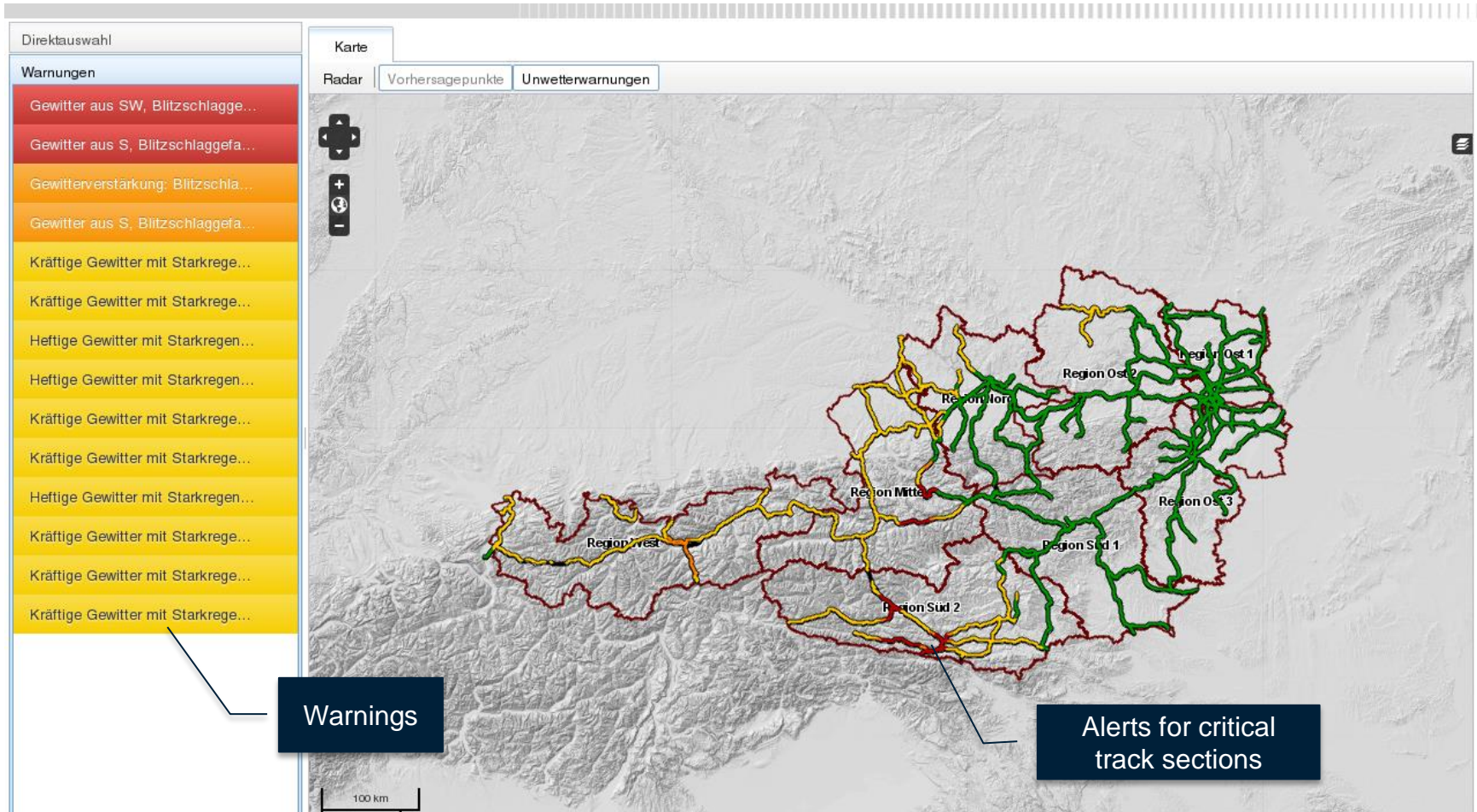
+	INCREASE OF SAFETY
+	MORE NETWORK AVAILABILITY
+	COST REDUCTIONS & EFFICIENCY
+	RELIABLE WINTER OPERATION

National standards & procedures



SYSTEM OVERVIEW

24H SURVEILLANCE OF THE WHOLE NETWORK



Natural hazards - status quo

WEATHER WARNING SECTIONS

- The ÖBB rail weather system is not only used for operational planning, but also for **safety issues** (natural hazards)
- At the moment very critical track sections are declared as **WEATHER WARNING SECTIONS**
- **If a certain severe weather warning is issued or e.g. some heavy rain expected, there is an individual special operation checklist in effect for every track section!**
- An more automatic approach is planned – Complete natural hazards mapping

Direktauswahl

Warnungen

- Verstärkung des Gewitters: Starkregen und lokale Sturmböen
- Gewitterverstärkung: Gefahr von Starkregen und lokalen Überflutu...**
- Gewitter aus N, Gefahr von Starkregen, lokale Überflutungen
- Gewitter aus NO, Gefahr von Starkregen, lokale Überflutungen
- Gewitter mit viel Regen in kurzer Zeit möglich, örtlich Überflutungen

Gewitterverstärkung: Gefahr von Starkregen und lokalen Überflutungen
Das Gewitter hat sich verstärkt. Im Gewitterbereich besteht die Gefahr von Starkregen mit lokalen Überflutungen.

Zeitraum

Erstellungszeit	Beginn	Ende
Freitag, 11. Juli 2014 15:08	Freitag, 11. Juli 2014 14:23	Freitag, 11. Juli 2014 16:43

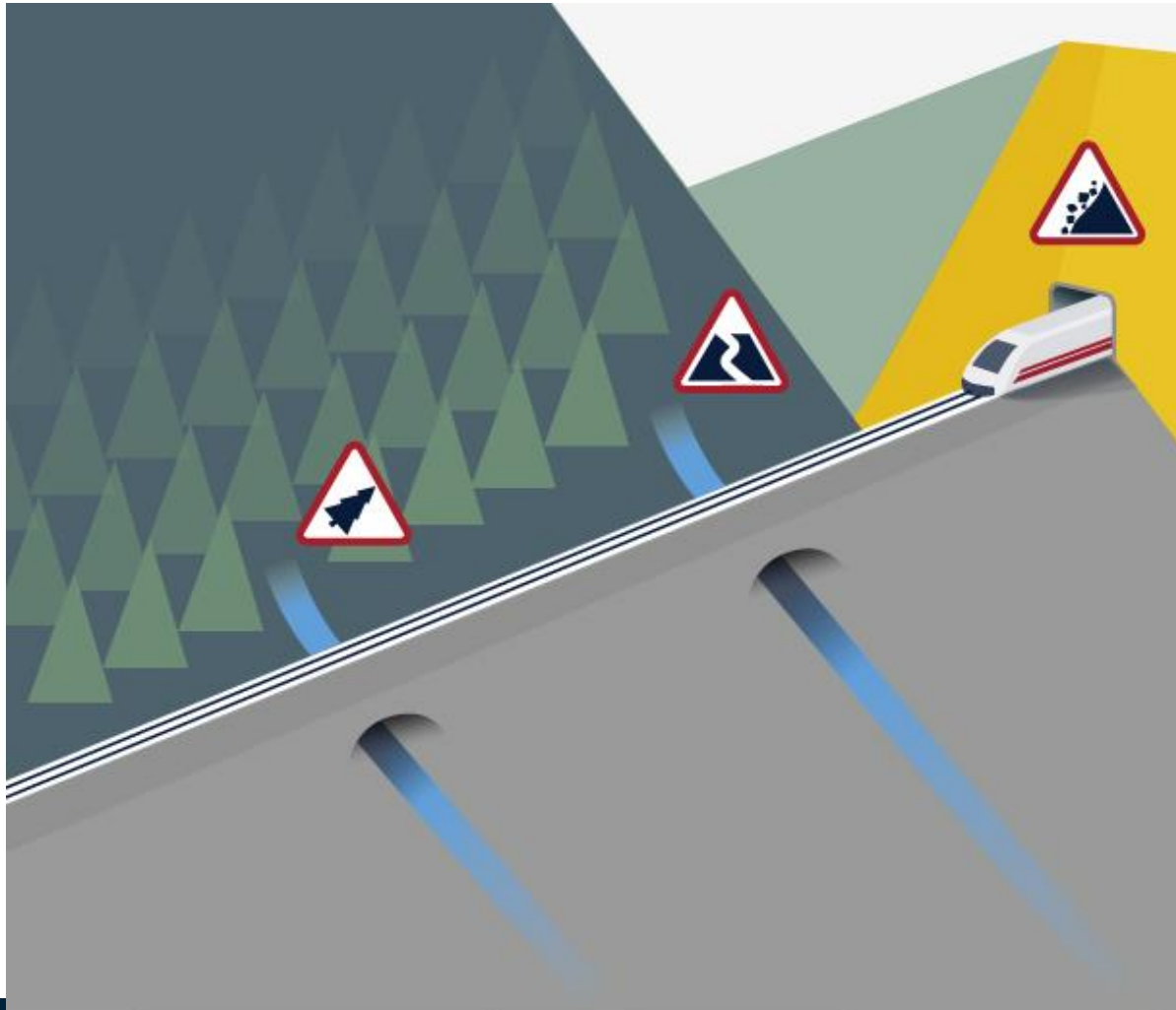
Betroffene Punkte

Laa/Thaya Stockerau

nundsherberg ASC Mistelbach

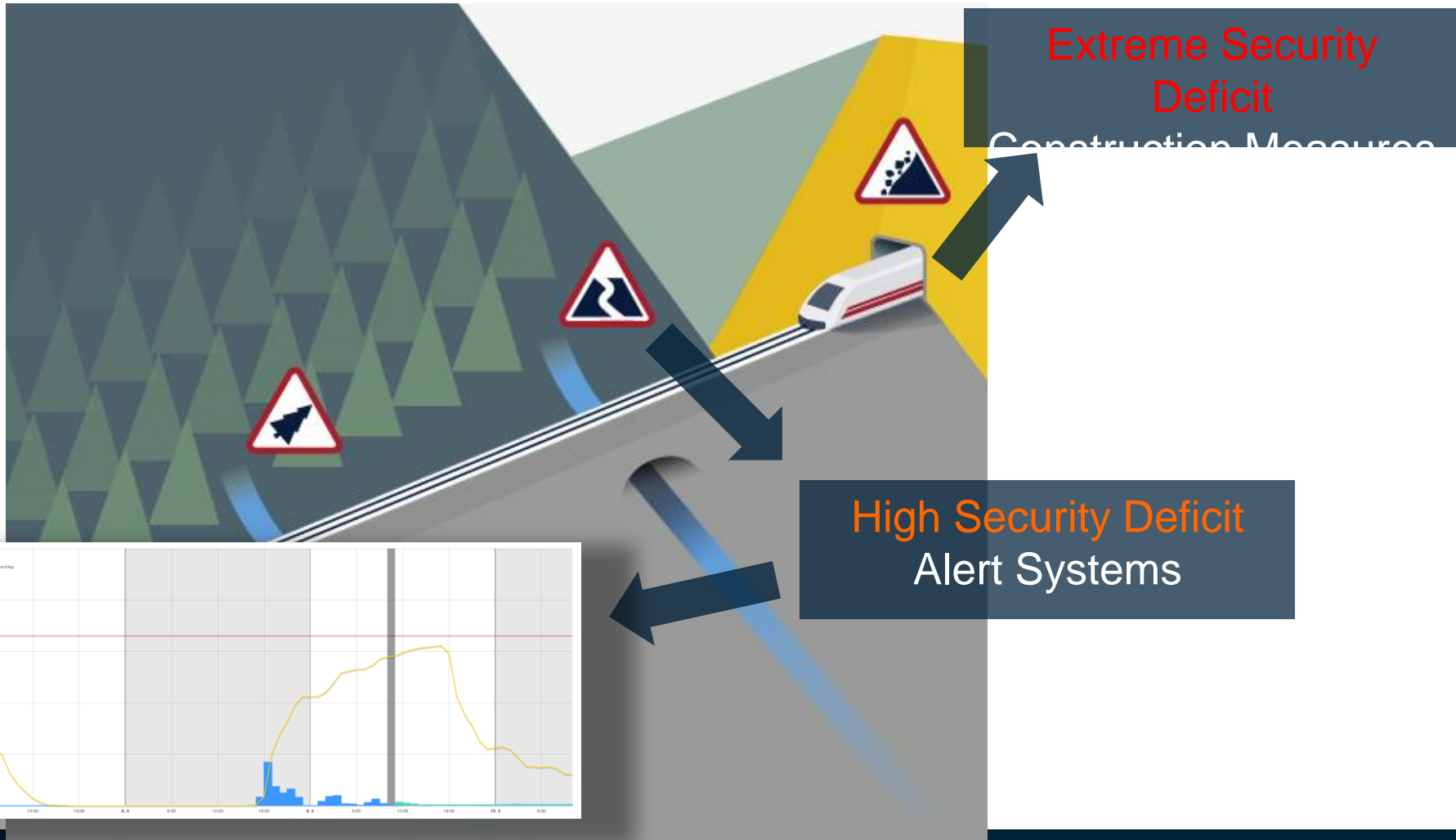
The new natural hazards management

FOR THE WHOLE NETWORK



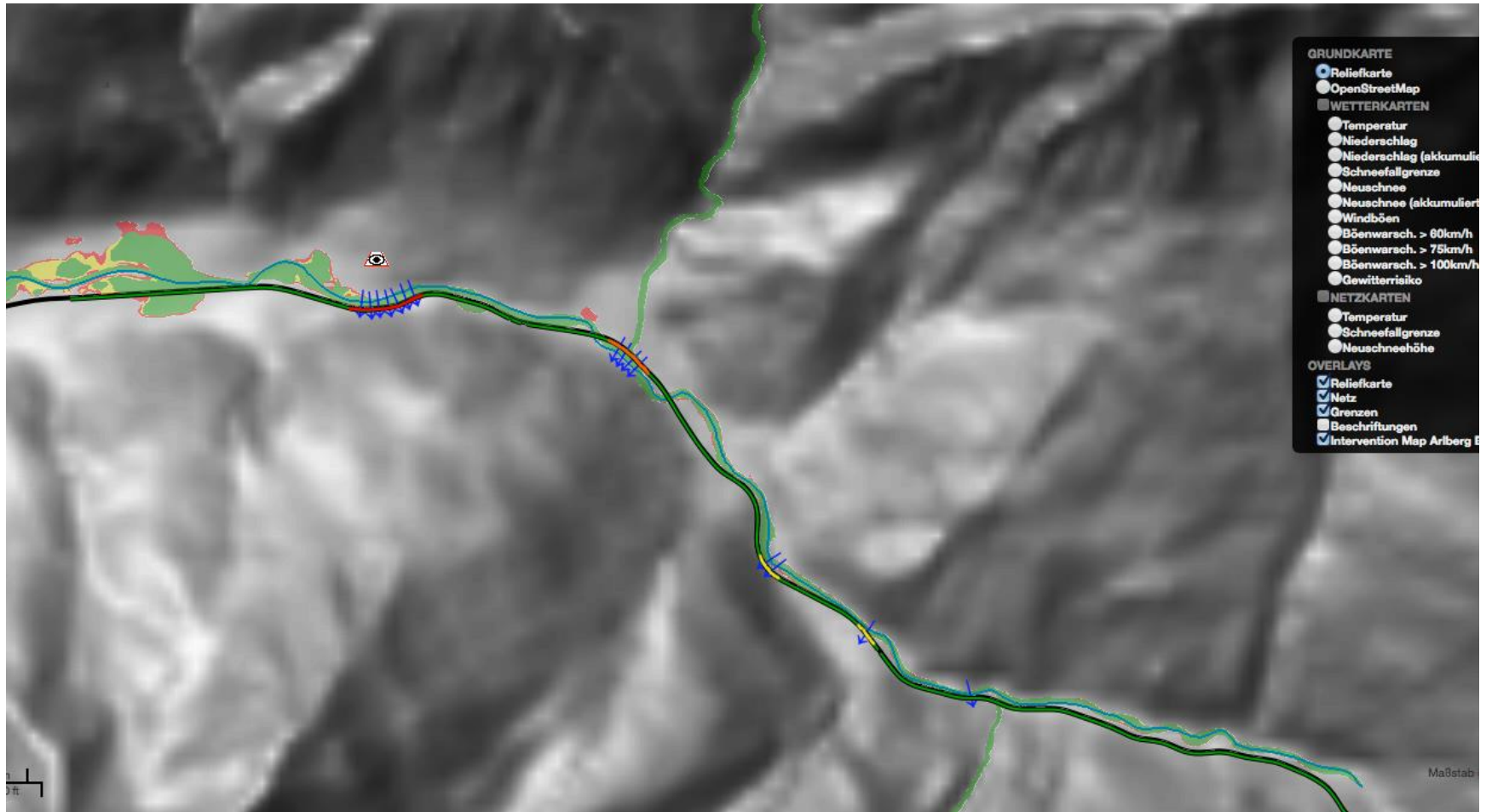
The new natural hazards management

NETWORK WIDE EVALUATION OF RISKS AND SECURITY DEFICITS



Risk mapping of the network

BASE FOR THE NEW NATURAL MANAGEMENT PLAN

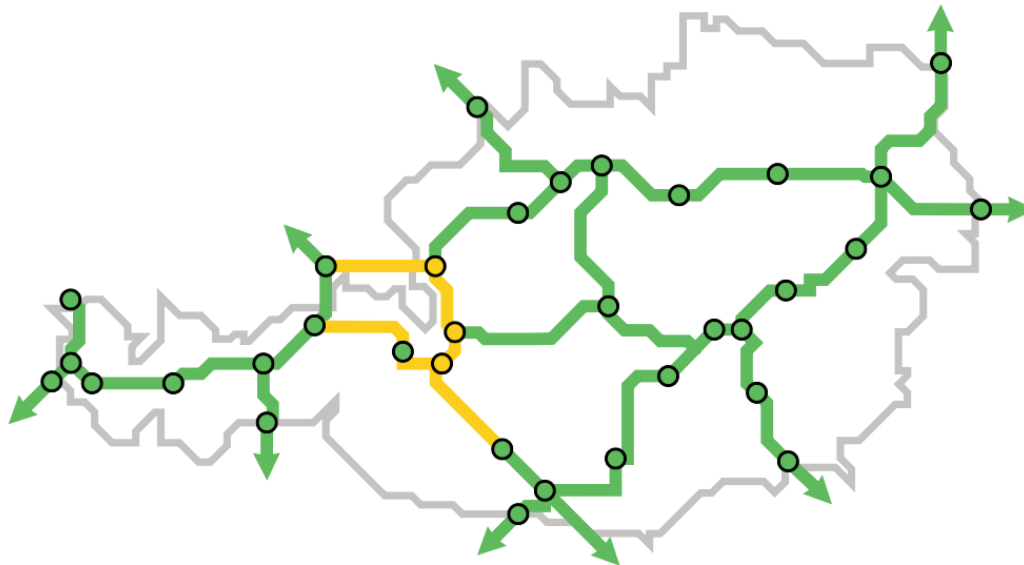


Corridor information

WEATHER ALERTS FOR NATIONAL & INTERNATIONAL ROUTES

ÖBB
INFRA Verkehrsleitzentrale - infra:wetter

01.08.2014 09:00 – 12:00



12:00 – 15:00



15:00 – 21:00



02.08.2014



03.08.2014



Hochwasser

Neuschnee

Hitze

Wind

Lawinen

Kälte

UBIMET

International approach

TRANS NATIONAL WEATHER ALERT SYSTEM FOR CORRIDORS

- In cooperation with international organizations, we would like to prepare an more trans-national approach for natural hazards management, road & rail weather forecasts and alert systems.
- It is a huge advantage for corridor managers to provide costumers with risk forecasts, e.g. when large meteorological inducted delays are expected (flooding, snowstorm, freezing rain,...)
- Some weather related problems have their roots outside of the own network



GOALS

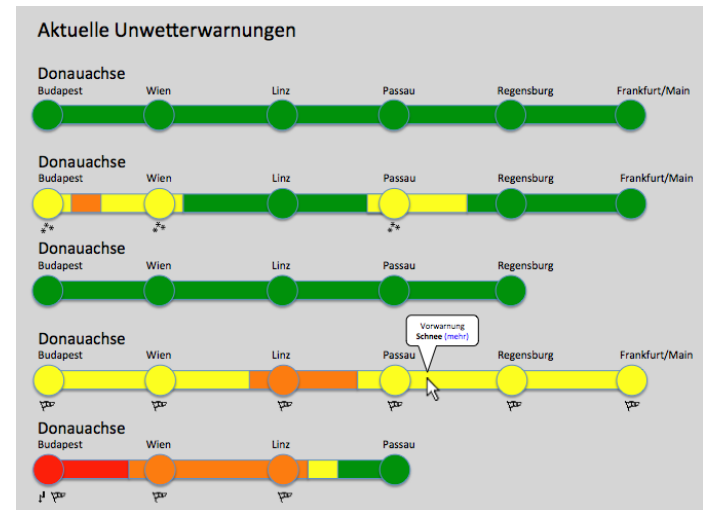
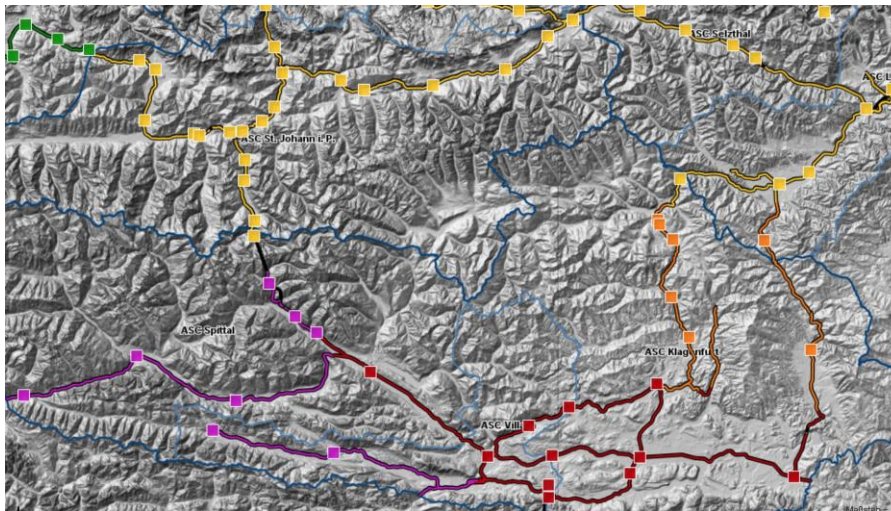
Extension of existing national weather systems for international data

Monitoring and forecasts for international trains (ice problems, delays)

Exchange of information and standardized communication between national railway operators

TEM/TER Corridor Weather Alert System

- UBIMET suggests one pilot project for a trans-national road & rail weather information system.
 - Gaining experience in implementing trans-national online platforms
 - Evaluation of advantages and disadvantages – feasibility study
 - Multi-Language settings and standardized interfaces for the exchange of information
 - Implementation of local and national information into the international system (e.g. expected closures due avalanches, flooding, storms, blizzards,...)

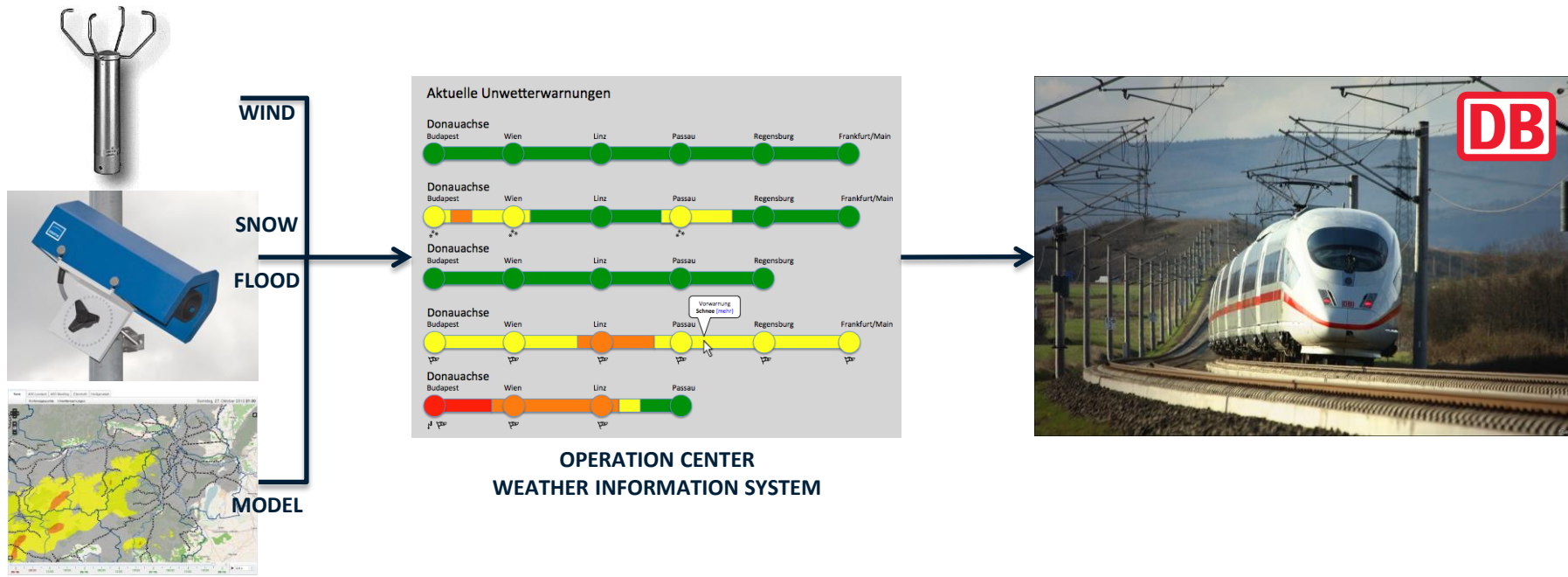


Research Focus UBIMET Transportation

1	Ice on overhead lines	In preparation
2	Ice/Snow on high-speed trains /carriages	In preparation
3	Drifting sand	Feasibility study
4	Fire risk & heat warnings (maintenance works)	In operation
5	Risk of fallen trees (snow/wind)	In operation
6	Intelligent switch point heating (energy savings)	Running project
7	Blowing snow forecasts	In operation
8	Flash flood warnings & remote track monitoring	In operation

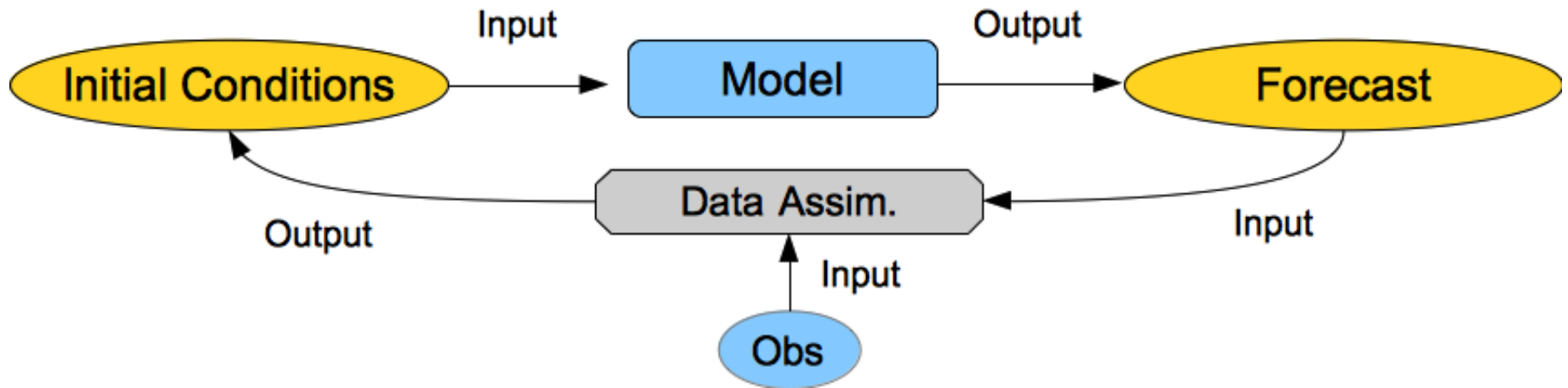
Real-time surveillance of the network

- 100% surveillance of critical weather situations
- Direct implementation of sensor data into meteorological models
- High cycle models for up to date forecasts & nowcasting
- Implementation of warning levels for the infrastructure operator
- Online alert screens for operation centers & message distribution system



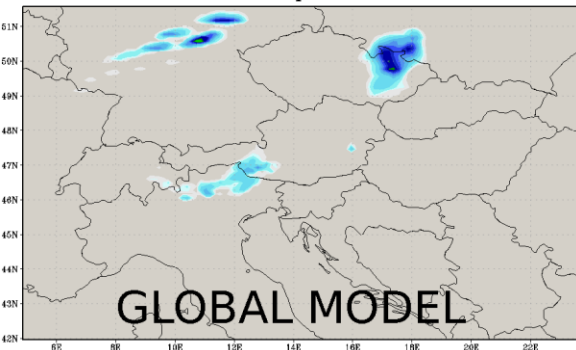
High cycle models & analysis

DATA ASSIMILATION



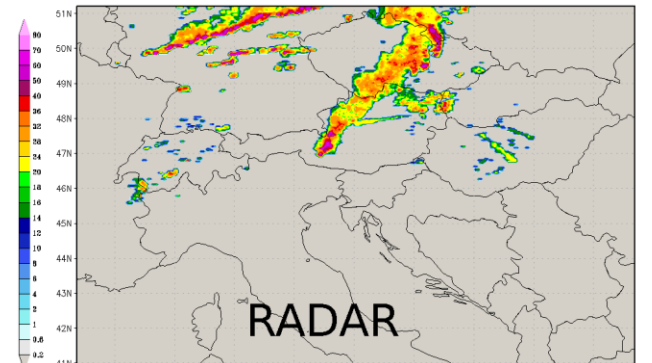
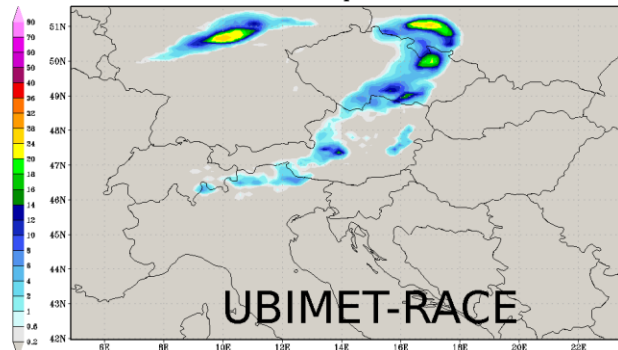
Friday 11Z19AUG2011

Total Precipitation 1 h



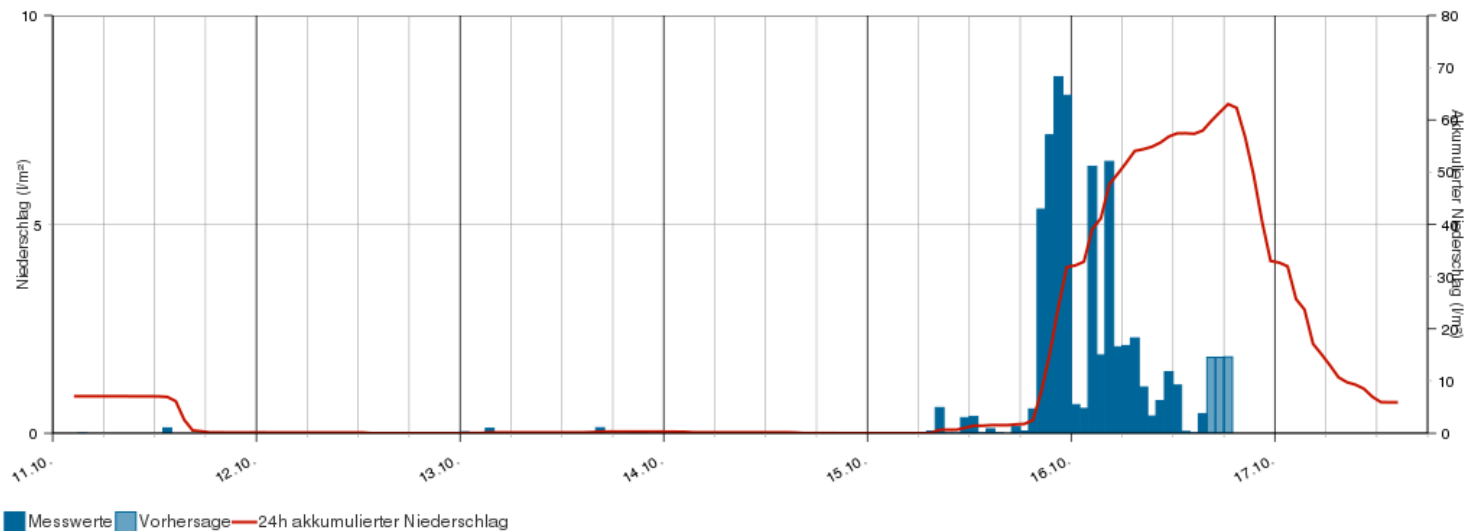
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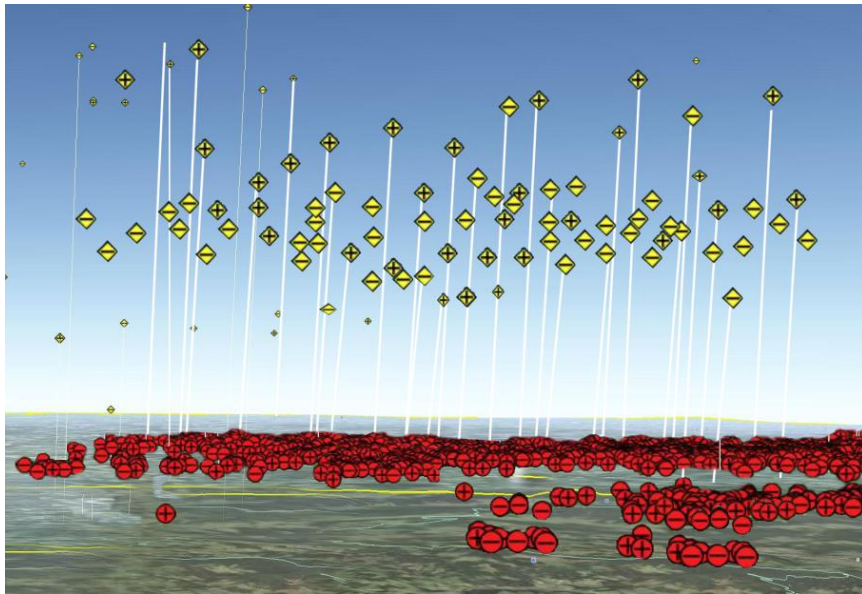
Flash flood warnings for rail & roads

- Traditional radar based systems
- Calculation of liquid precipitation rates and soil saturation
- Warning levels based on experience and case studies
- Problems:
 - Adaptation of thresholds may be necessary
 - No hydrological model (would be too expensive)
 - Remote areas without radar coverage



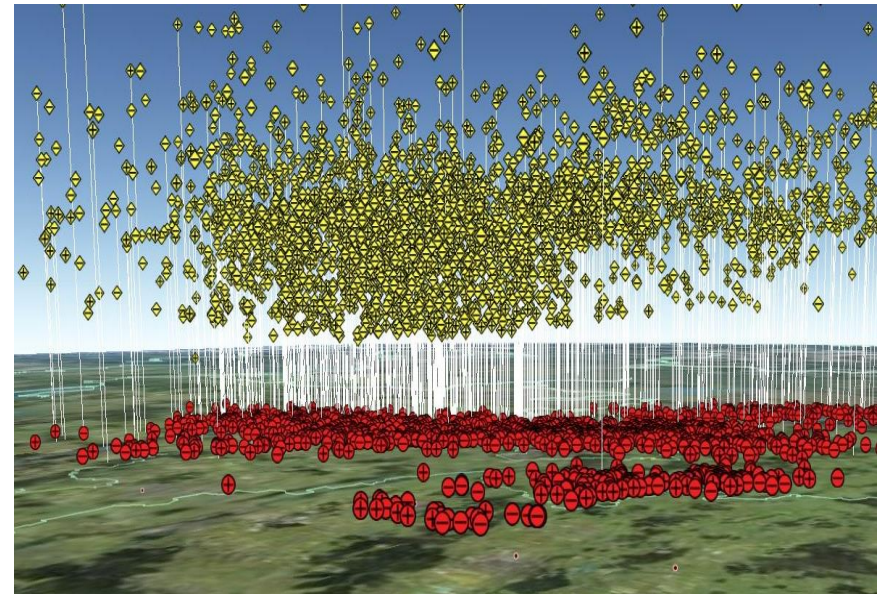
3D lightning detection

„Normal“ thunderstorm



Low rate of cloud-to-cloud strikes

Severe thunderstorm



High cloud-to-cloud rate

System users & partner



NATIONAL MET OFFICES



Aviation

AIRPORTS & AIR TRAFFIC CONTROL

- High technology lightning detection systems
- Airport warning systems
- Risk estimations & airport forecasts
- Aircraft de-icing forecasts

Adaptation of last generation aviation weather software systems for road and rail users.



Civil protection

NATIONAL WARNING CENTRES

- Live Weather Cockpit
- On demand weather forecasts for the operation area
- Warnings & information for the on-site teams
- Essential information for dispatching

Rescue & emergency operation support systems.



Energy

PRODUCERS & NETWORK OPERATORS

Reduction of energy
consumption
(switch point heating)

- Energy consumption forecasts for cities & countries
- Live surveillance of the whole network and critical assets
- Calculation of the power line temperature and maximum capacity
- Energy production forecasts based on self learning models (solar power, wind)



Conclusions

- Huge developments in rail weather models during the last years
- Problems in implementing weather warnings and forecasts into the daily operational business
- Lack of trans-border information systems
- Searching for test regions for an trans-national information system
- Still a lot of research to be done – there is much room for improvements
- Combination of climate models and local risk models for long-term risk predictions!

BE PREPARED FOR CLIMATE CHANGE IMPACTS

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