



UBIMET

Rail Weather & Natural Hazards Management

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
- Focus on research activities in the railway sector
- Cooperation with international organizations and universities, affiliate member of UIC
- Supplier of meteorological alarm and forecast systems for railways (ÖBB, DB)



EURNEX

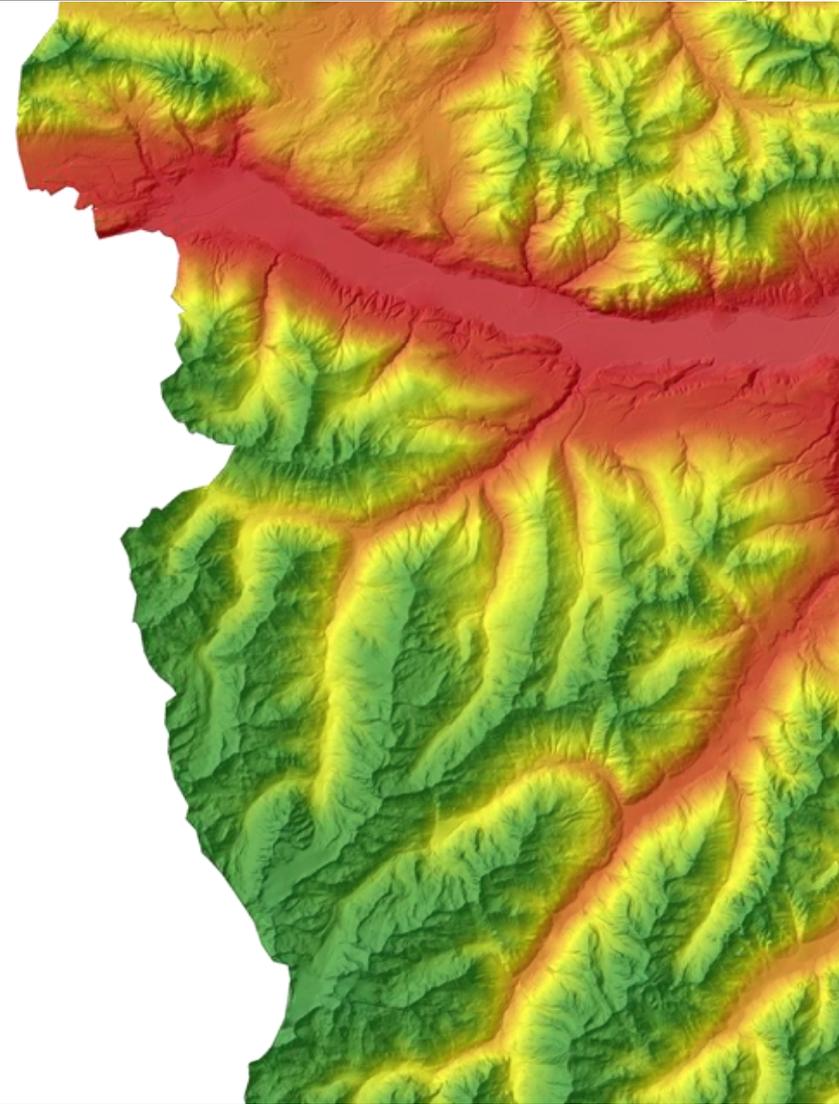
RAIL RESEARCH NETWORK (EUROPE & CENTRAL ASIA)



Rail Weather Forecast & Alarm Systems

10 YEARS OF EXPERIENCE

- Special weather model for the infrastructure sector (rail, road, energy,...)
- Agile, adaptive and self-learning meteorological model
- Resolutions of up to 100m
- Considers local weather phenomena related to surface topography (e.g. cold-air pools in valleys, local wind systems)
- Continuous development in cooperation with national railway operators!



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

+

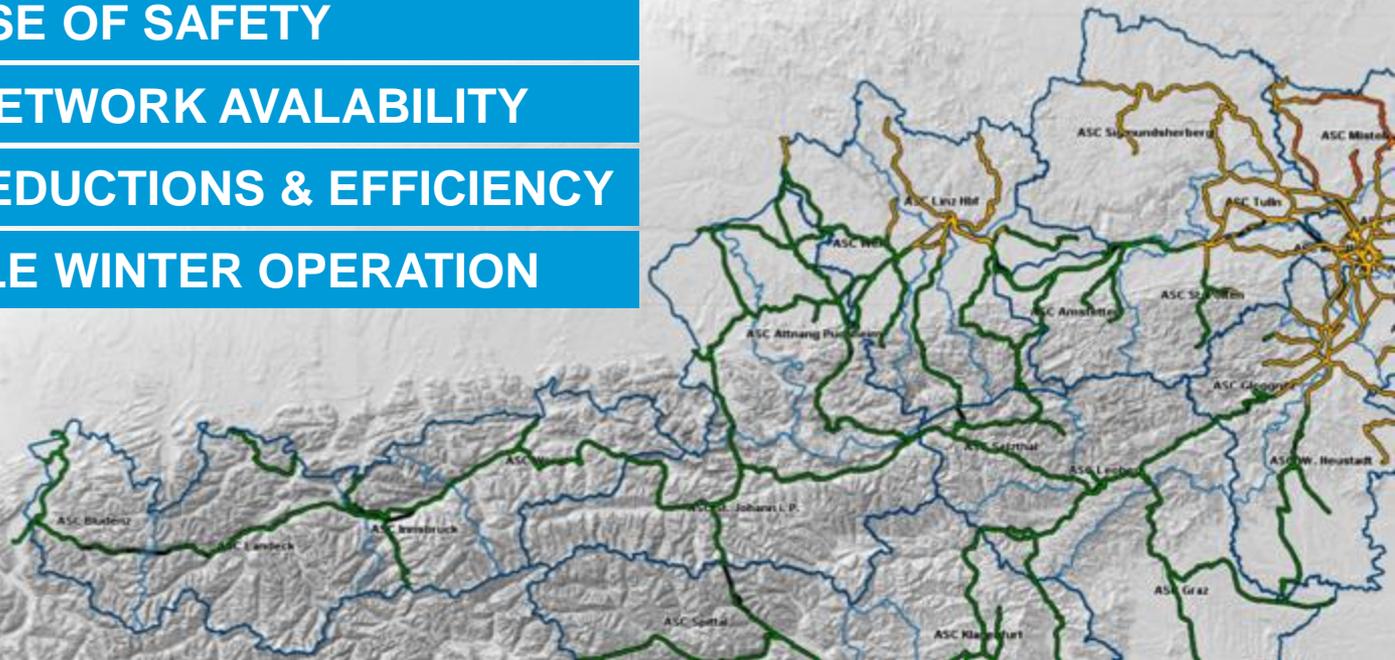
MORE NETWORK AVAILABILITY

+

COST REDUCTIONS & EFFICIENCY

+

RELIABLE WINTER OPERATION



ÖBB infra:wetter

GOALS OF THE RAIL WEATHER INFORMATION & WARNING SYSTEM

- Highly precise weather forecasts along the railway lines
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INCREASE OF SAFETY

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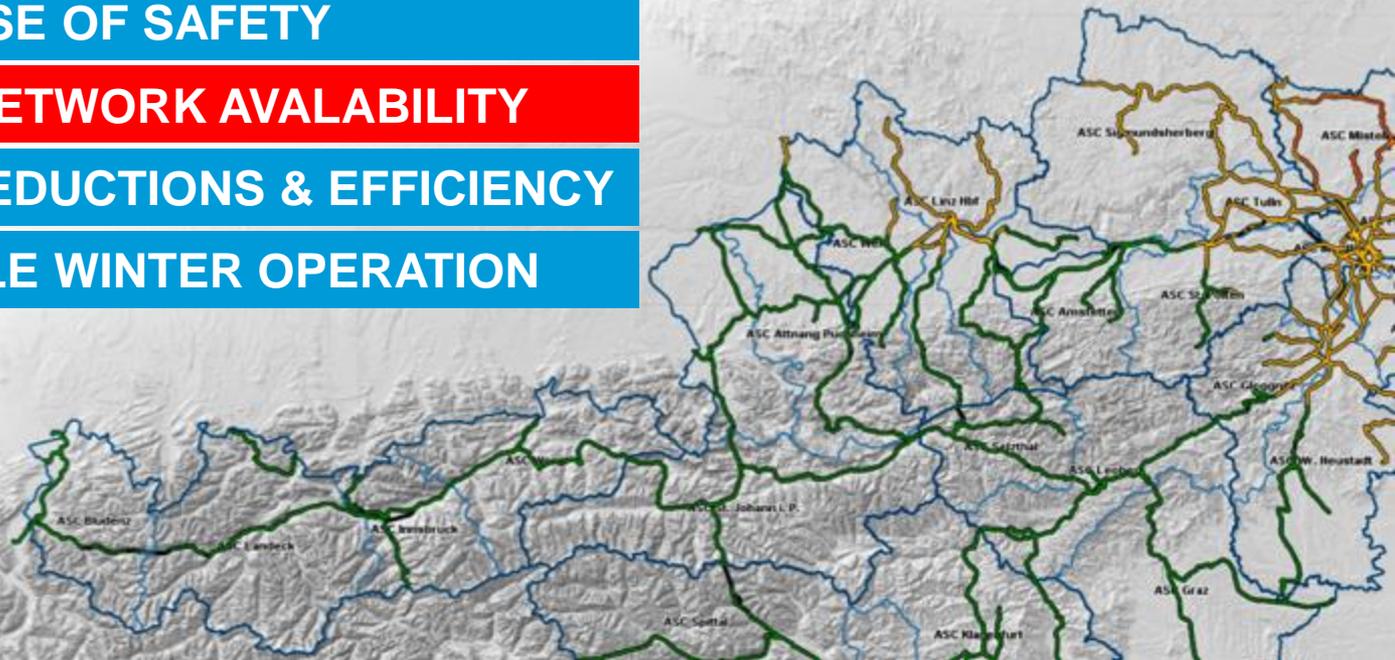
MORE NETWORK AVAILABILITY

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RELIABLE WINTER OPERATION

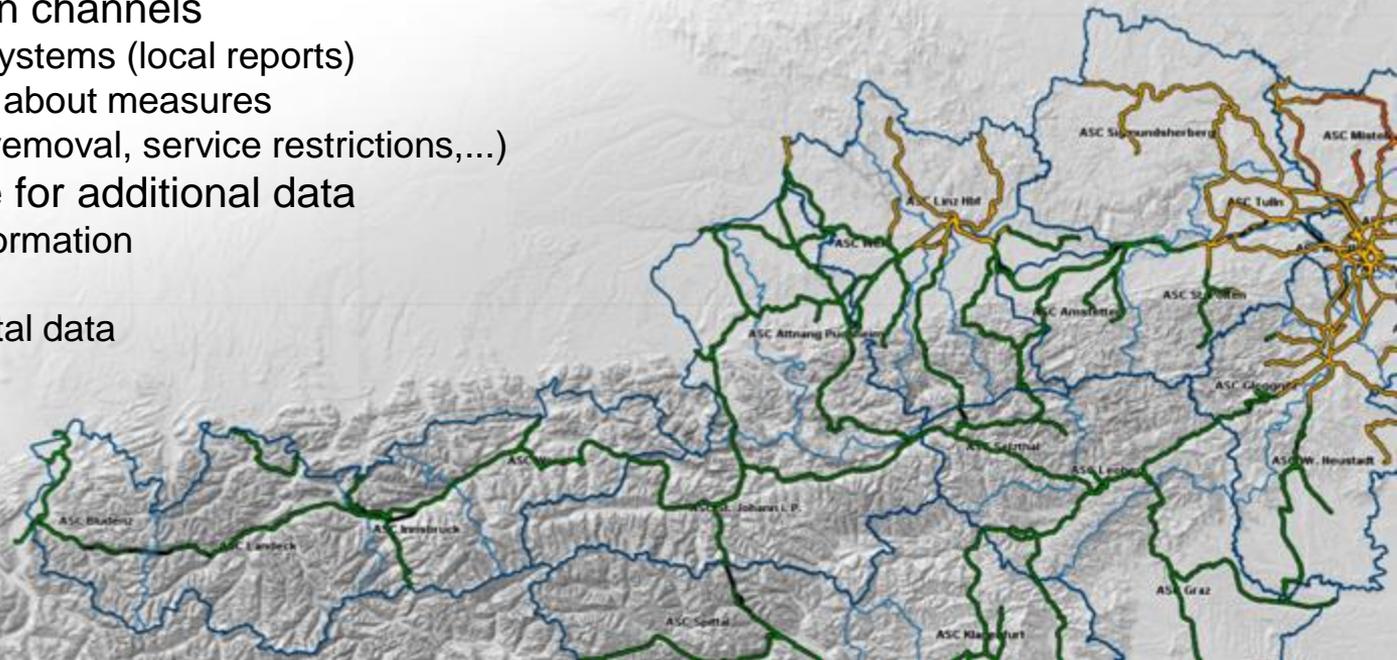


IRIS

THE UBIMET INFRASTRUCTURE PORTAL

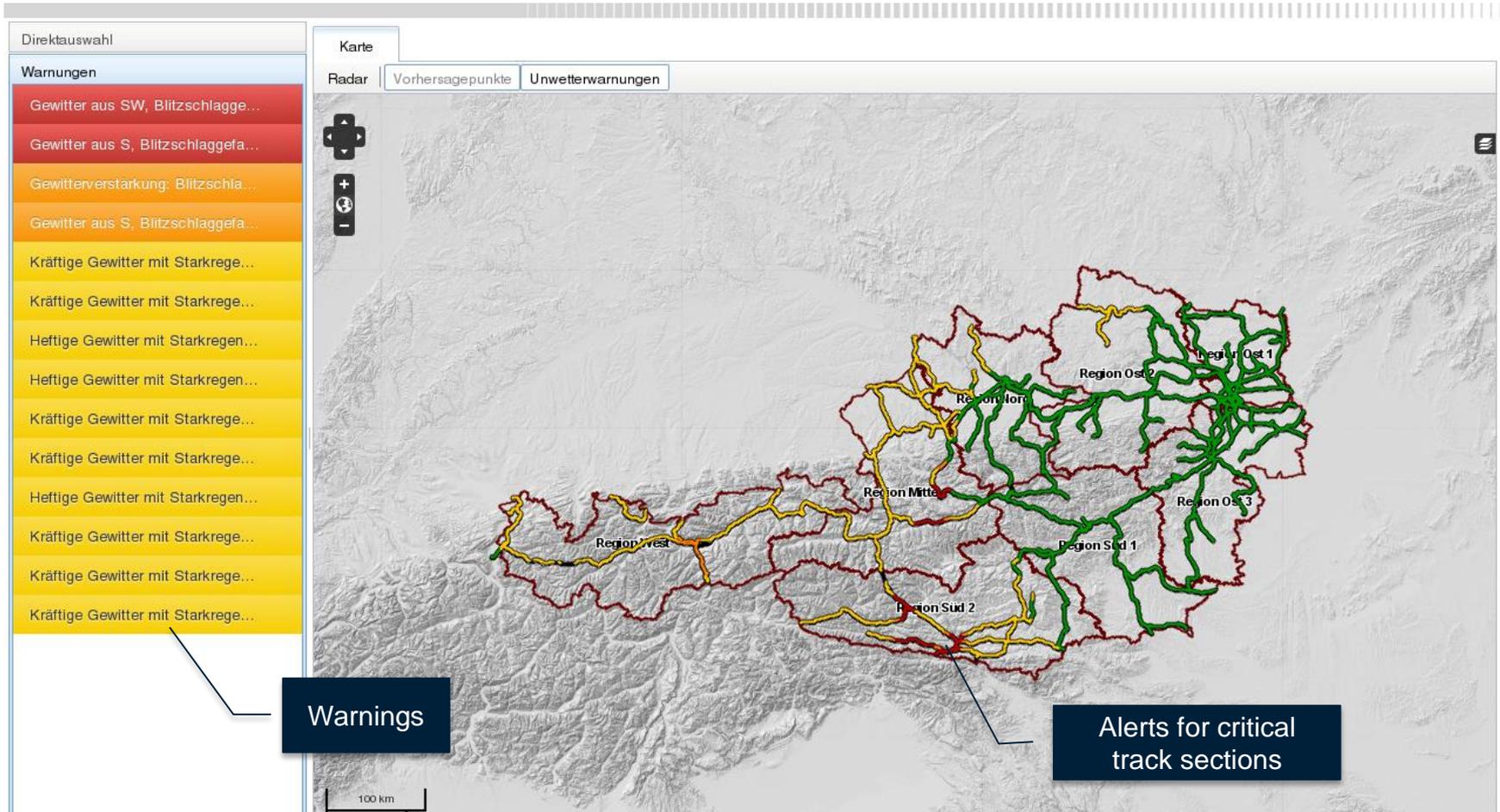
○ The System includes:

- On demand weather forecasts by special infrastructure weather models
- Reliable weather warning system
- Real time weather station data
- Communication channels
 - Reporting systems (local reports)
 - Information about measures (e.g. snow removal, service restrictions,...)
- Open interface for additional data
 - flooding information
 - fire risk
 - governmental data
 - ...



SYSTEM OVERVIEW

24H SURVEILLANCE OF THE WHOLE NETWORK



REGIONAL INFORMATION

WARNINGS & FORECASTS FOR EVERY SINGLE TRACK

BB INFRA **infra:wetter** Übersicht Wetterberichte Messdaten Sonderinformationen Administration Support Eisenbach, Stefan

Direktauswahl

Warnungen

- Massiver Schneefall, 70-100cm N...
- Starker Schneefall mit 40-60cm N...
- Massiver Schneefall, 70-100cm N...
- Starker Schneefall, 50-80cm Neu...
- Bis Fr.mittag Schneefall, 20-30cm...
- Bis Fr.mittag Schneefall, 25-35cm...
- Starker Schneefall, oftmals 30-50...
- Starker Schneefall, oftmals 25-40...
- Bis Donnerstagabend zeitweise S...
- Bis Donnerstagabend weitere 5 bi...
- Häufig Schneefall, verbreitet 15 bi...
- Häufig Schneefall, dabei je nach ...
- Über 1100-1300 m zwischen 20 u...
- Sturmböen aus SO-S mit 70-80 k...
- Zeitweise Schneefall, in Summe 5...
- Bis Donnerstagabend weitere 5 bi...
- Do.morgen bis Fr.mittag häufig S...
- Zeitweise Schneefall, bis Freitag...

Warnstufen

Karte ASC Attnang Puchheim ASC Innsbruck ASC Meidling Brennersee Ebenfurth Heiligenstadt Kienberg-Gaming Langen/Arberg

Radar Vorhersagepunkte Unwetterwarnungen

Forecasts & warnings for critical points

Pernegg

10 km
5 mi

Maßstab = 1 : 294

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RAIL WEATHER INFORMATION

ON DEMAND RAIL WEATHER FORECASTS

OB
INFRA

infra:wetter Übersicht Wetterberichte Messdaten Sonderinformationen Administration Support

Karte ASC Attnang Puchheim ASC Innsbruck ASC Meidling Brennersee Ebenfurth Heiligenstadt Kienberg-Gaming Langen/Arlborg Sillian x

Vorhersage für Sillian

Warnungen

VIOLETT-WARNUNG: Starker Schneefall, 50-80cm Neuschnee, örtl. Verkehrs-/ Stromstörungen
Am Donnerstagmorgen setzt Schneefall ein, der sich nachfolgend rasch verstärkt und dann praktisch ununterbrochen bis mindestens Freitagabend andauert. Dabei sind je nach Höhenlage Neuschneemengen von etwa 50 bis 80 Zentimeter zu erwarten, lokal auch etwas mehr. Der Schnee wird im Laufe des Freitags besonders in Lagen unterhalb etwa 1000 Meter zunehmend nass und schwer. Somit ist neben häufigen Verkehrsbehinderungen in einigen Fällen auch mit Störungen der Stromversorgung durch Schneebruch zu rechnen.

Erstellungszeit: Mittwoch, 29. Januar 2014 18:43
Gültig ab: Donnerstag, 30. Januar 2014 06:00
Gültig bis: Freitag, 31. Januar 2014 20:00

VORWARNUNG: Do.morgen bis Fr.abend intensiver Schneefall, 50-80 cm Neuschnee möglich
Am Donnerstagmorgen kommt zunehmend Schneefall auf. Nachfolgend kann es für lange Zeit und mit großer Intensität schneien, erst am Freitagabend lässt der Schneefall deutlich nach. Bis dahin sind 50 bis 80 cm Neuschnee möglich. In Folge der großen Schneemengen kann es zu massiven Verkehrsbehinderungen kommen. Am Samstag ist erneut kräftiger Schneefall möglich, achten Sie diesbezüglich auf weitere Warnungen.

Erstellungszeit: Mittwoch, 29. Januar 2014 18:43
Gültig ab: Donnerstag, 30. Januar 2014 07:00
Gültig bis: Freitag, 31. Januar 2014 20:00

Aussichten

	Mittwoch, 29. Januar 2014								Donnerstag, 30. Januar 2014								Freitag, 31. Januar 2014							
	03:00	06:00	09:00	12:00	15:00	18:00	21:00	24:00	03:00	06:00	09:00	12:00	15:00	18:00	21:00	24:00	03:00	06:00	09:00	12:00	15:00	18:00	21:00	24:00
Temperatur [°C]	-8	-8	-7	-4	-3	-5	-8	-8	-8	-7	-5	-4	-4	-4	-3	-3	-2	-2	-2	-1	-1	0	1	1
Windmitte [km/h]	5	5	0	0	5	0	0	0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Windböen [km/h]	5	5	5	5	5	5	5	5	5	5	10	10	5	10	10	10	10	10	10	10	10	10	10	10
Niederschlag [mm/3h]	0	0	0	0	0	0	<1	<1	<1	<1	<1	1	2	5	10	11	8	7	9	14	10	10	10	10
Neuschneehöhe [cm/3h]	0	0	0	0	0	0	<1	<1	<1	<1	<1	2	5	10	19	22	16	14	19	10	10	10	10	10
Wetterzustand																								
	☀️ 07:41 ☀️ 17:05								☀️ 07:40 ☀️ 17:07								☀️ 07:38 ☀️ 17:08							

Meteogramme

Temperature (in °C)

Wind (in km/h)

29.01 06.00 12.00 18.00 30.01 06.00 12.00 18.00 31.01 06.00 12.00 18.00 01.02

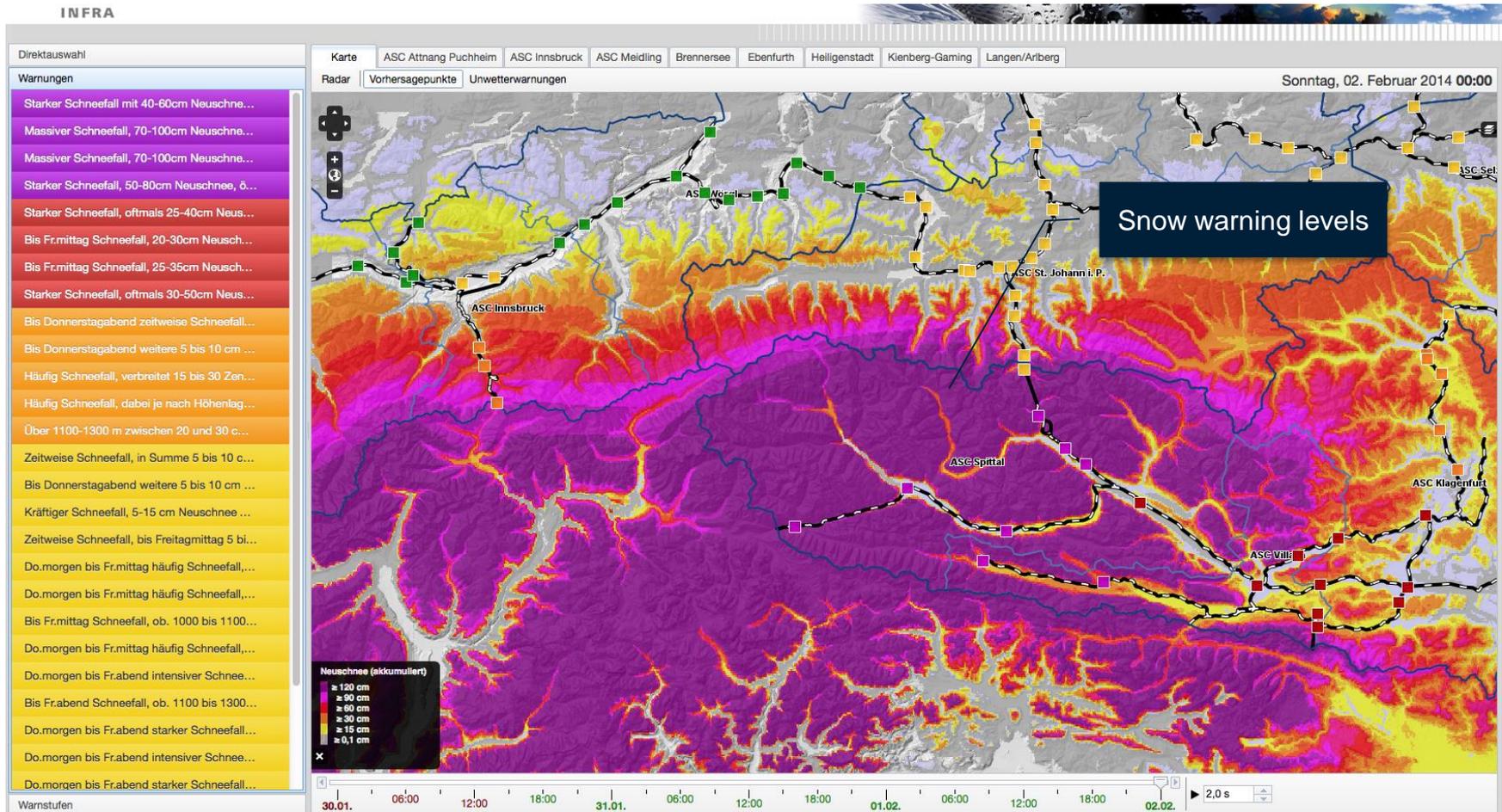
WARNINGS

3-day rail weather forecast

temperature

RISK MAPS

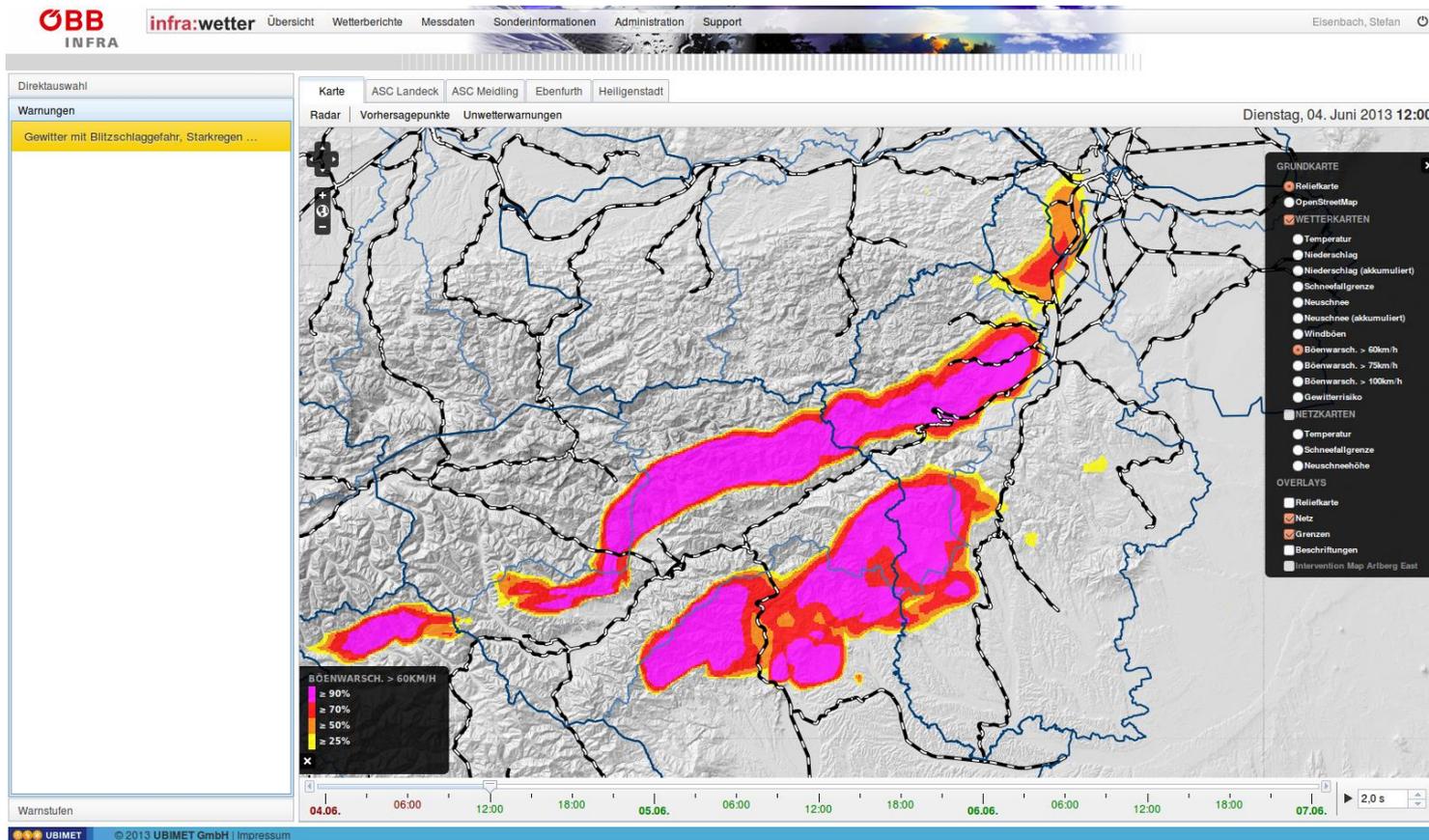
WEATHER MAPS WITH RISK INFORMATION (SNOW, WIND, ICE,...)



Probabilistic models

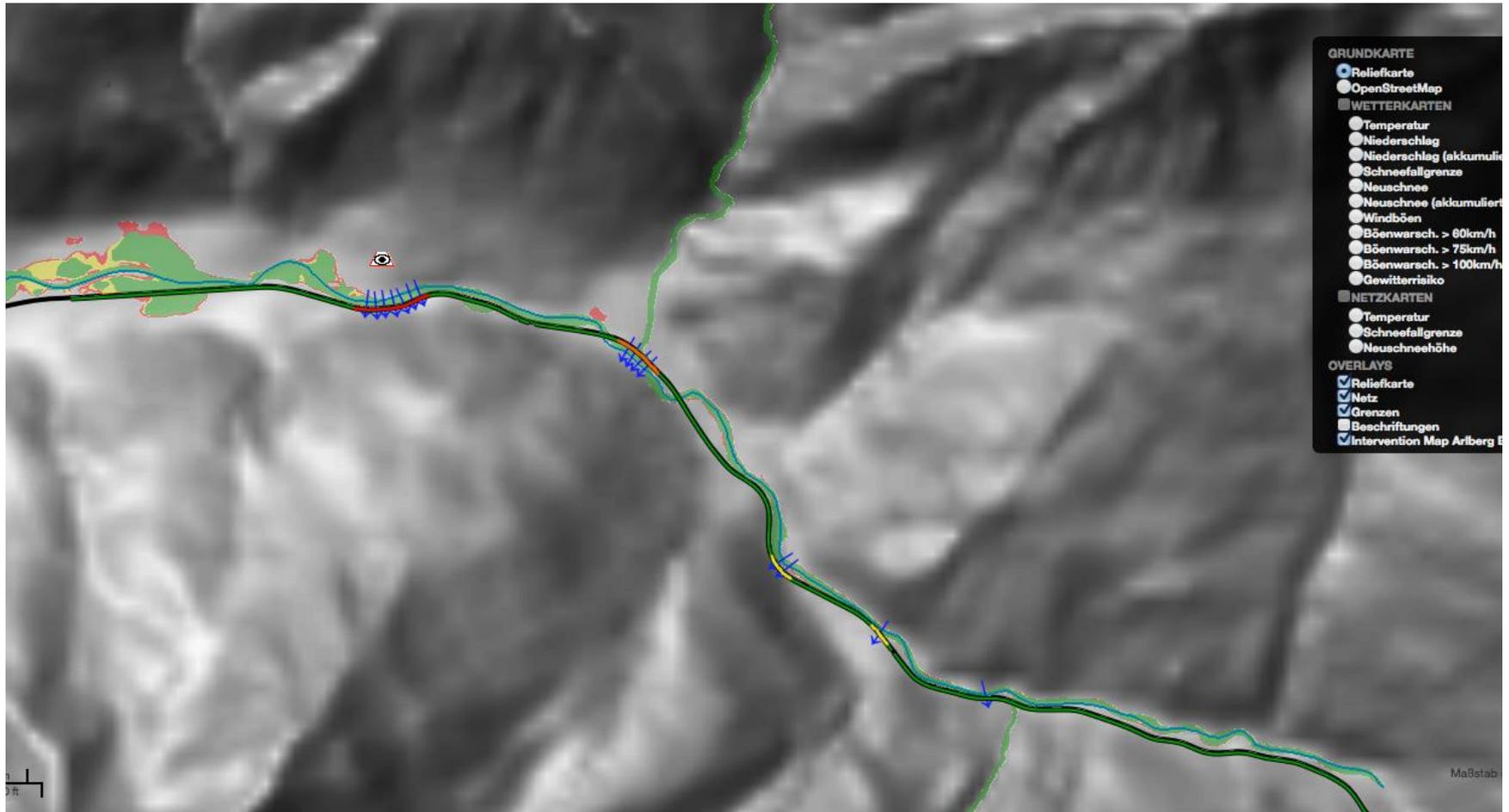
RISK PARAMETERS

- Risk of certain wind speeds / gusts, certain snow or precipitation rates



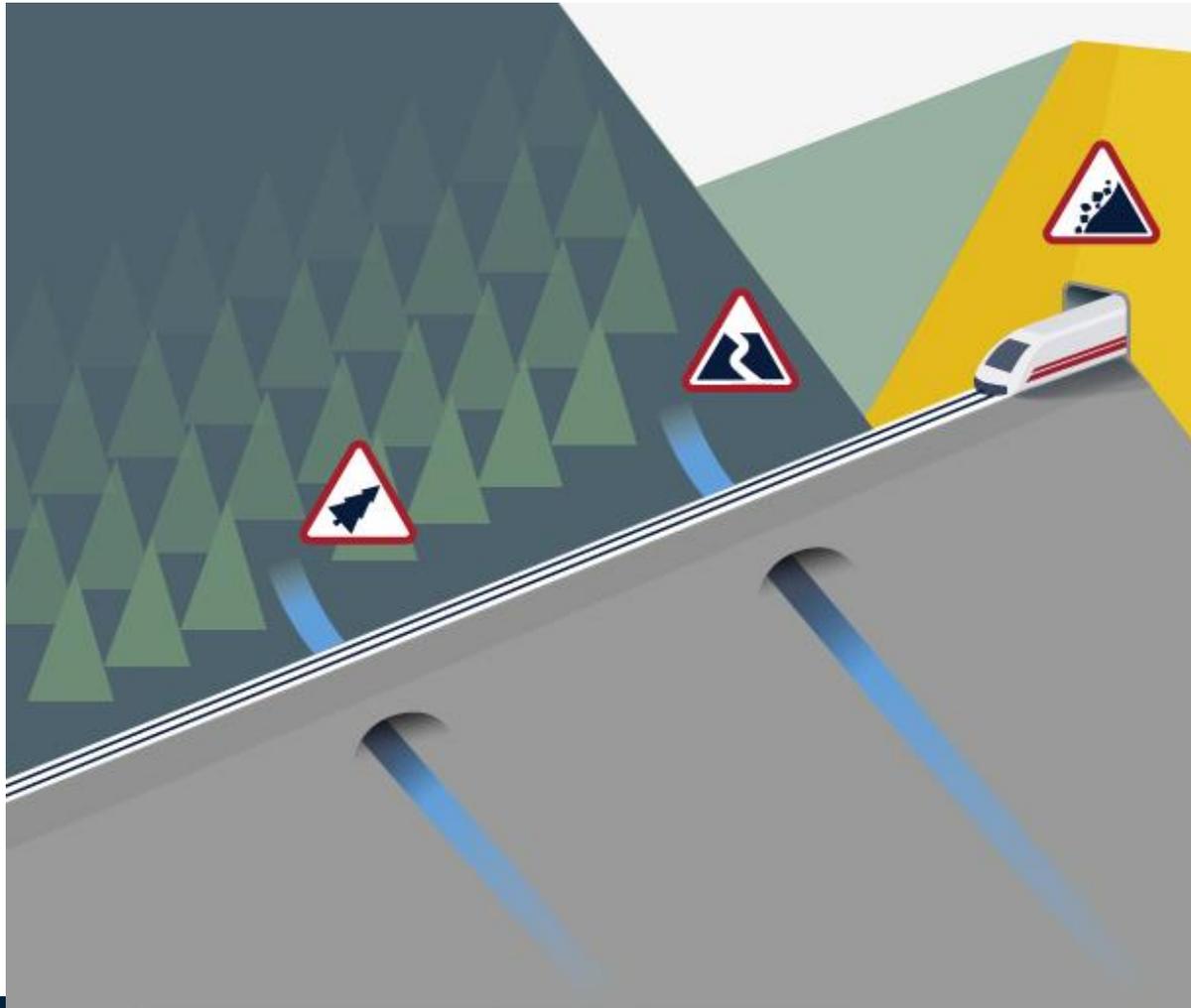
Risk mapping of the network

BASE FOR THE NEW NATURAL MANAGEMENT PLAN



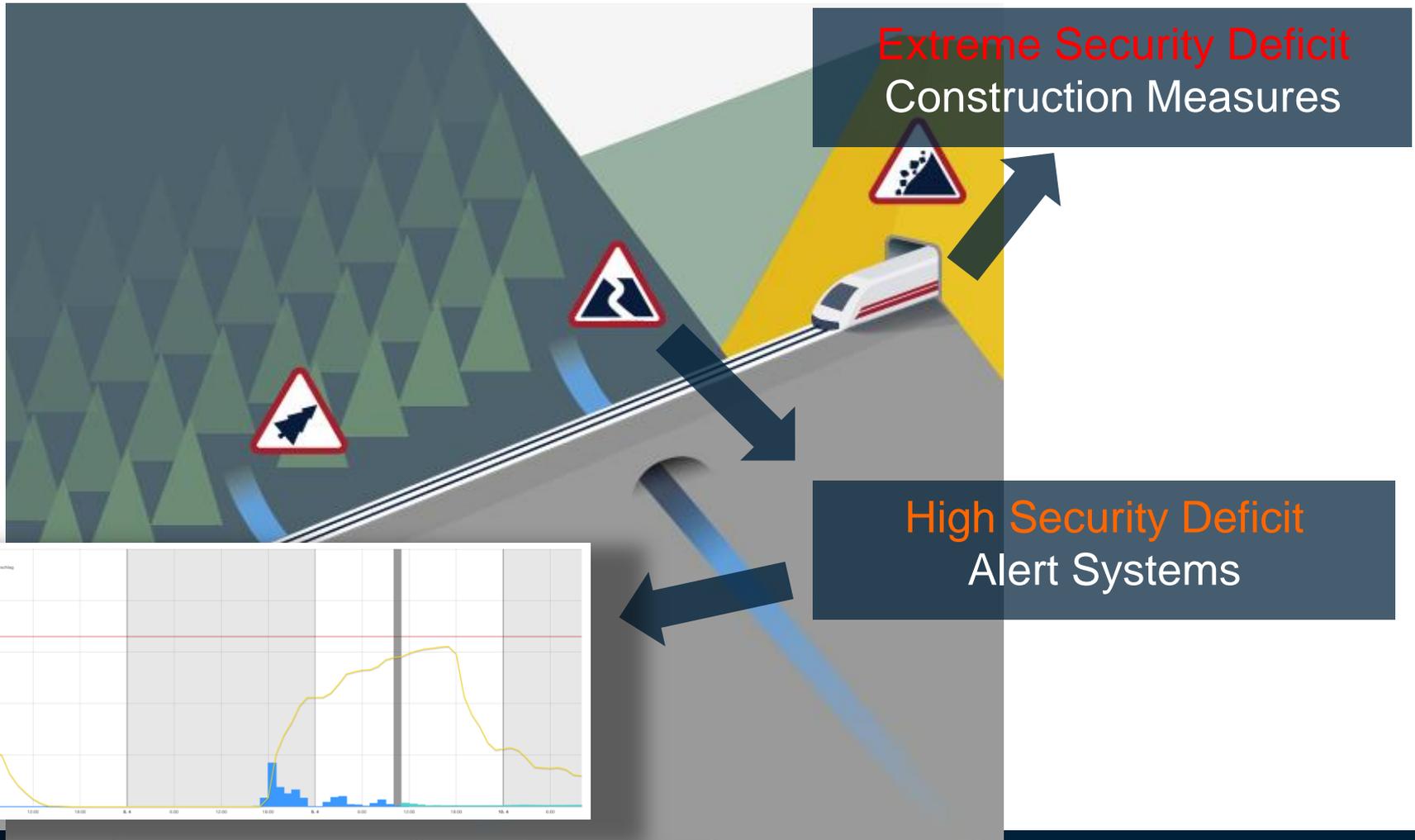
The new natural hazards management

FOR THE WHOLE NETWORK



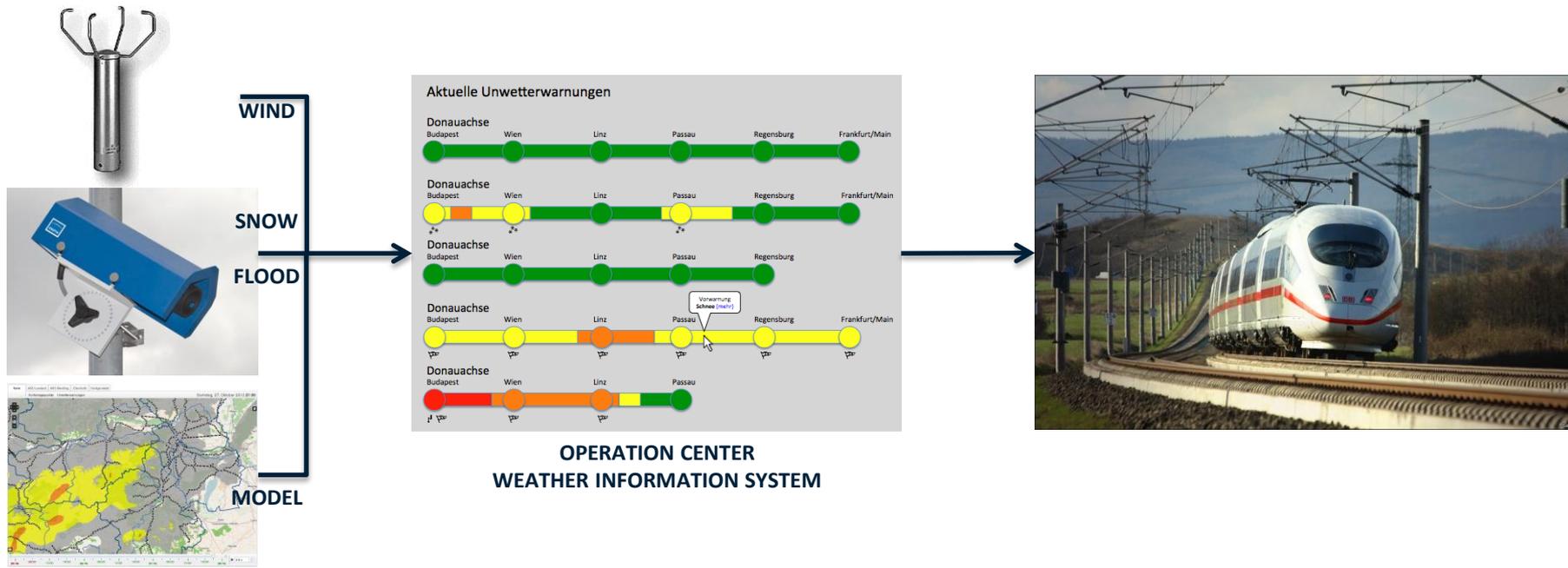
The new natural hazards management

NETWORK WIDE EVALUATION OF RISKS AND SECURITY DEFICITS



Surveillance of the network

- Usage of sensors (robust design, maintenance free)
- 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



The German System

DB FERNVERKEHR

Ist-Werte für Linie 62 am 10.11.2013

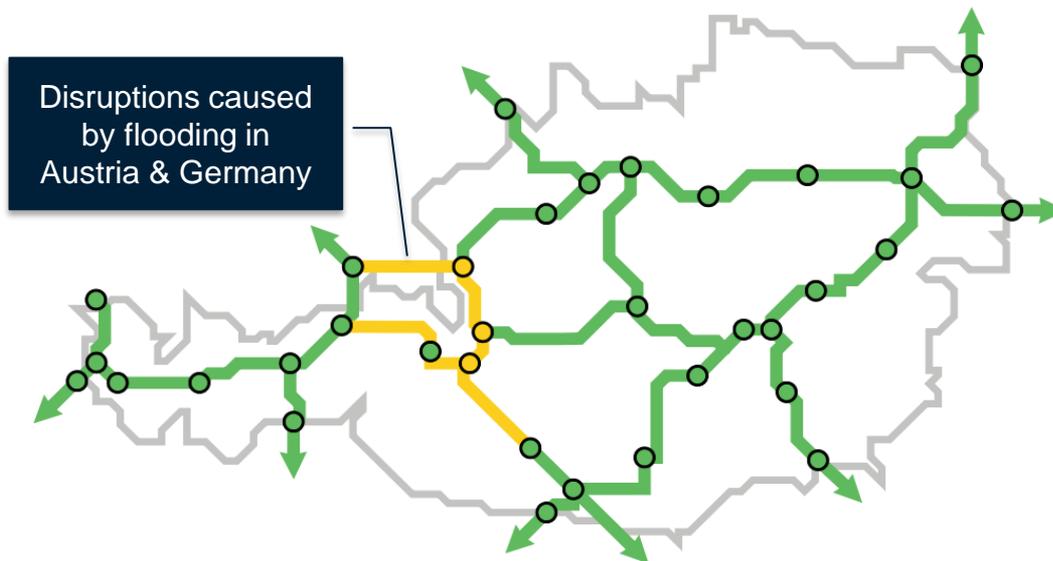
Strecke	Max. Temperatur (C°)	Max. Temp. mit Bedeckungseffekt (C°)	Min. Temperatur (C°)	Luftfeuchtigkeit (%)	Schnee Niederschlag (cm)	Schneehöhe (cm)	Wind (km/h)
	Ø 8.1	Ø	Ø 3.0	Ø 96	Ø 0	Ø 5	Ø 38
Frankfurt(M) Hbf	7.7	7.7	4.0	90	0.0	0.0	44
Bickenbach (Bergstr)	7.9	7.9	4.1	93	0.0	0.0	46
Ladenburg							
Ubstadt-Weiher	8.1	8.1	4.2	92	0.0	0.0	43
Stuttgart Hbf							
Göppingen	6.9	6.9	3.1	99	0.0	4.6	41
Ulm Hbf							
Jettingen	6.6	6.6	1.9	97	0.0	2.1	42
Augsburg Hbf							
Mammendorf	6.5	6.5	2.3	99	0.0	2.7	44
München Hbf							
Ostermünchen	8.5	8.5	2.2	98	0.0	0.3	45
Übersee							
Salzburg Gr	11.3	11.3	1.9	96	0.0	1.6	39
Bischofshofen (ÖBB)							
Bad Hofgastein (ÖBB)	7.4	7.4	-1.9	98	0.0	39.3	26

ÖBB Corridor information

FOR NATIONAL & INTERNATIONAL TRAINS

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

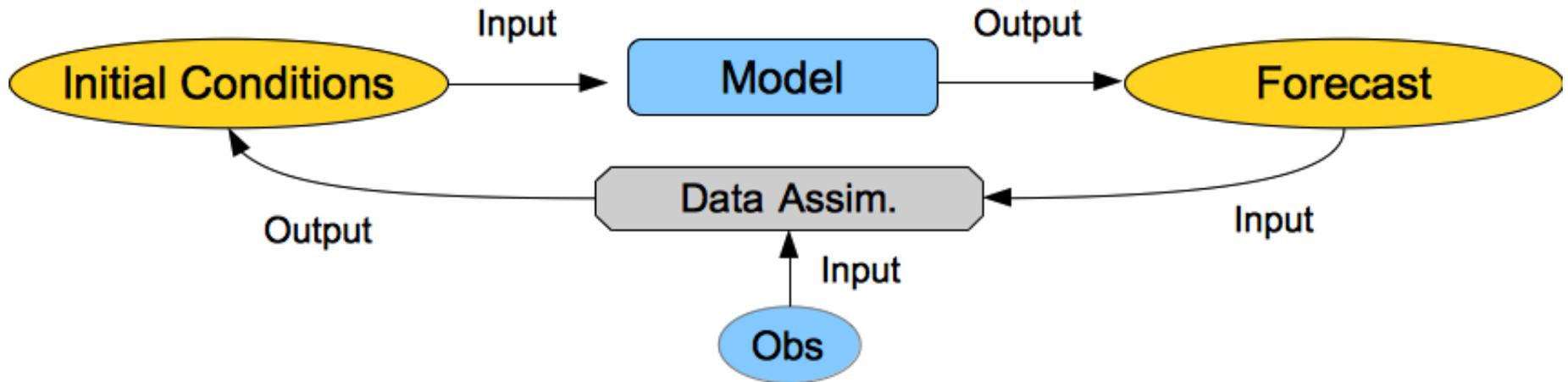
Lawinen

Kälte

UBIMET

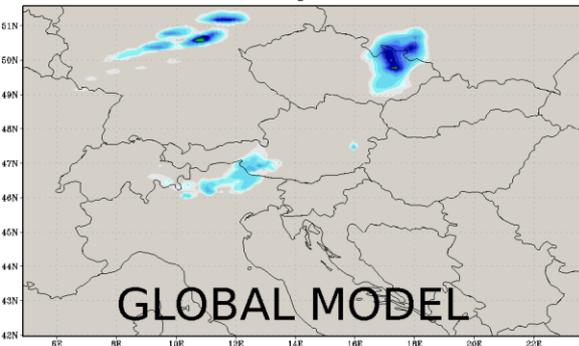
High cycle models & analysis

DATA ASSIMILATION



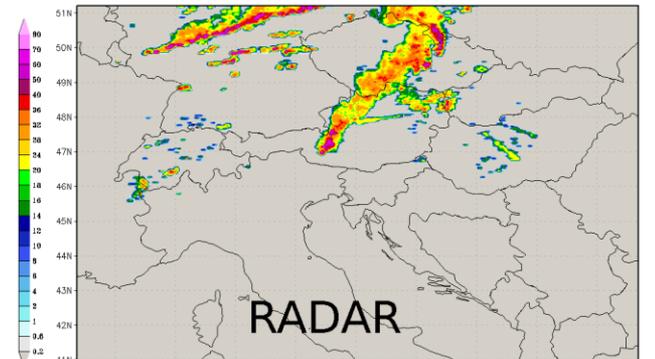
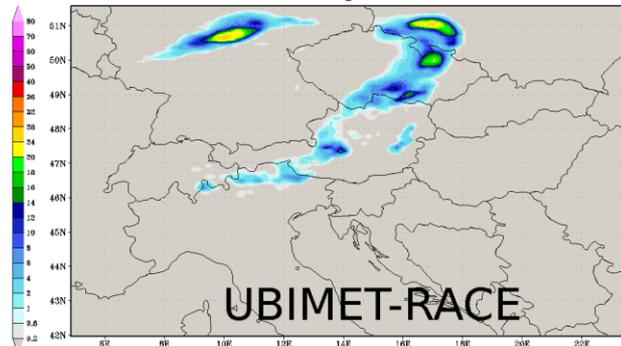
Friday 11Z19AUG2011

Total Precipitation 1 h



Friday 11Z19AUG2011

Total Precipitation 1 h



Formula 1

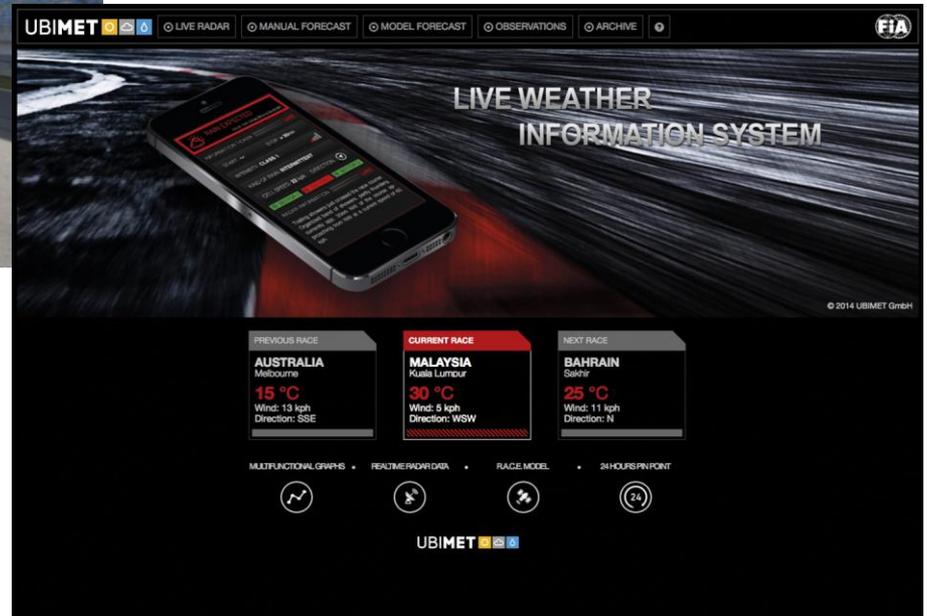
RAIN ALERT SYSTEM



Long term contract and cooperation with FIA

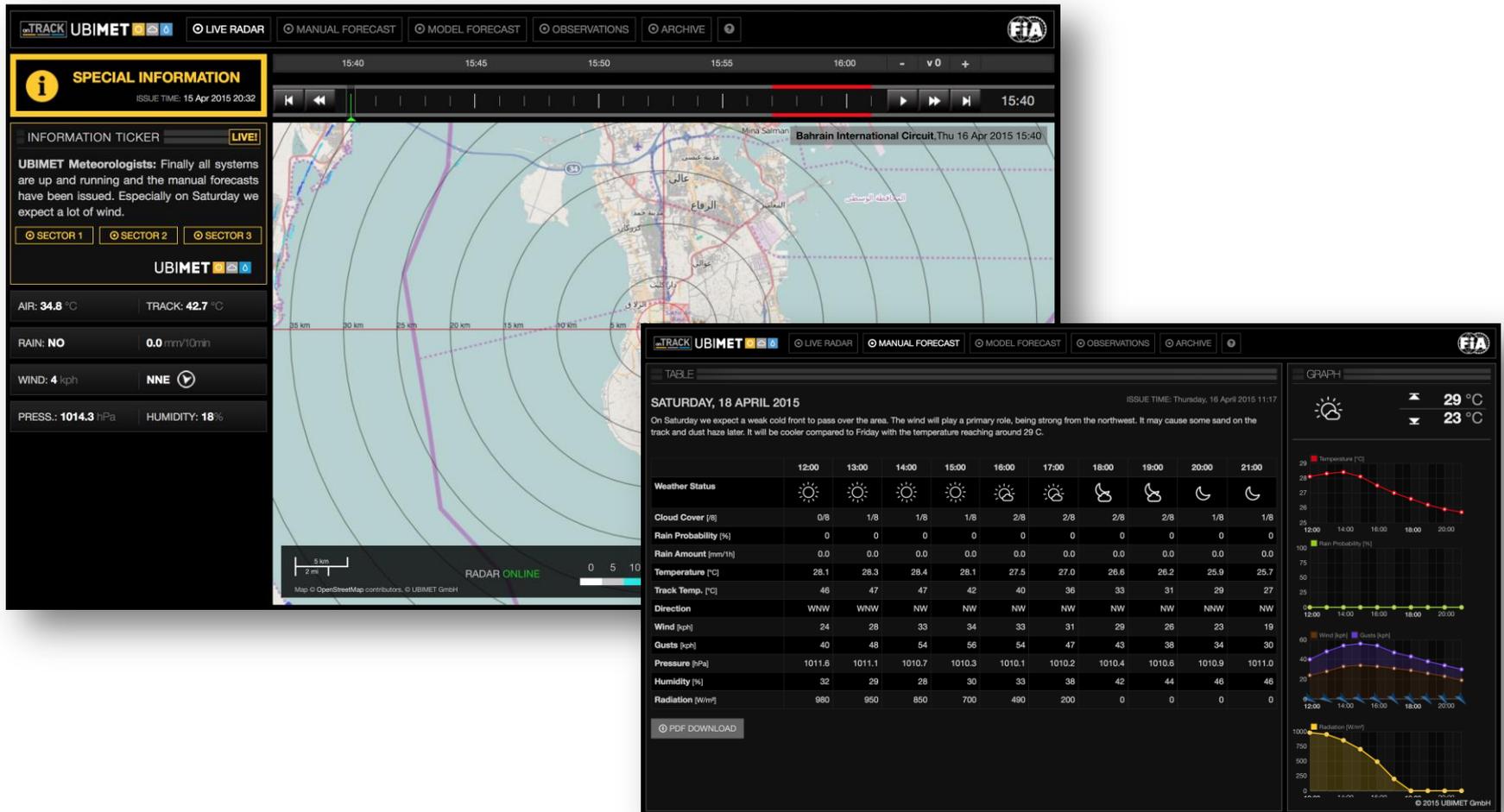


Weather forecasts, rain warning system and und operation of mobile radar stations for all Formula 1 races around the world.



On Track

THE FORMULA 1 REAL-TIME WEATHER INFORMATION SYSTEM



Mobile Weather Radar System

UBIMET WEATHER RADARS AT EVERY FORMULA 1 RACE



Mobile MET Operation Centre

MOBILE WEATHER CENTRE & SERVER SYSTEMS AT THE FORMULA 1



Adaptive Weather Information System ÖBB /



Deutsch


oebb

Weather Dashboard » **oebb**
WeatherCockpit für User Öbb

- Übersicht
- Unwetterwarnungen
- Wetterkarten
- Wetterprognosen
- Wetterstationen
- Wetterberichte
- Archiv
- Lawinen
- Hauptachsen
- Hochwasser
- Muren / Wildbäche

Unwetterwarnungen



Derzeit ist keine Unwetterwarnung aktiv.

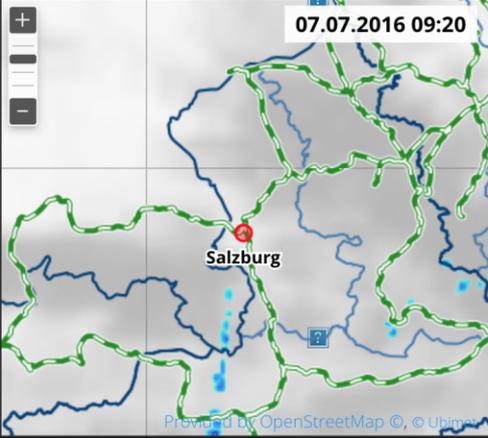
Notifications

Lagemeldung Wetter vor einem Monat

Information: Donec auctor eleifend luctus. In tristique...

Live-Karte

07.07.2016 09:20



Provided by OpenStreetMap ©, © Ubimet

Warnungen

Winterdienststabelle

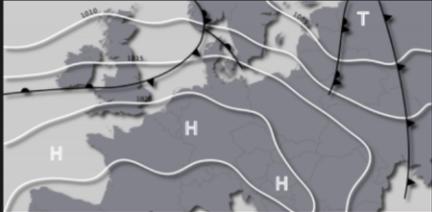
	Do., Juni 23		Fr., Juni 24		Sa., Juni 25	
	06:00 - 18:00	18:00 - 06:00	06:00 - 18:00	18:00 - 06:00	06:00 - 18:00	18:00 - 06:00
Admont	keine	keine	keine	keine	keine	keine
Amstetten	keine	keine	keine	keine	keine	keine

Wetterberichte

Situationsreport

letzte Aktualisierung: 2016-06-23 13:00:00+00

Am Nachmittag sonnig und heiß



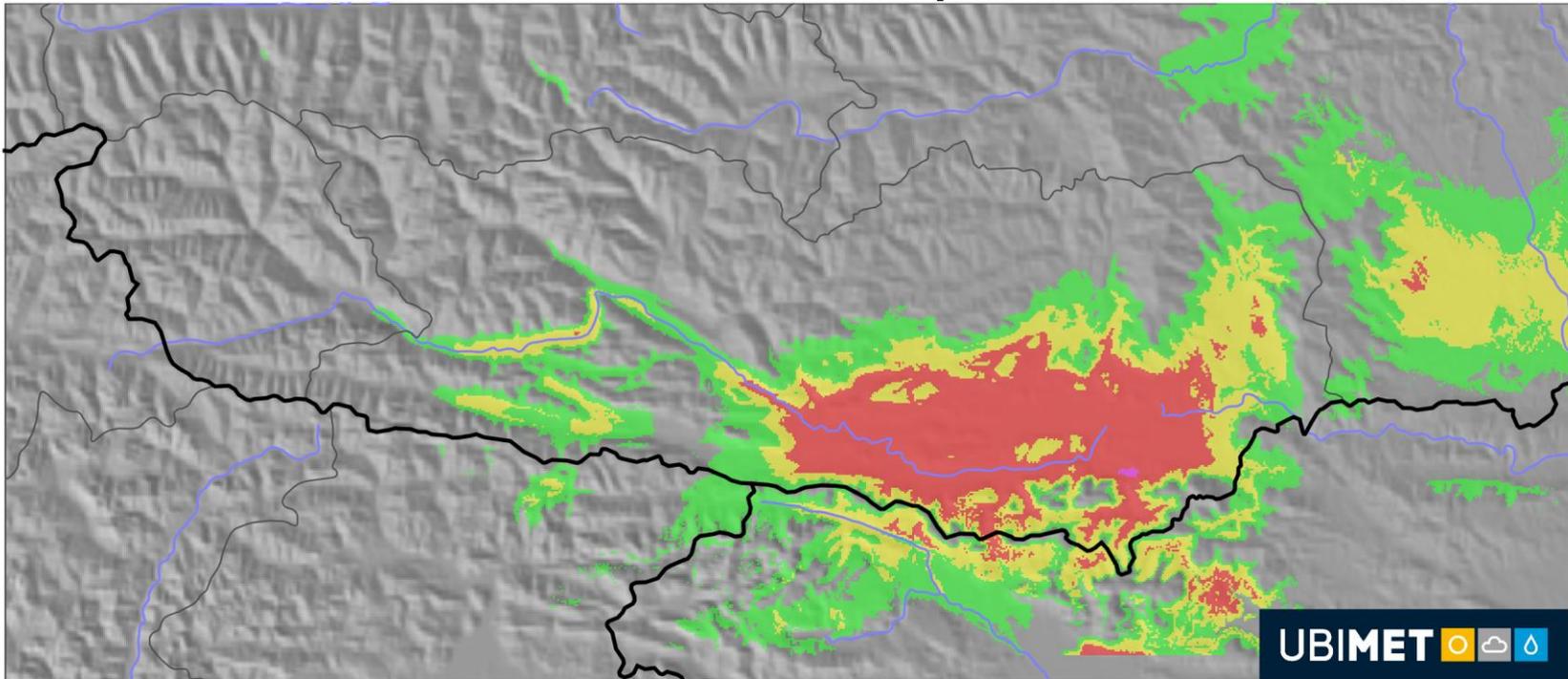
Research Focus UBIMET Rail Department

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

Snow on trees – Risk model

27.04.2016 - AUSTRIA & SLOVENIJA

Maximales Risiko für Schneebruch am 27. April 2016 für Laubwald, 00:00

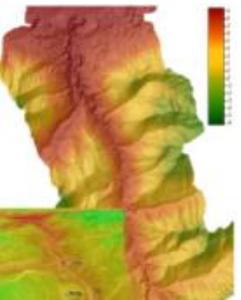


What to do with that information?

Conclusion

SUMMARY & BENEFITS

- Since 2005 UBIMET is providing meteorological information systems for railways
- Proved weather warning systems (fire risk, flooding risk, snow forecasts,...)
- Continuous research activities and developments of new forecasting systems
- Decision support systems for railways & internal communication
- Consulting in implementation of checklists and natural hazards management
- International approach & international cooperation



Weather Models



Quality Control/Meteorologist



Railway Weather Information & Warning System



Railway Operator

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