13th UIC Sustainability Conference

VIENNA 2016

Weather Resilience and Climate Change Adaptation

How ÖBB and UBIMET have addressed this challenge together

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Karin Schwarz,UBIMET

12, 13, 14 October 2016

About the Project

- Climate and weather-related events such as storms and flooding form a challenge for railway infrastructure
- Climate change has been driving the frequency and intensity of weather-related events
- Planning periods of ÖBB are future-oriented, pro-active approach is essential
- ÖBB recognized the importance of this topic and launched the climate change adaptation KLIWA initiative

Climate Change Study

UNIVERSITY OF NATURAL RESOURCES & LIFE SCIENCES, VIENNA

large scale precipitation	floodings of larger rivers
local heavy precipitation	flash floods
heavy snowfall (near 0°C)	wet & heavy snow e.g. on trees
avalanches	snow, wind, changing temperatures
local storm gusts	thunderstorms
large scale gales	e.g. storms in autumn/winter
blowing snow	wind & cold temperatures
high temperatures	multiple day heat waves

What does this mean for ÖBB?

- In Austria temperatures rise by 1 to 2 degrees in the coming decades
- Among temperature-induced phenomena are heat, wet snow, glacier recession as well as strong precipitation and strong winds

Natural Hazards in Railway Operation

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- Winter operation & Snow removal
- Energy consumption
- Switch points
- Landslides & Flash Floods
- Overhead Contact lines
- Bridges & Flooding Alerts
- Fire Risk
- Wind Speed Alerts
- Electrical Systems & Lightning

Weather Accounts for 4% of Rail Accidents

1.03 Main causes of accidents

2015	Causes at first level	Causes at second level	
EXTERNAL CAUSES	THIRD PARTIES	Trespassing	47,0%
		Vehicle (LC accident)	15,8%
		Pedestrian (LC accident)	8,5%
	76,0%	Pedestrian on public railway area	3,9%
		Other or not specified	0,7%
79,9%	WEATHER & ENVIRONMENT	Environment	2,8%
	3,9%	Weather	1,2%
INTERNAL CAUSES	INFRASTRUCTURES	Tracks and structures	1,7%
		Energy system	1,4%
	3,9%	Other or not specified	0,9%
	ROLLING STOCK	Running gear	1,0%
	3,3%	Other or not specified	2,3%
	HUMAN FACTORS (Railway staff & subcontractors)	Track and switch maintenance staff	0,9%
		Traffic operating and signalling staff	1,5%
		Train drivers	1,7%
	8,0%	Other or not specified	4,0%
19,8%	RAILWAY USERS	Passengers	4,6%
	4,7%	Other or not specified	0,1%
CAUSES NOT IDENTIFIED			0,2%

Source: UIC Safety Report 2016

Who we are

WE STAND FOR HIGH-PRECISION METEOROLGY

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UBIMET

- Founded in Vienna in 2004 in Wien with focus on high-precision meteorology
- Headquarters in Vienna
- Offices in Karlsruhe, Melbourne, Munich, New York & Zürich
- Innovation & market leader in the field of applied meteorology and severe weather warnings
- Run by the founders, 50% are owned by Red Bull

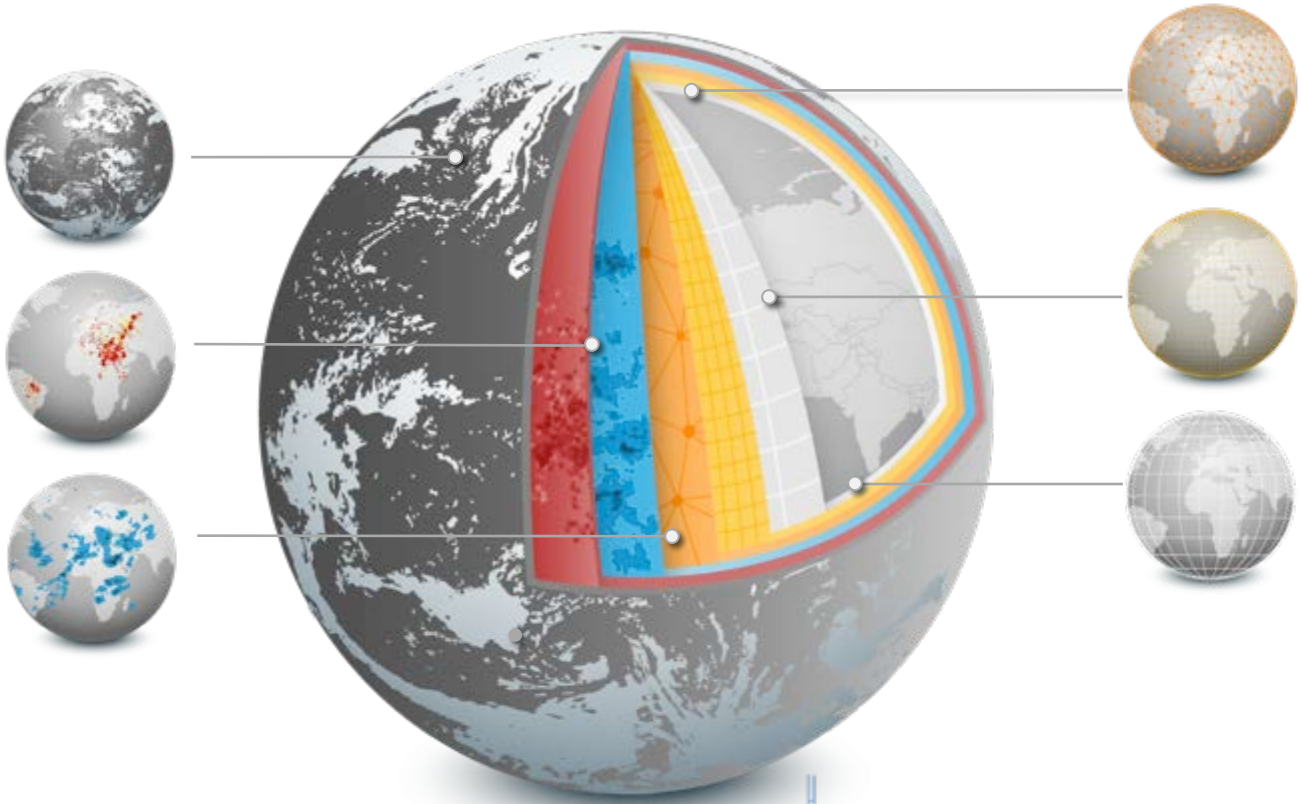
Allianz ÖBB FIA Fraport Frankfurt Airport Services Worldwide PGA AUSTRALIA 1911

UBIMET Layer Principle

Satellite Data
Updates every 5-15 min

Lightning Data
Updates every 30 sec

Radar Data
Updates every 5-10 min



Weather Station Data
Updates every 10 min

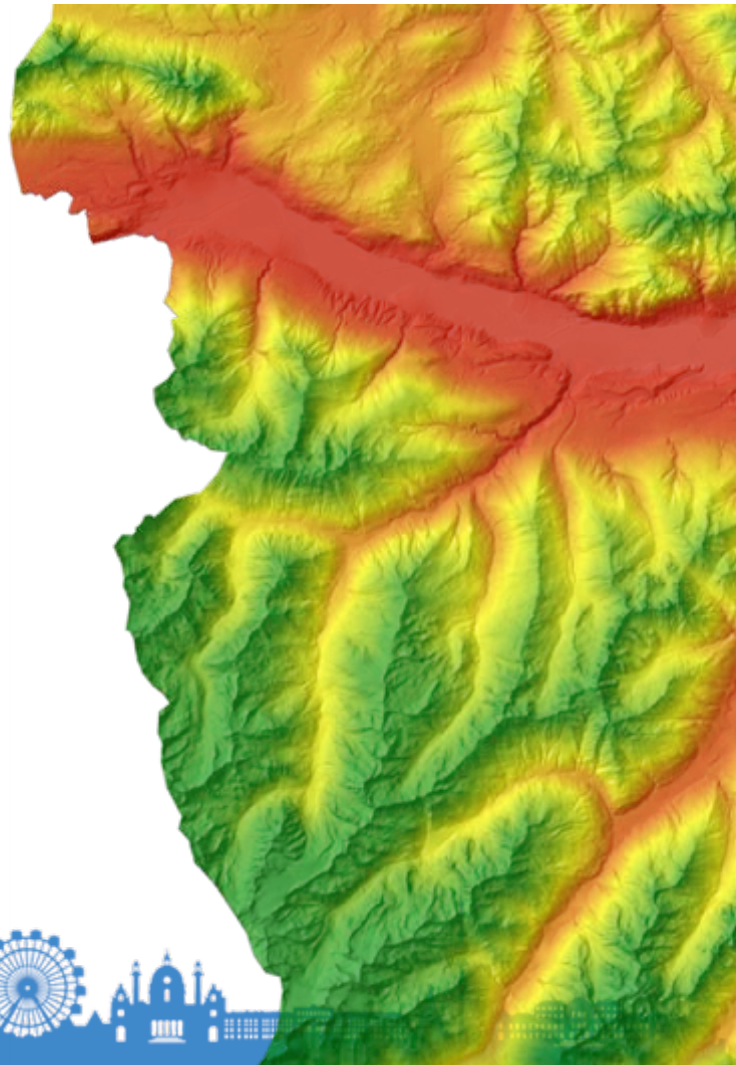
Local Model Data
Resolution: 4 x 4 km
Updates every hour

Global Model Data
Resolution: 13 x 13 km
Updates every 6 hours

UBIMET: from observation to professional weather forecast

10 YEARS OF RESEARCH &DEVELOPMENT

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



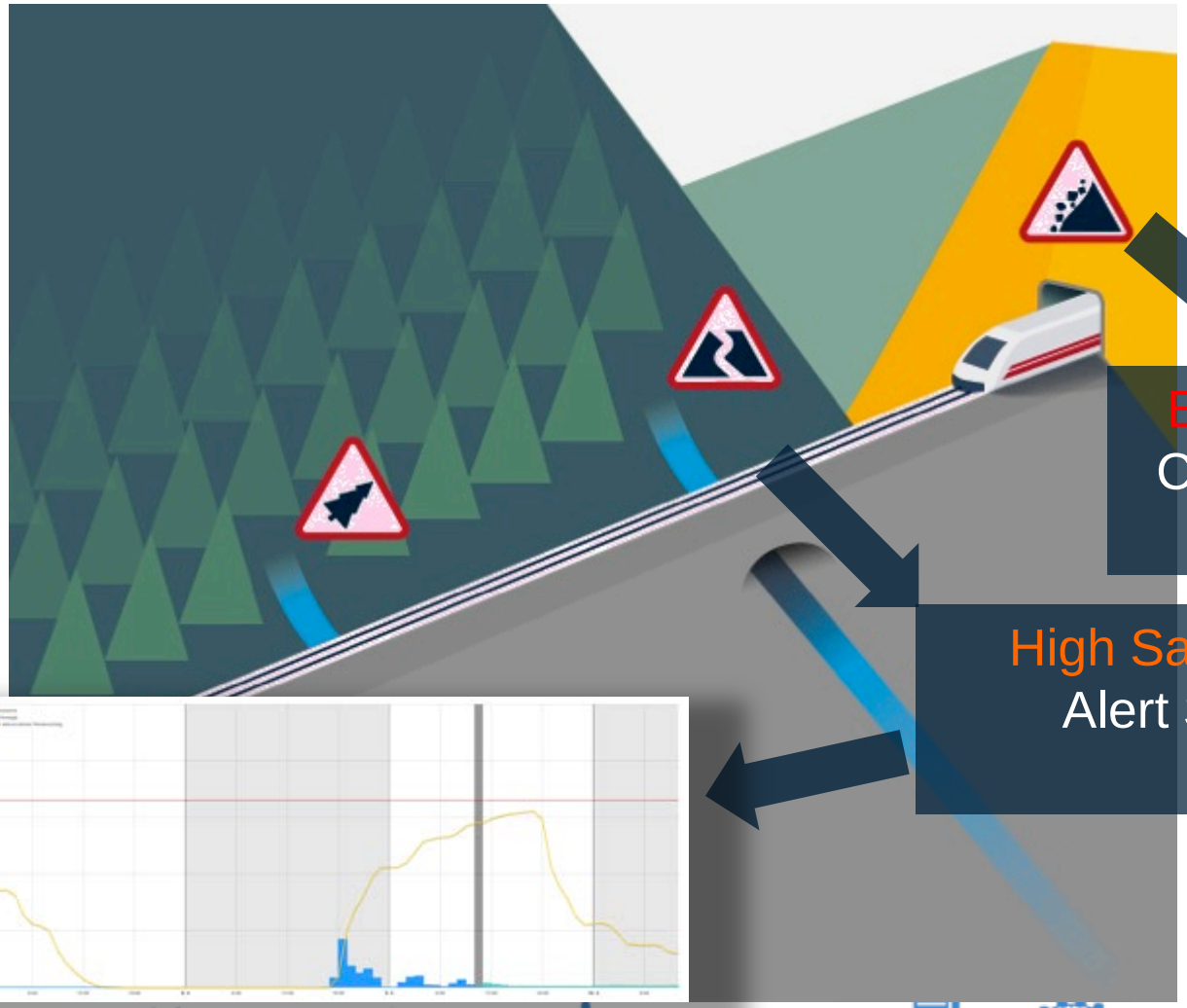
2005 the Austrian Federal Railways asked UBIMET to implement a nationwide meteorological monitoring system

ÖBB natural hazard management

FOR THE WHOLE NETWORK

ÖBB natural hazard management

NETWORK WIDE EVALUATION OF RISKS AND SAFETY DEFICITS



Extreme Safety Deficit
Construction Measures

High Safety Deficit
Alert Systems

ÖBB infra:wetter

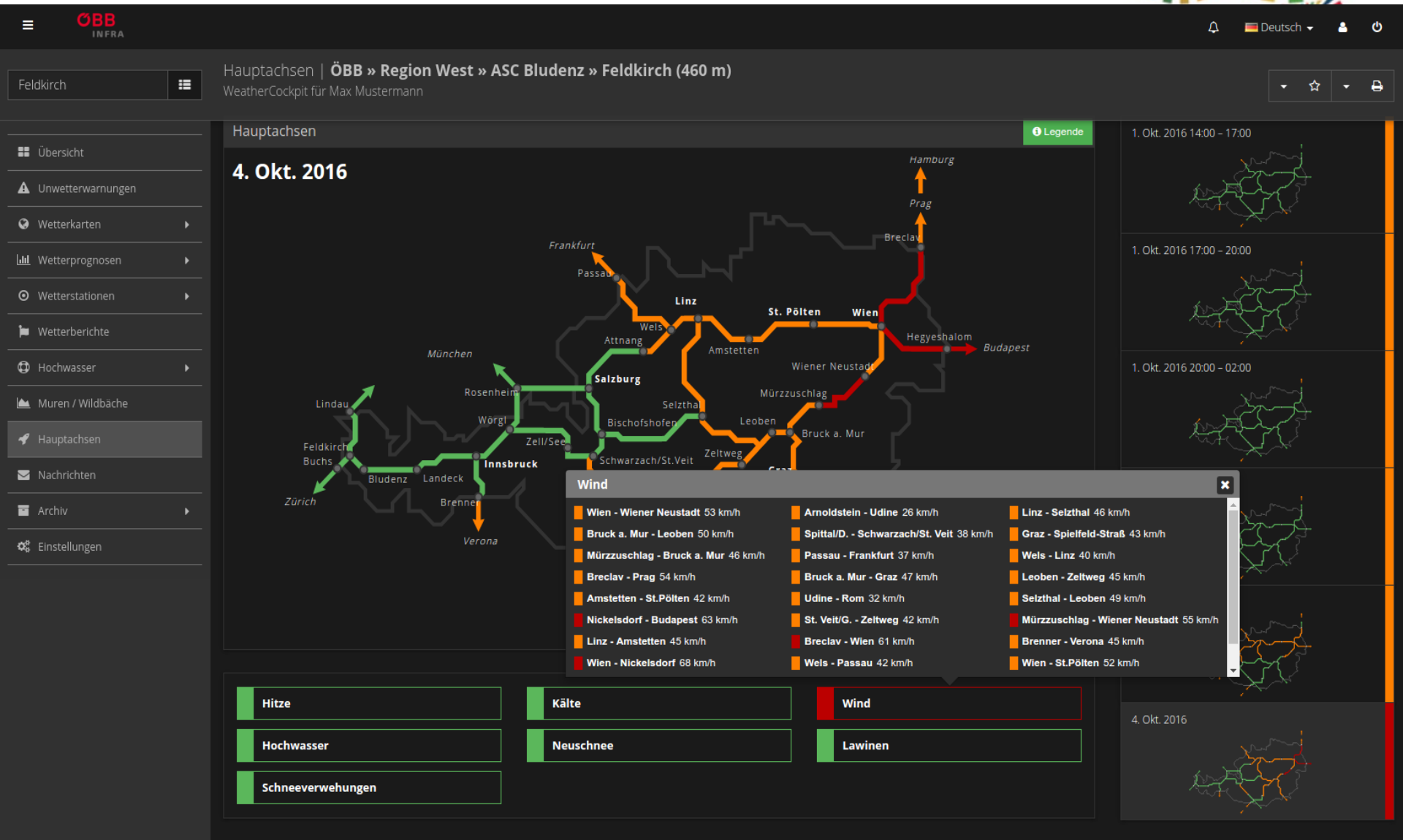
PROFESSIONAL UBIMET SOLUTION FOR ÖBB

- ÖBB REQUIREMENTS

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

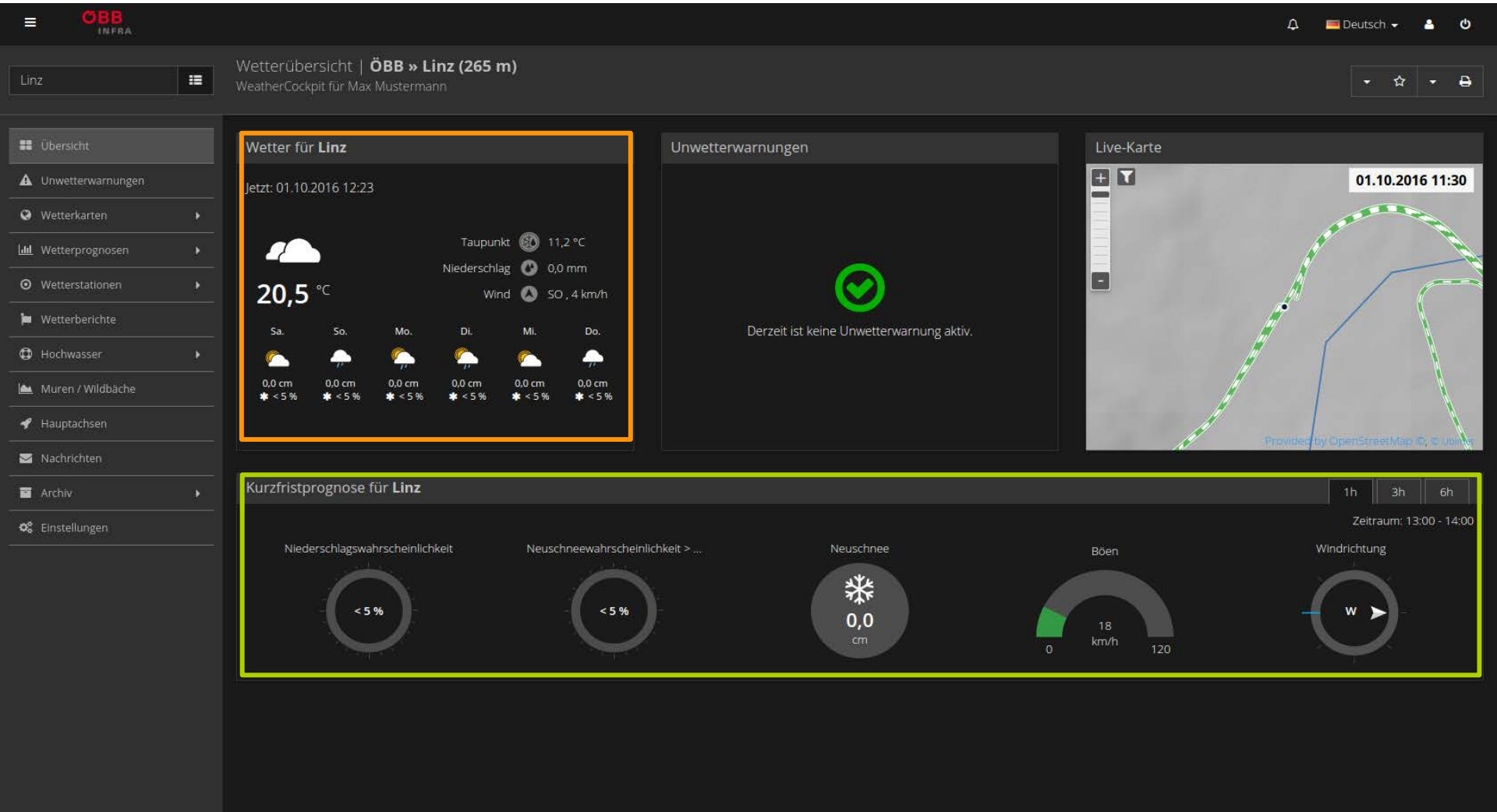
ÖBB infra:wetter

PROFESSIONAL UBIMET SOLUTION FOR ÖBB



ÖBB infra:wetter

PROFESSIONAL UBIMET SOLUTION FOR ÖBB



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PROFESSIONAL UBIMET SOLUTION FOR ÖBB

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ÖBB INFRA

Deutsch

Bludenz

Prognoseübersicht 24 Stunden | **ÖBB » Region West » ASC Bludenz » Bludenz (560 m)**

WeatherCockpit für Max Mustermann

- Übersicht
- Unwetterwarnungen
- Wetterkarten
- Wetterprognosen
  - 24 Stunden
  - 4 Tage
  - 8 Tage
- Wetterstationen
- Wetterberichte
- Archiv
- Muren / Wildbäche
- Nachrichten
- Hochwasser
- Hauptachsen
- Einstellungen

Letzte Aktualisierung: 19.09.2016 11:25

OEBB

OEBB

	Mo., Sep. 19													Di., Sep. 20								
	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00
Temperatur [°C]	12,2	12,5	12,3	12,7	12,8	12,2	11,4	11,1	10,9	10,6	10,6	10,6	10,6	10,4	10,3	10,3	10,2	10,2	10,4	10,4	10,2	10,7
Taupunkt [°C]	9,7	9,0	8,2	8,0	7,6	7,1	6,4	6,0	5,6	5,3	5,2	4,7	4,7	4,7	4,6	4,6	4,5	4,4	4,4	4,5	4,4	4,7
Niederschlag [mm]	1,0	0,2	0,3	0,2	0,1	0,2	0,3	0,1	0,0	0,1	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Neuschnee [cm]	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Schneebruch (Laub) max.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schneebruch (Nadeln) max.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schneeverwehung max.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schneefallgrenze [m]	2300	2300	2400	2300	2400	2400	2400	2400	2400	2400	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2200	2200
Wind [km/h]	6	2	3	2	2	3	3	3	3	3	3	3	3	4	3	3	3	2	1	1	1	1
Böen max. [km/h]	8	8	6	7	5	6	6	6	7	6	5	5	4	4	4	4	3	3	2	2	2	2
Windrichtung	NW	NW	W	W	NW	W	W	SW	SW	SW	SW	SW	SW	W	W	SW	SW	S	SO	NO	N	SO
Windbruch (Laub) max.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Windbruch (Nadeln) max.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Windwurf (Laub) max.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Windwurf (Nadeln) max.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Temperatur

16

14

ÖBB infra:wetter

PROFESSIONAL UBIMET SOLUTION FOR ÖBB

- ÖBB REQUIREMENTS

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

- Highly precise weather forecasts along the railway lines
- Severe Weather Warnings for the safety of railway operation, i.e.
  - Flooding
  - Lightning detection
  - Heavy snow falls
- Exact snow forecasts for planning winter services
- State of the art Weather Cockpit application, available 24x7

ÖBB Lessons Learned

- It was important to select the right partner capable of understanding our requirements and developing a professional solution.
- Creating awareness and understanding of risk, consequences and benefits, enabled ÖBB to deploy a successful and measurable project.
- Adaptation = continuous process
- Effects
  - Positive effect on company risk index
  - Trains runs on time
  - Increase of attractiveness for our customers