INCA-CE achievements and status

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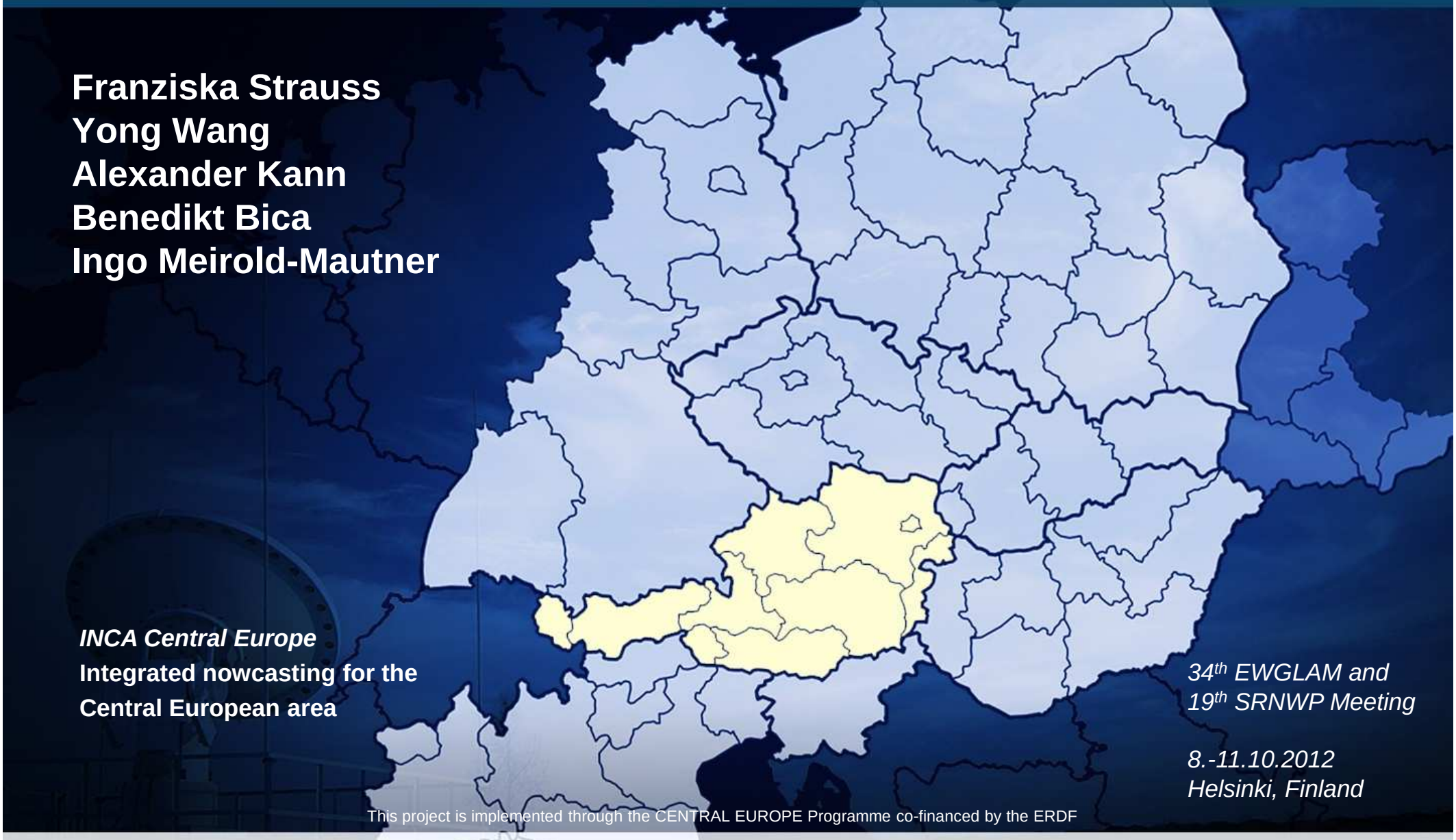


INCA Central Europe
Integrated nowcasting for the Central European area

34th EWGLAM and 19th SRNWP Meeting

8.-11.10.2012
Helsinki, Finland

This project is implemented through the CENTRAL EUROPE Programme co-financed by the ERDF

ZAMG Central Institute for Meteorology and Geodynamics

WWRP WORLD WEATHER RESEARCH PROGRAMME

INCA-CE Nowcasting for Central Europe

CENTRAL EUROPE COOPERATING FOR SUCCESS.

EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

The Challenges for Severe Weather Warnings

More detailed and accurate weather warning in time and space

Better coordination between weather service and crisis management

Optimized strategies of using weather warning information

INCA-CE: transnational framework

INCA-CE within the Central Europe Programme

4 Programme Priorities:

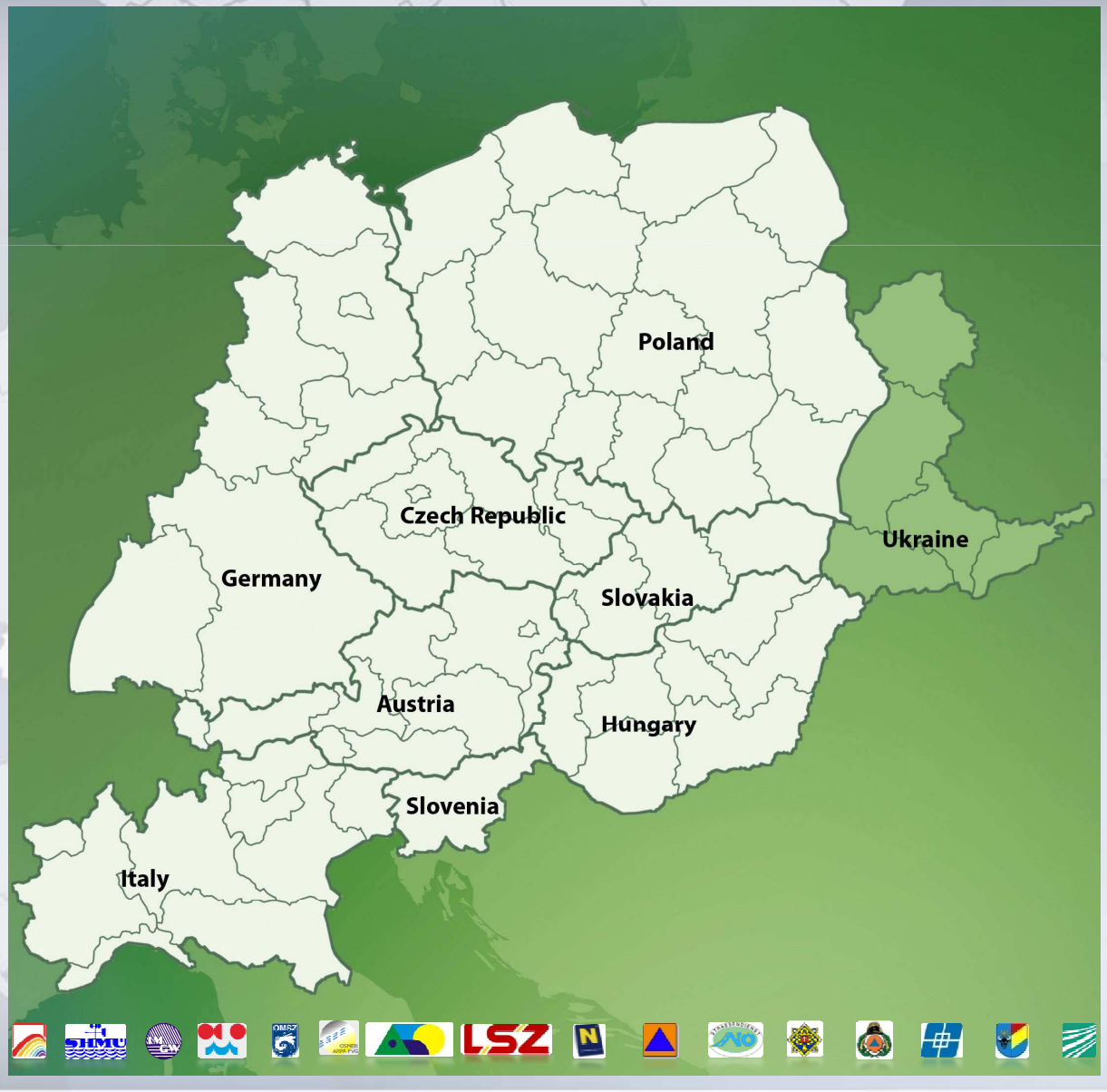
- Innovation
- Accessibility
- Environment
- Competitiveness and attractiveness of cities and regions

- **INCA-CE: 16 partners from 8 CE countries**
  - Weather services
  - Application partners in civil protection, road safety, hydrology
    - Research institutions
    - National and local authorities

- Project budget: 3.3 million €
  (4.7 million US$)

- 80% of overall budget is covered by EU

- Project duration: Apr 2010 – Sep 2013



INCA-CE: WMO/WWRP FDP

A Forecast Demonstration Project of World Meteorological Organization (WMO), World Weather Research Programme (WWRP)

Integrating Nowcasting with crisis management and risk prevention in a transnational framework

INCA-CE: international R&D on nowcasting













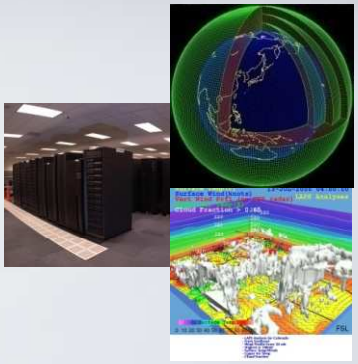

A state-of-the-art, very high-resolution in time and space, application-oriented, real-time analysis and nowcasting system INCA

Operational implementation at each partner

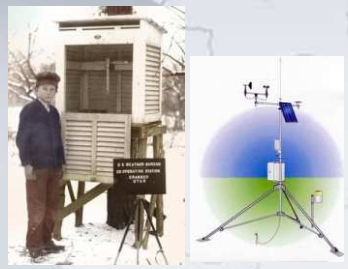
Common efforts on research and maintenance

24 institutions from meteorology, hydrology, crisis management, road safety, fire brigade, police, ministries etc.

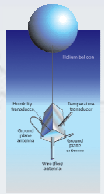
INCA: Integrated Nowcasting through Comprehensive Analysis



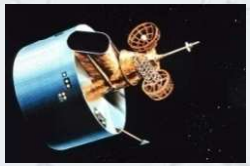
NWP forecasts



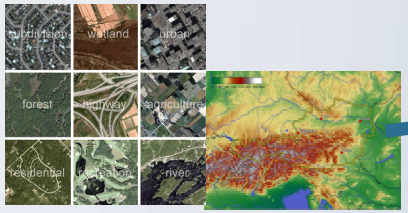
Surface observations



Radiosondes



Satellite observations



Geoinformation data

INCA

Data QC, Integration, Optimization

Radar observations

Analyses and Nowcasts

INCA-CE: Relevance

Operational Hydrology

Prediction of heavy rainfall and associated flooding risks will help to set up efficient procedures in the management of mitigating actions for the protection of buildings, roads, and other infrastructure.

Civil Protection

Civil protection will benefit from a more comprehensive assessment of meteorological threats, and a more detailed and timely forecast, leading to more efficient warning protocols and dissemination strategies.

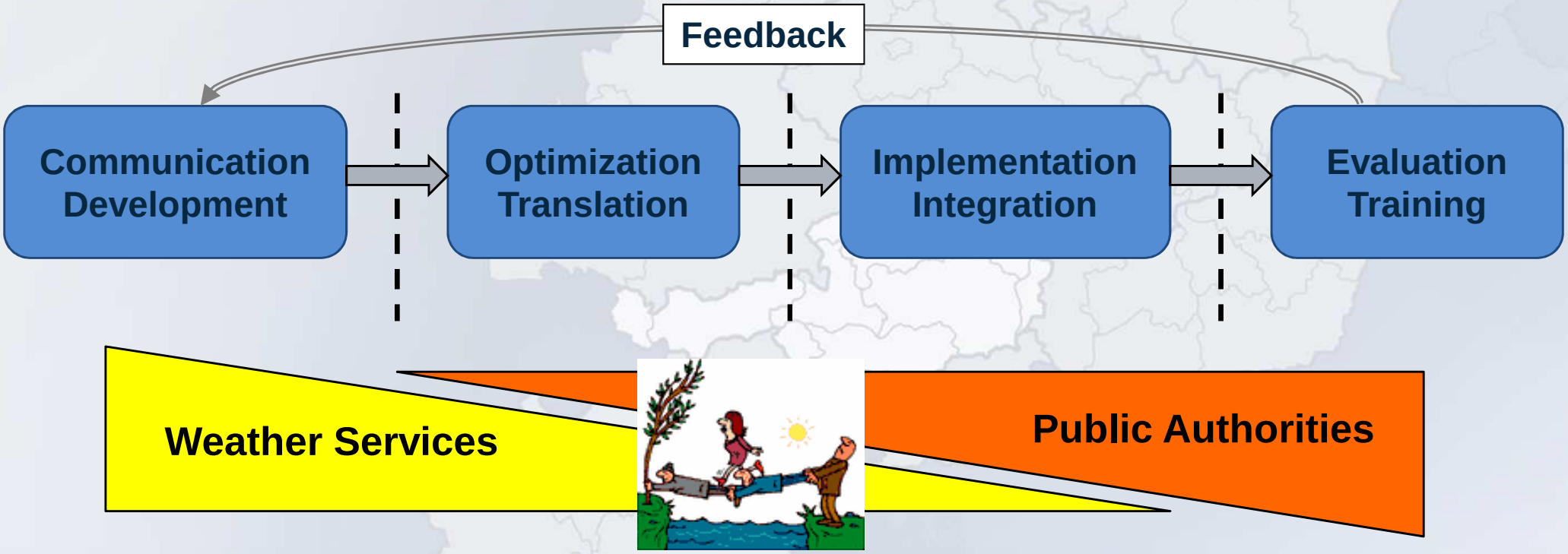
Road Safety

Road safety will be enhanced by a more detailed road weather forecast made available to both the road management authorities as well as the general public.

While the frequency and strength of critical weather events and natural disasters cannot be reduced, a state-of-the-art information and warning system will be developed to better support public and private institutions in case of severe events.

INCA-CE project concept

Building a bridge between nowcasting and crisis management



WWRP/WMO FDP INCA-CE realization

The WMO/WWRP FDP will be conducted in 2012-13 over Central Europe (CE) within four implementation phases:

1. **Development of transnational strategy in road safety, civil protection and operational hydrology (01. – 05. 2012)**
   - **Compilation and evaluation of regional methods currently in use**
   - **Provide solution strategies for optimal use of nowcasting and weather warnings in crisis management and risk prevention**

2. **Optimization of nowcasting system (01. 2012– 06. 2013)**
   - **INCA development towards the needs of crisis management and risk prevention**
   - **Algorithmic extension; standard input and output interfaces**
   - **Improvement in data flow, quality control, computational efficiency**
   - **Observational data exchange in real time**

WWRP/WMO FDP INCA-CE realization

3. **Forecast Demonstration of the developed strategy and optimized nowcasting system through pilot implementations (06. 2012–09. 2013)**
   - **National-scale application and testing of the nowcasting system and warning strategies at user level**
   - **Establishment of structured feedback channels for final evaluation**

4. **Evaluation and feedback (06. 2012–09. 2013)**
   - **Elaboration and compilation of transnational results, guidelines and recommendations**
   - **Evaluation, feedback circle between nowcasting provider and crisis management and risk prevention**
   - **Training for better understanding of the warning strategies and nowcasting system**

INCA-CE core outputs

A state-of-the-art, very high-resolution in time and space, application-oriented, real-time analysis and common nowcasting system INCA and its visualization

Nowcasting products translated into user relevant information

Communication, feedback, training mechanism between nowcasting provider and application

Nowcasting moduls for hydrology, civil protection and road safety

Real time observation exchange, standardized input/output interfaces, data flow, QC etc.

Optimized transnational warning strategies, guidelines

Transnational strategies in 3 application areas

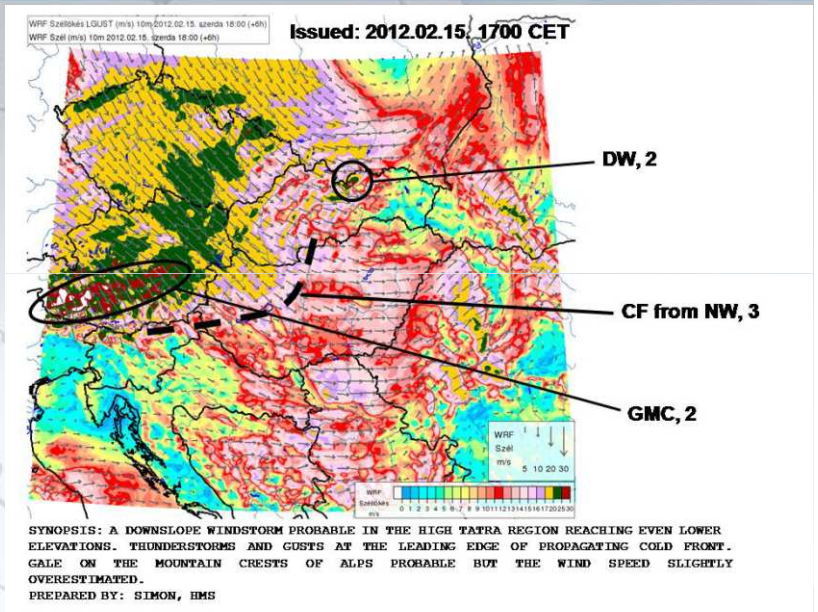
- **Description of the current situation in each participating country**: organization, communication and dissemination methods, weather parameters/thresholds used for warnings, cross-border cooperation, (ongoing) projects -> **identification of parallels in the different CE countries**
- **Case studies**: validation of available forecasts/nowcasts and their **benefits**
- **Warning chain:** communication, dissemination (current situation)
- **User requirements and recommendations**: common standards needed; general common concept for future nowcasting model enhancements; improved communication / cooperation through a forum / Web portal

Recommendations in Hydrology

- **1. Horizontal resolution (1km)**: already fulfilled
- **2. INCA precipitation update frequency 5 minutes** (important for flash floods): Operationally in Austria; in Slovakia, Poland and Czech Rep. not possible due to temporal availability of station data (regularly 10 min)
- **3.Time period of precipitation accumulation**: at least a precipitation accumulation period of 10 minutes should be implemented; however, 5 minute accumulations could provide better results -> the current operational setting (10 - 15 minutes) is already a good compromise and could/should be kept
- **4. Precipitation analysis with error estimation**: Validation of precipitation analysis (e.g. by cross-validation) should be carried out by the meteorological services and provided to the hydrologists
- **5. Probabilistic precipitation nowcasting**: will be one of the 'hot topics' in the near future. But, a system which takes into account all error sources of precipitation nowcasting (radar uncertainty, station data and the combination, displacement and cell evolution uncertainty, NWP uncertainty) or which treats all error sources together in a statistical way, has to be developed thoroughly and is beyond the scope of INCA-CE

Recommendations in Civil Protection

- **1. INCA-SWING (Severe Weather INterpretation Guide)**: Basic meteorological terms explained to the general public and Civil Protection authorities for an increased meteorological understanding; however, SWING cannot be automated -> based on the Risk-AWARE INTERREG (2004-2005) project a "Table for Scenario Identification" guideline will be defined as a subjective tool



- **2. INCA-MCPEX (Meteorological Civil Protection Exercise)**: took place in September 2012; end-users would appreciate the highlighting of relevant meteorological information; a standardized visualization of meteorological information is prefered

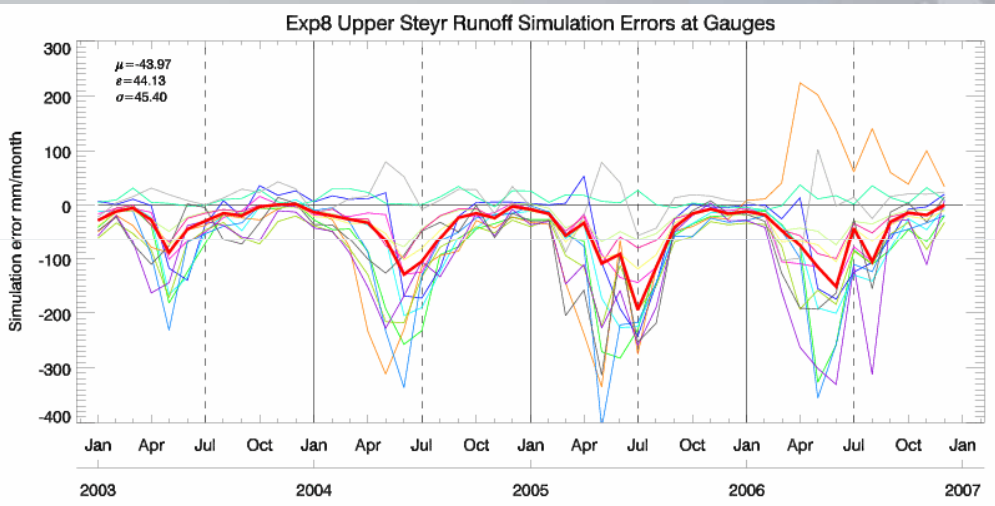
- **3. INCA-ISW (Impact of Severe Weather)**: The link between the meteorological conditions with probability of accidents, occurrence of damages and number of Civil Protection actions required is a novel approach with great potential. However, it is out of the scope of INCA-CE and probably, this approach would need another project

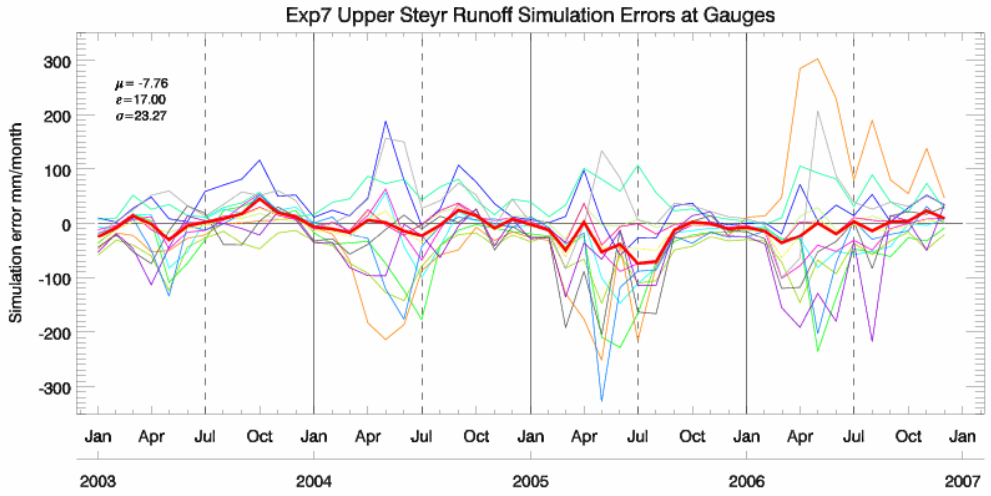
Recommendations in Road Safety

- **1.** Nowcasts for air temperature, dew point, wind (speed, gusts and direction), cloudiness, precipitation (type and amount with the probability), visibility, cloud coverage and type; detailed forecasts for special meteorological events: freezing drizzle, snowfall, drifting snow, wind gusts, fog and other causes of reduced visibility, black ice, storm with exact starting time of event and estimated duration -> Already existing: air temperature, dew point, wind (speed, gusts and direction), cloudiness, precipitation (type and amount with the probability); cloud coverage = cloudiness; not yet existing parameters, but which could be developed with dedicated manpower: freezing drizzle, drifting snow, fog (visibility), black ice; wind gusts are under development for civil protection applications anyway

- **2.** Improved INCA parameterization for surface temperature is needed (RMSE < 2 ℃) and/or INCA solar flux forecasts should be developed for energy balance model -> Improvements of the surface temperature are expected based on the implementation of satellite data; a global radiation nowcasting module should be developed; a proto-type is existing at ZAMG, but must be refined and further developed

Improvements of the INCA system





Red bold line: Median of simulation errors at all gauges

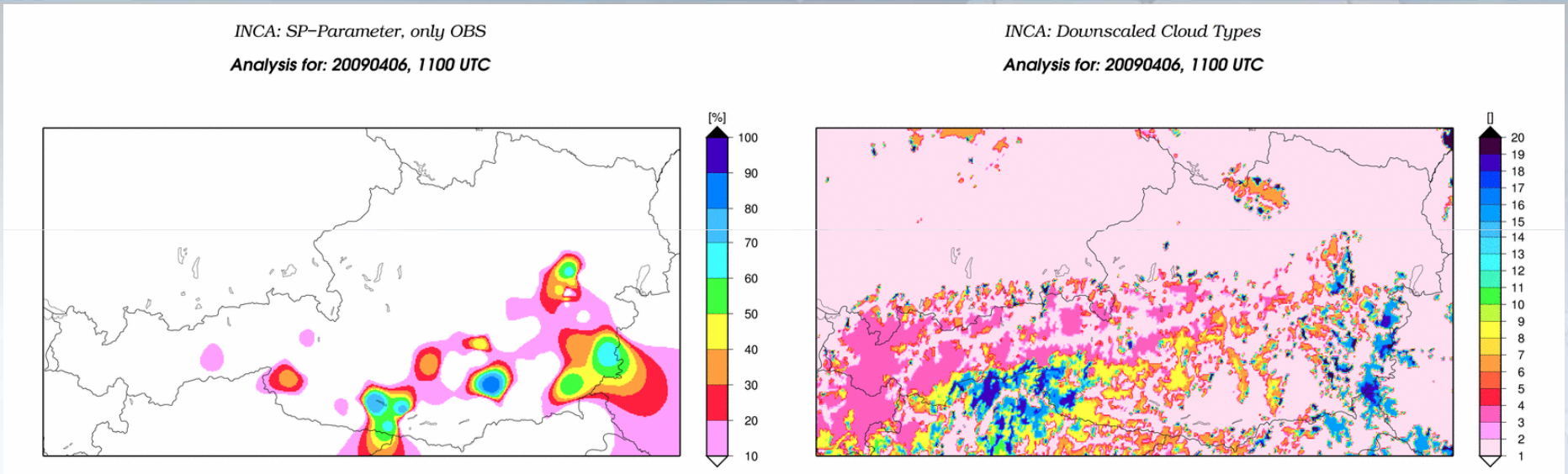
Parameterization of elevation effects in precipitation forecasts and runoff simulation

No elevation dependence used

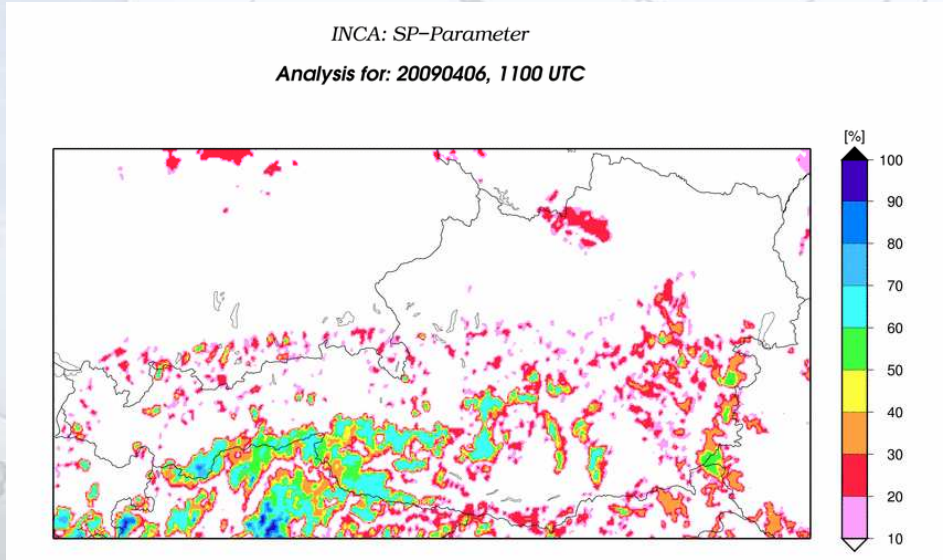
Elevation dependence

MAE reduction: - 61.5 %

Improvements of the INCA system

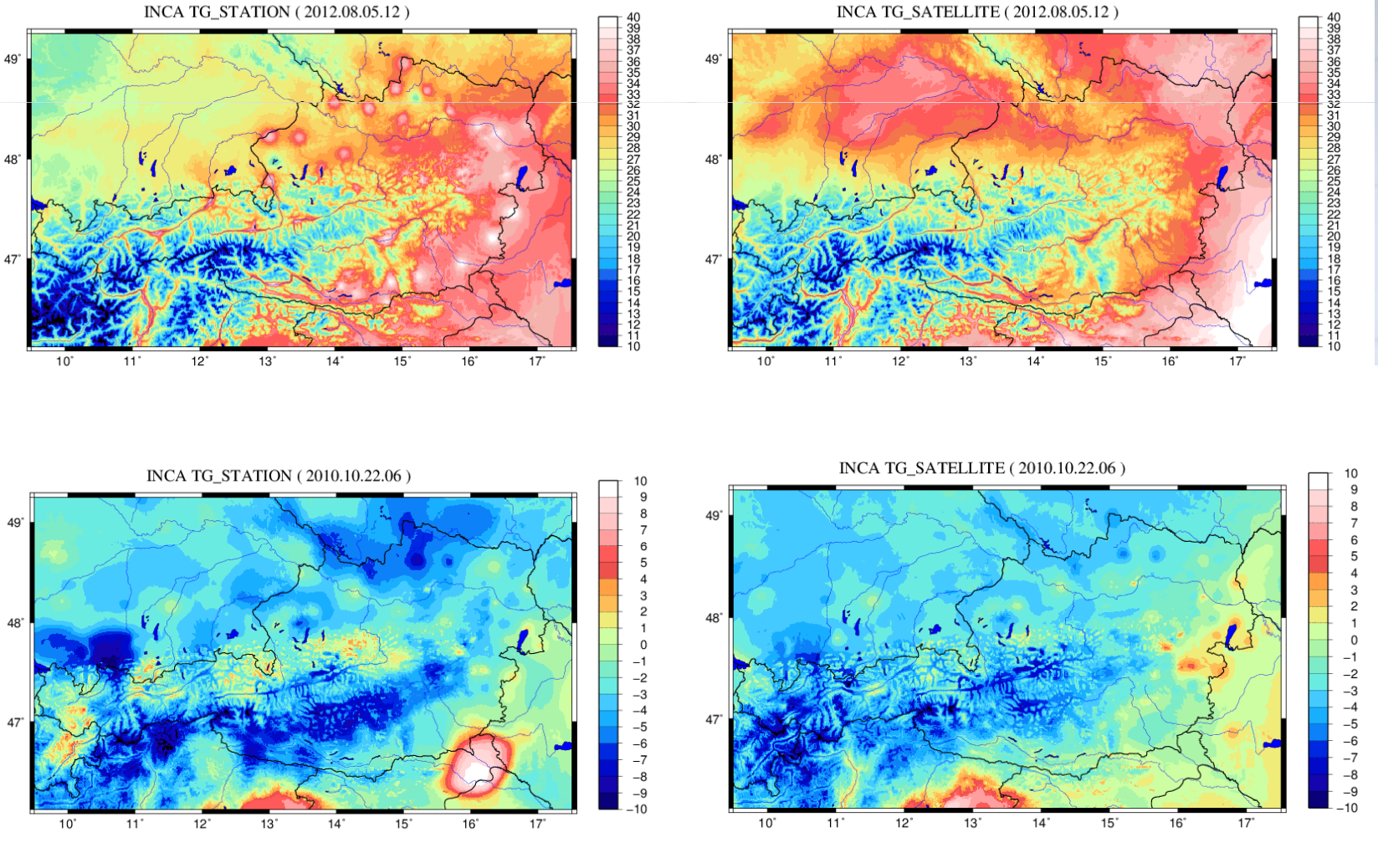


Insolation fraction improved by addtionally taking into account satellite information



Improvements of the INCA system

Road surface temperature improved by combining observations with satellite measurements

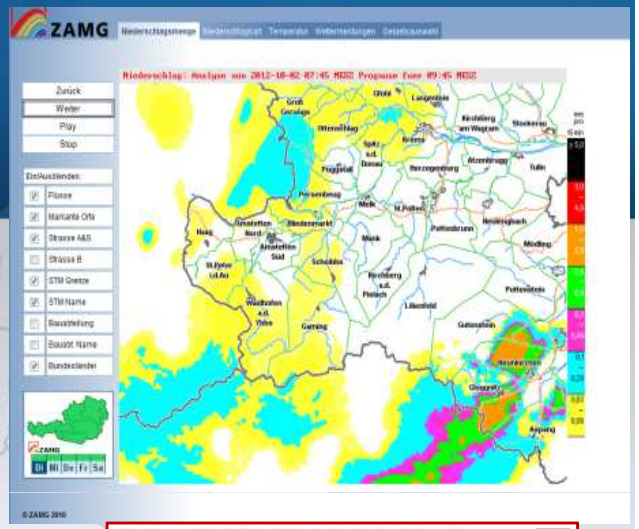


Evaluation process with end-users

- **Preparation of questionnaires**, e.g. for road safety in Austria
  - Different format of meteorological information available to the end-users:
    - password protected web portal
    - warnings via email and sms including additional information from the strategy recommendations (e.g. temperature decrease in conjunction with wet road conditions, wind gusts)
    - INCA-CE web portal

  -> Evaluation of each format of meteorological information

  - Winter season 2012/13
  - ~ 10 participating road maintenance services
- **Further recommendations for improvements -> feedback loop**
- **Benefits of using newly developed INCA products and INCA-CE web portal**




ZENTRALANSTALT FÜR METEOROLOGIE UND GEODYNAMIK
Teilrechtsfähige Einrichtung des Bundes
Abteilung Wetter / Kundenservice Tel (01) 36 0 26/2311 Fax (01) 368 45 70
ZAMG

WETTERBERICHT

Für die
Straßenmeistereien in NIEDERÖSTERREICH

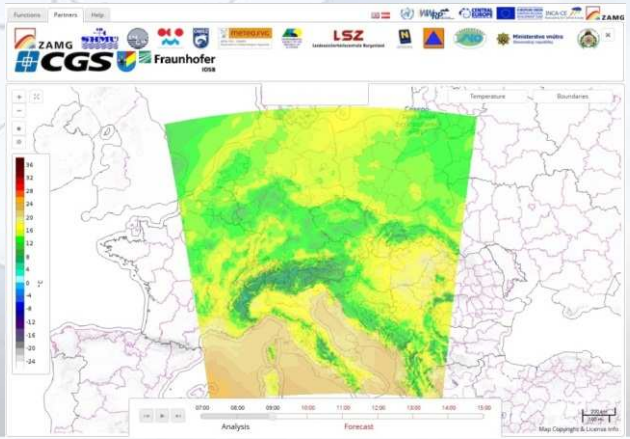
Wettervorhersage für Niederösterreich für die nächsten Tage

Erstellt am Montag, 16. April 2012 von Mag. Thomas Turecek

Montag bis Dienstag in der Früh:
Im ganzen Land geht es trüb und nass durch den Tag und daran ändert sich auch in der kommenden Nacht nichts. Die Schneefallgrenze sinkt bis zum Abend auf 700m bis 400m Seehöhe. Bei mäßigem bis lebhaftem Wind aus West bis Nordwest sinken die Temperaturen im Tagesverlauf und liegen am späten Nachmittag zwischen 1 und 6 Grad. Die Tiefsttemperaturen der kommenden Nacht liegen zwischen minus 2 und plus 5 Grad.

Dienstag, 17.4.2012:
Am Vormittag ziehen meist noch dichte Wolken durch, langsam lockert es aber auf. Vor allem im Mostviertel schneit oder regnet es mitunter noch leicht. Im Laufe des Nachmittages setzt sich immer öfter die Sonne durch. Der Wind weht schwach bis mäßig, in den östlichen Landesteilen zum Teil lebhaft, aus Nordwest bis Nord. Frühtemperaturen minus 2 bis plus 5 Grad, Tageshöchsttemperaturen 7 bis 12 Grad.

Mittwoch, 18.4.2012:
Wechselnd bewölkt geht es durch den Tag, vor allem im Flachland überwiegt der Sonnenschein. Im Berg- und Hügelland kann es hingegen zeitweise leicht regnen. Der Wind weht schwach aus Ost bis Südost. Frühtemperaturen minus 4 bis plus 1 Grad, Tageshöchsttemperaturen 8 bis 15 Grad.



Summary

In the frame of the INCA-CE project 24 international institutions, not only from weather services, but also from hydrological services, public authorities of crisis management, civil protection and road management, work together on:

- **more detailed and accurate nowcasting system**
- **optimized strategies for the use of weather warning information by decision-makers of various social and economic sectors**
- **coordinated warning of severe weather**

Save Life! **Save Cost!** **Reduce Risks!**

www.inca-ce.eu