EUMETNET ASIST
A joint initiative on nowcasting throughout Europe

Ingo Meirold-Mautner, Benedikt Bica, Alexander Kann, Yong Wang

EUMETNET
EUROPEAN METEOROLOGICAL SERVICES NETWORK

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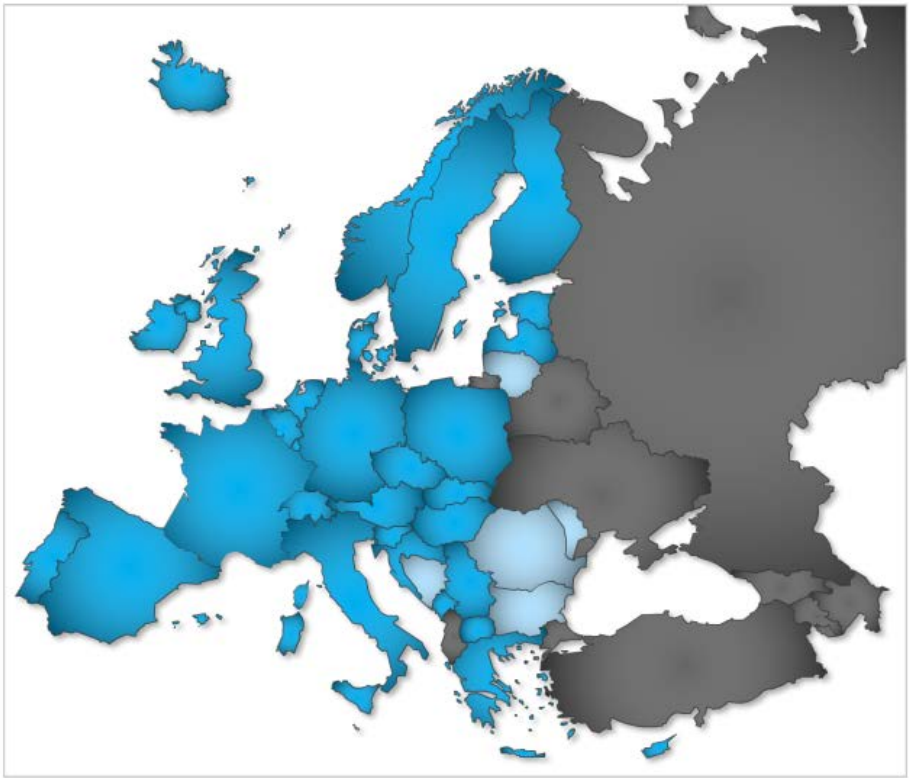
WMO WWRP 4th International Symposium on Nowcasting and Very-short-range Forecast 2016 (WSN16)
25-29 July 2016, Hong Kong

EUMETNET Programmes

"EUMETNET is a grouping of 31 European National Meteorological Services that provides a framework to organise co-operative programmes between its Members in the various fields of basic meteorological activities. "

"These activities include observing systems, data processing, basic forecasting products, research and development and training."

Austria	**Luxemburg**
Belgium	**Montenegro**
Bulgaria	**Netherlands**
Croatia	**Malta**
Cyprus	Moldova
Czech Rep.	**Norway**
Denmark	**Poland**
Estonia	**Portugal**
Finland	Romania
France	**Serbia**
Germany	**Slovakia**
Greece	**Slovenia**
Hungary	**Spain**
Iceland	**Sweden**
Ireland	**Switzerland**
Italy	**FYROM**
Latvia	**United Kingdom**
Lithuania	



Bold: Full members
Normal: Cooperating NM(H)s
GREEN = ASIST partners

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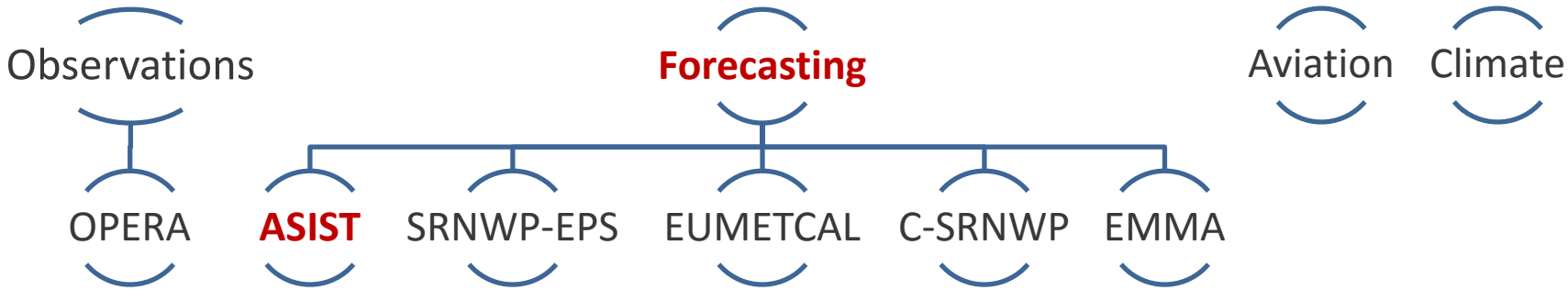
EUMETNET Programmes



ASIST (**A**pplication oriented analy**SIS** and very short range forecas**T** environment) started in July 2015 to set up a European wide cooperation on nowcasting and very short range forecasting (VSRF).
It is the follow-up project of the Nowcasting Activity 1st phase which ended in June 2014.

Close cooperation with:

- Forecasting Programmes
  - Forecast Programme Management (Dick Blaauboer, KNMI)
  - SRNWP-EPS Phase II (José Antonio Garcia-Moya Zapata, AEMET)
  - EUMETCAL (Alessandro Chiarello, FMI)
  - C-SRNWP (Balazs Szintai, OMSZ)
  - EMMA /EMMA-H (Michael Staudinger, ZAMG)
- Observations Programme
  - OPERA (Elena Saltikoff, FMI)

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EUMETNET Nowcasting Cooperation as a 2-phase approach

Nowcasting Activity (1st phase)
01/2013 – 06/2014 (18 months)
Coordinated by ZAMG in collaboration with KNMI
23 participating members
• Feasibility of nowcasting cooperation • Requirements for joint developments • Inventory of current nowcasting systems • 1st European Nowcasting Conference • Requirements of 2nd phase

ASIST (2nd phase)
07/2015 – 12/2017 (30 months)
Coordinated by ZAMG
24 participating members
• Benefit of observation exchange • Verification and testing. Training and evaluation • Potential of probabilistic nowcasting • Initiating future EU projects • Knowledge exchange • 2nd European Nowcasting Conference

<u>Both phases have the same four working areas (WAs)</u>

1. Nowcasting systems
2. Observation and NWP
3. Verification and societal/economical impacts
4. Application and user aspect

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1st European Nowcasting Conference – April 2014, Vienna, Austria

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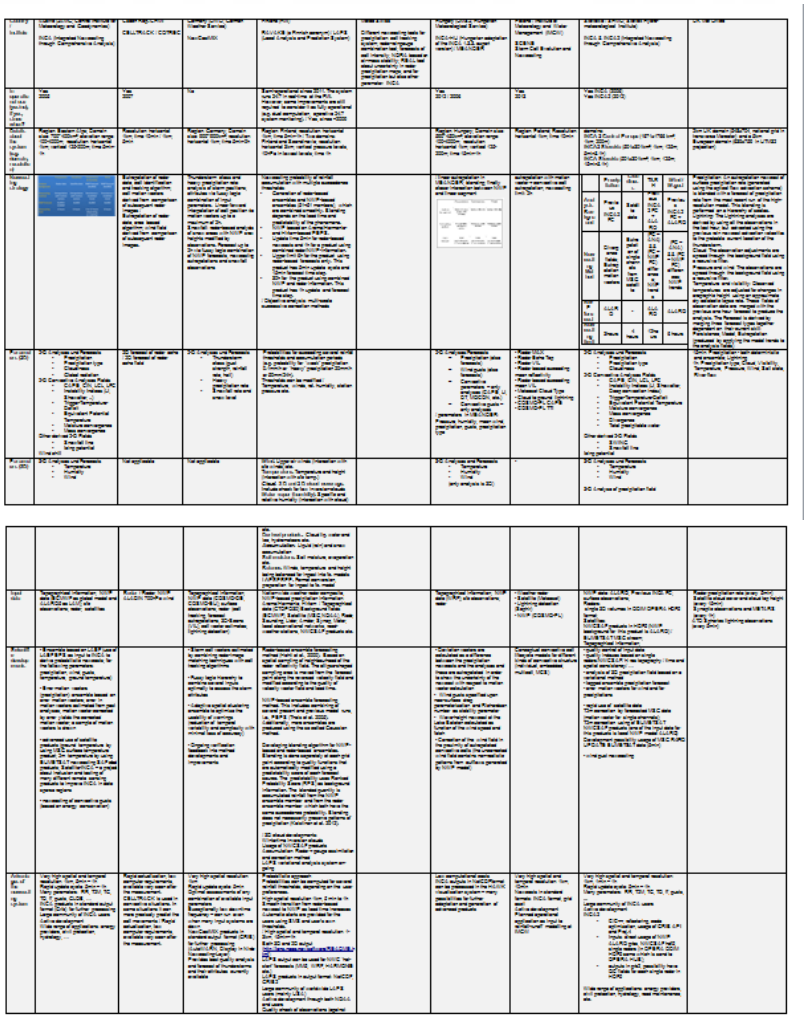
Results from Nowcasting Activity 1st phase (WA1)

1. **Nowcasting systems**
   - Different users requirements
     - a huge amount of variables, products, thresholds, etc.
     - different treaments: combination of radar, satellite, NWP data, extrapolation, blending, etc.
     - deterministic vs. probabilistic solutions
   - Wide range of tools and techniques
     - Short term warning systems
     - Mostly for precipitation (however, systems with more parameters exist)
     - There is often a strong link between research and user needs
   - Inportant for NMSs:
     - Short term warning systems
     - Seamless forecasts



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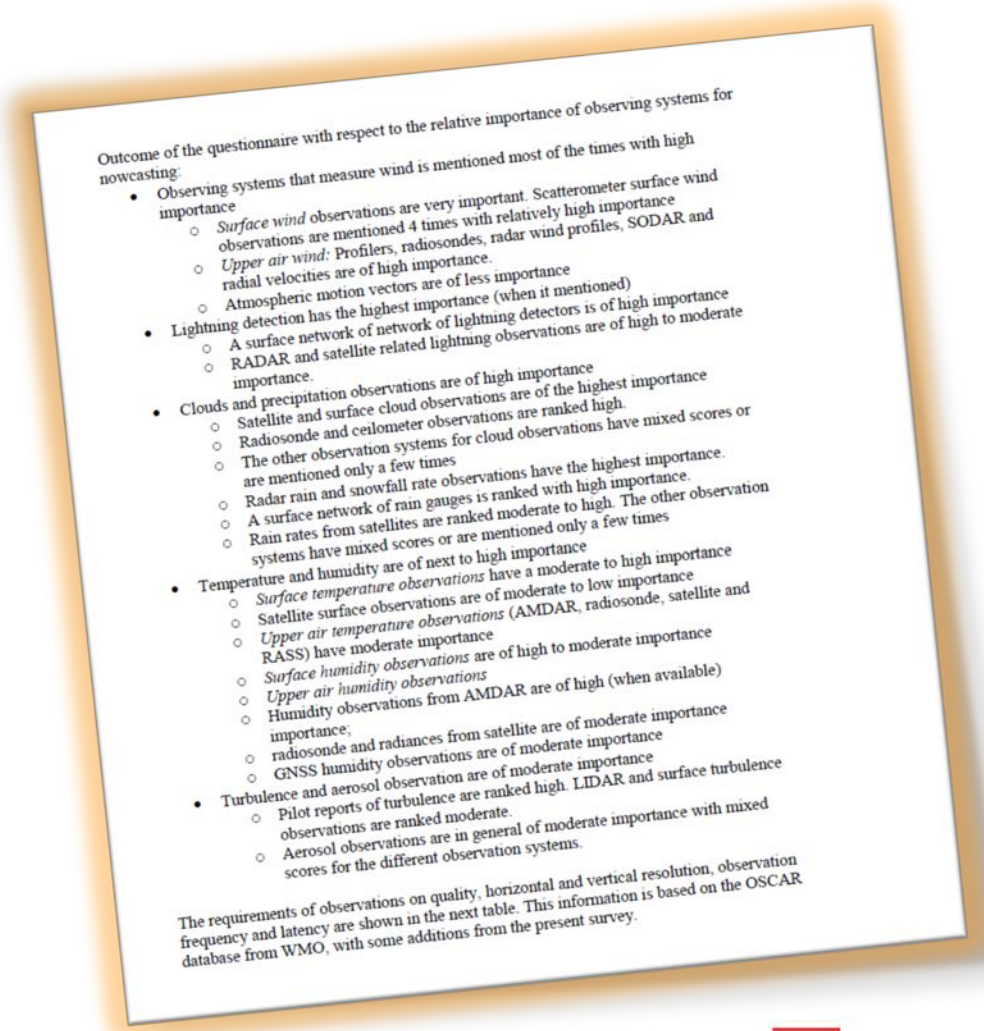
Results from Nowcasting Activity 1st phase (WA2)

2. Observation and NWP

- Focus on the availability of data from national surface network
- Improve observation data
  - Volume
  - Latency
- More upper air wind and temperature information
- More 3D humidity information
- Enhance the use of satellite products
- Support and make use of EUMETSAT-SAFs
- Quality control of the observations



Outcome of the questionnaire with respect to the relative importance of observing systems for nowcasting:

- Observing systems that measure wind is mentioned most of the times with high importance
  - *Surface wind* observations are very important. Scatterometer surface wind observations are mentioned 4 times with relatively high importance
  - *Upper air wind:* Profilers, radiosondes, radar wind profiles, SODAR and radial velocities are of high importance.
  - Atmospheric motion vectors are of less importance
- Lightning detection has the highest importance (when it mentioned)
  - A surface network of network of lightning detectors is of high importance
  - RADAR and satellite related lightning observations are of high to moderate importance.
- Clouds and precipitation observations are of high importance
  - Satellite and surface cloud observations are of the highest importance
  - Radiosonde and ceilometer observations are ranked high.
  - The other observation systems for cloud observations have mixed scores or are mentioned only a few times
  - Radar rain and snowfall rate observations have the highest importance.
  - A surface network of rain gauges is ranked with high importance.
  - Rain rates from satellites are ranked moderate to high. The other observation systems have mixed scores or are mentioned only a few times
- Temperature and humidity are of next to high importance
  - *Surface temperature observations* have a moderate to high importance
  - Satellite surface observations are of moderate to low importance
  - *Upper air temperature observations* (AMDAR, radiosonde, satellite and RASS) have moderate importance
  - *Surface humidity observations* are of high to moderate importance
  - *Upper air humidity observations*
  - Humidity observations from AMDAR are of high (when available) importance;
  - radiosonde and radiances from satellite are of moderate importance
  - GNSS humidity observations are of moderate importance
- Turbulence and aerosol observation are of moderate importance
  - Pilot reports of turbulence are ranked high. LIDAR and surface turbulence observations are ranked moderate.
  - Aerosol observations are in general of moderate importance with mixed scores for the different observation systems.

The requirements of observations on quality, horizontal and vertical resolution, observation frequency and latency are shown in the next table. This information is based on the OSCAR database from WMO, with some additions from the present survey.

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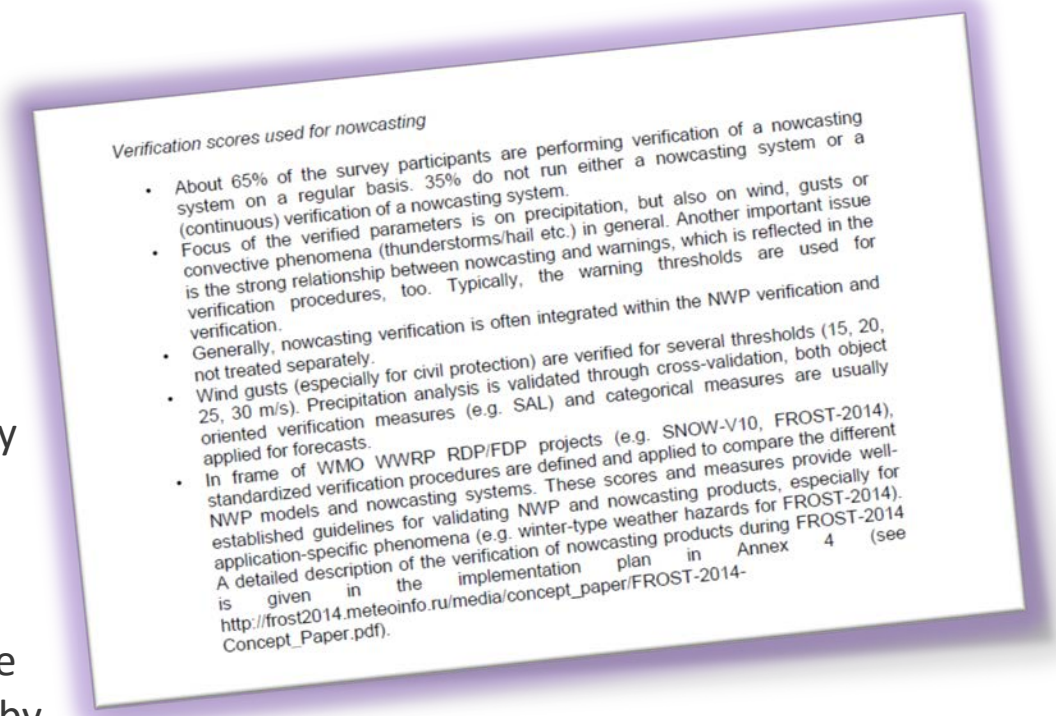
Results from Nowcasting Activity 1st phase (WA3)

3. Verification and societal/economical impacts

- Different verification procedures are in use
- Common efforts towards better nowcasting procedures have large potential to enhance both forecasting quality and applicability
- It is suggested to set up a 'nowcasting benchmark exercise'. Run on a common domain for a common time period, based on the same input data sets, and verified by using commonly agreed verification measures.



Verification scores used for nowcasting

- About 65% of the survey participants are performing verification of a nowcasting system on a regular basis. 35% do not run either a nowcasting system or a (continuous) verification of a nowcasting system.
- Focus of the verified parameters is on precipitation, but also on wind, gusts or convective phenomena (thunderstorms/hail etc.) in general. Another important issue is the strong relationship between nowcasting and warnings, which is reflected in the verification procedures, too. Typically, the warning thresholds are used for verification.
- Generally, nowcasting verification is often integrated within the NWP verification and not treated separately.
- Wind gusts (especially for civil protection) are verified for several thresholds (15, 20, 25, 30 m/s). Precipitation analysis is validated through cross-validation, both object oriented verification measures (e.g. SAL) and categorical measures are usually applied for forecasts.
- In frame of WMO WWRP RDP/FDP projects (e.g. SNOW-V10, FROST-2014), standardized verification procedures are defined and applied to compare the different NWP models and nowcasting systems. These scores and measures provide well-established guidelines for validating NWP and nowcasting products, especially for application-specific phenomena (e.g. winter-type weather hazards for FROST-2014). A detailed description of the verification of nowcasting products during FROST-2014 is given in the implementation plan in Annex 4 (see http://frost2014.meteoinfo.ru/media/concept_paper/FROST-2014-Concept_Paper.pdf).

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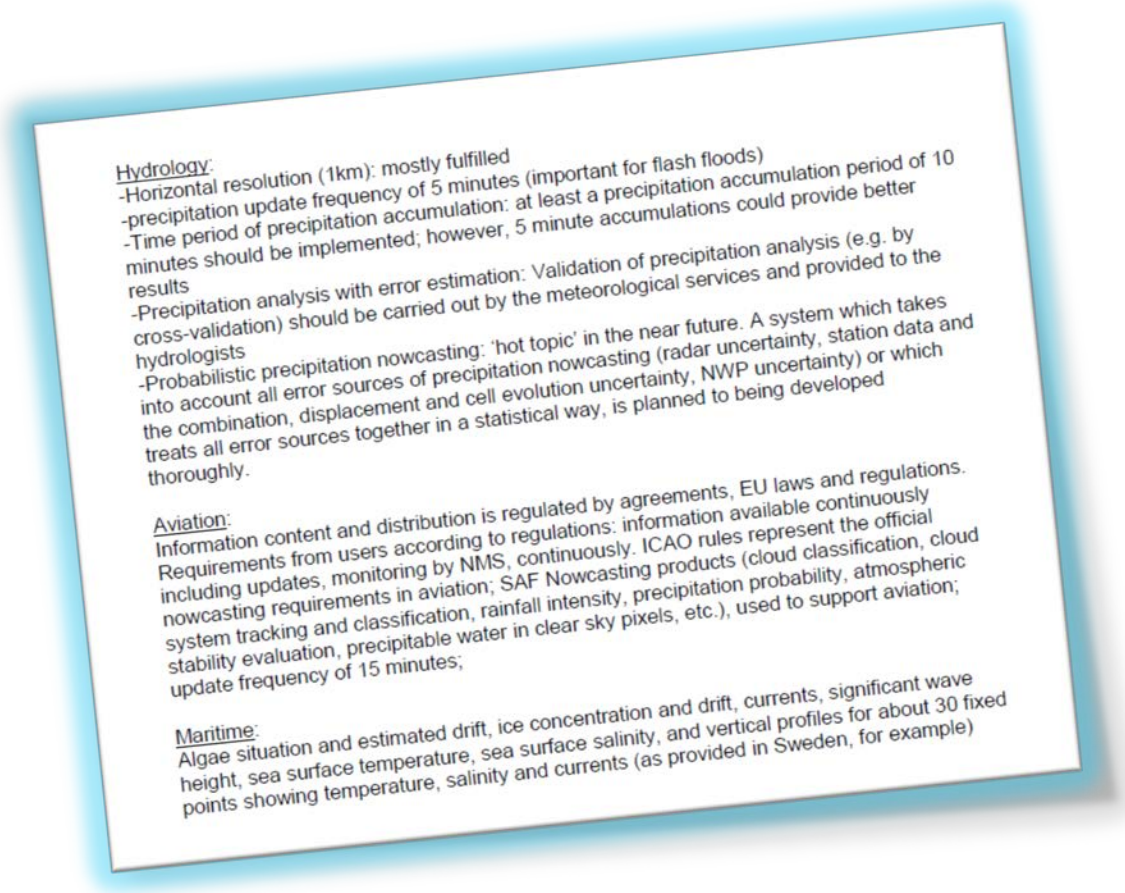
Results from Nowcasting Activity 1st phase (WA4)

4. Application and user aspect

- Different levels of experience in nowcasting and its applications in the partner institutions
- Importance of exchange of knowledge and know-how across the borders was highlighted
- Necessity to take into account the specific user-related requirements in any new field of application in order to guarantee best cooperation between NMS and application area
- Recommendation to elaborate a transnational strategy in the different fields of application



Hydrology:
-Horizontal resolution (1km): mostly fulfilled
-precipitation update frequency of 5 minutes (important for flash floods)
-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
-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
-Probabilistic precipitation nowcasting: 'hot topic' in the near future. 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, is planned to being developed thoroughly.

Aviation:
Information content and distribution is regulated by agreements, EU laws and regulations. Requirements from users according to regulations: information available continuously including updates, monitoring by NMS, continuously. ICAO rules represent the official nowcasting requirements in aviation; SAF Nowcasting products (cloud classification, cloud system tracking and classification, rainfall intensity, precipitation probability, atmospheric stability evaluation, precipitable water in clear sky pixels, etc.), used to support aviation; update frequency of 15 minutes;

Maritime:
Algae situation and estimated drift, ice concentration and drift, currents, significant wave height, sea surface temperature, sea surface salinity, and vertical profiles for about 30 fixed points showing temperature, salinity and currents (as provided in Sweden, for example)

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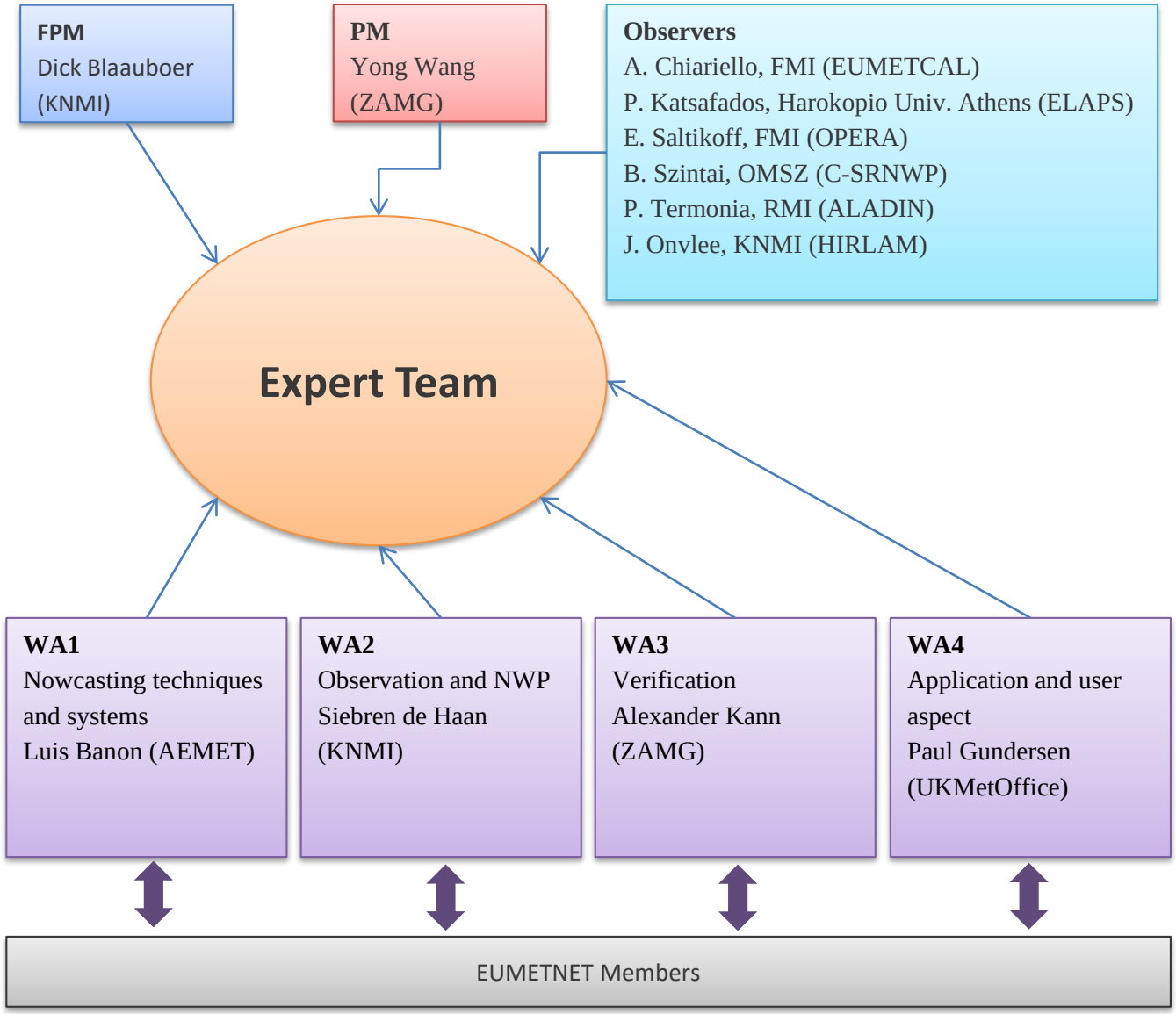
ASIST Management structure



Observers:

Provide advice, comments, experiences from their fields of expertise

Expert team:

- Main advisory board
- Steering and overviewing work progress
- Preparation of reports

Working areas:

Provide a framework of areas of expertise for ET members

Contributors from the participating members provide input for milestones and deliverables

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ASIST targets

1. **Description of end users' needs and system requirements**
   - Recommendation document providing best practices
   - Assessment of the relation of NMSs with their end users
2. **Benefit of exchanging additional observations for nowcasting**
   - Report on the benefit of cross-border data exchange
   - Propose a technical specification on data exchange
3. **Verification and testing of the European ASIST systems**
   - Cooperation with ESSL testbed
   - Guidelines for evaluating nowcasting systems
   - Nowcasting training material usable within EUMETCAL
4. **Initiating and coordinating future EU project(s) supporting ASIST goals**
5. **Establishment of specific ETs**
6. **Potential for delivering probabilistic nowcasting to end users Recommendations for implementation**
7. **Network building and coordination of knowledge exchange**
   - 2nd European Nowcasting Conference

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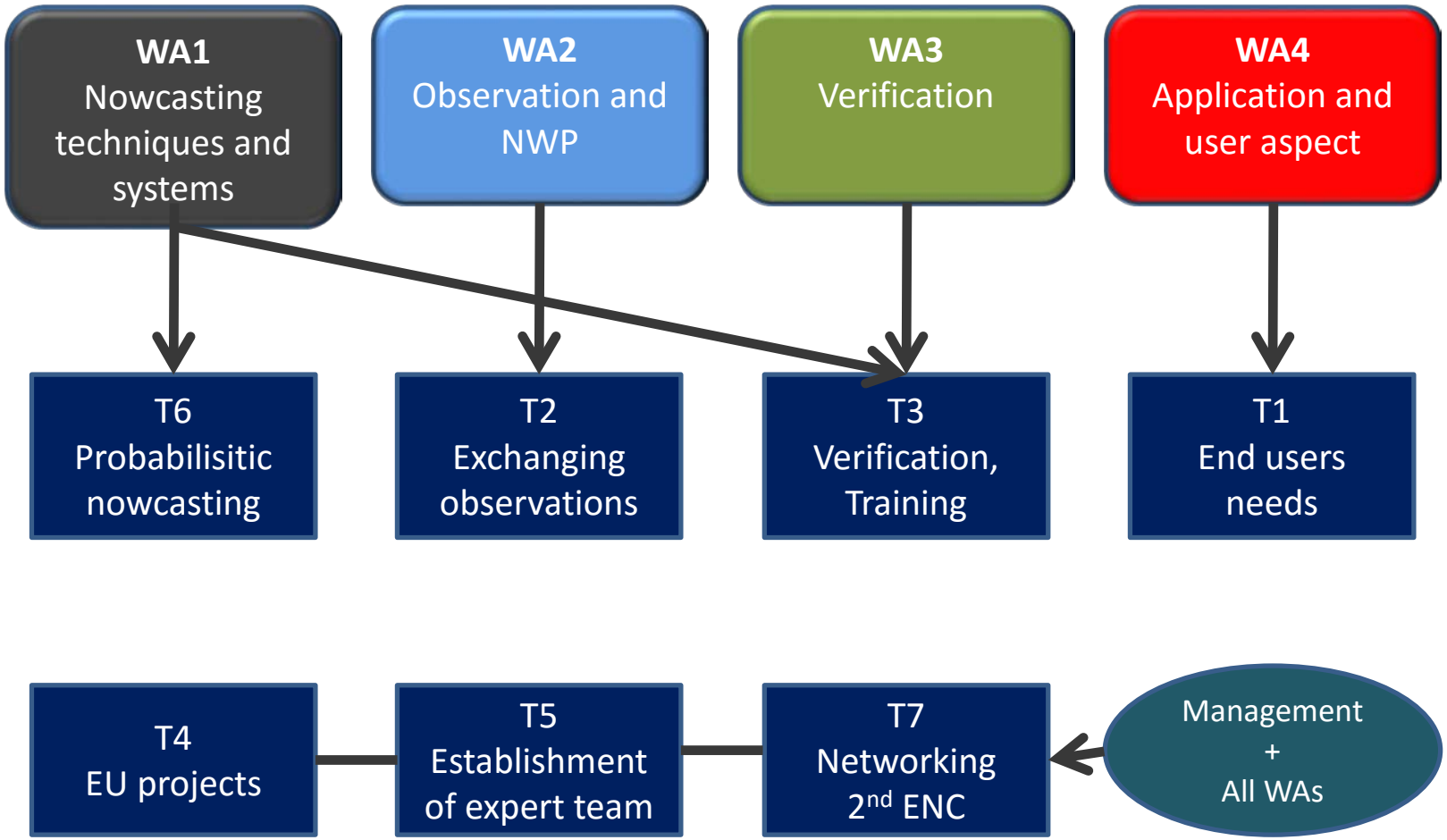
Linking Working Areas and Targets



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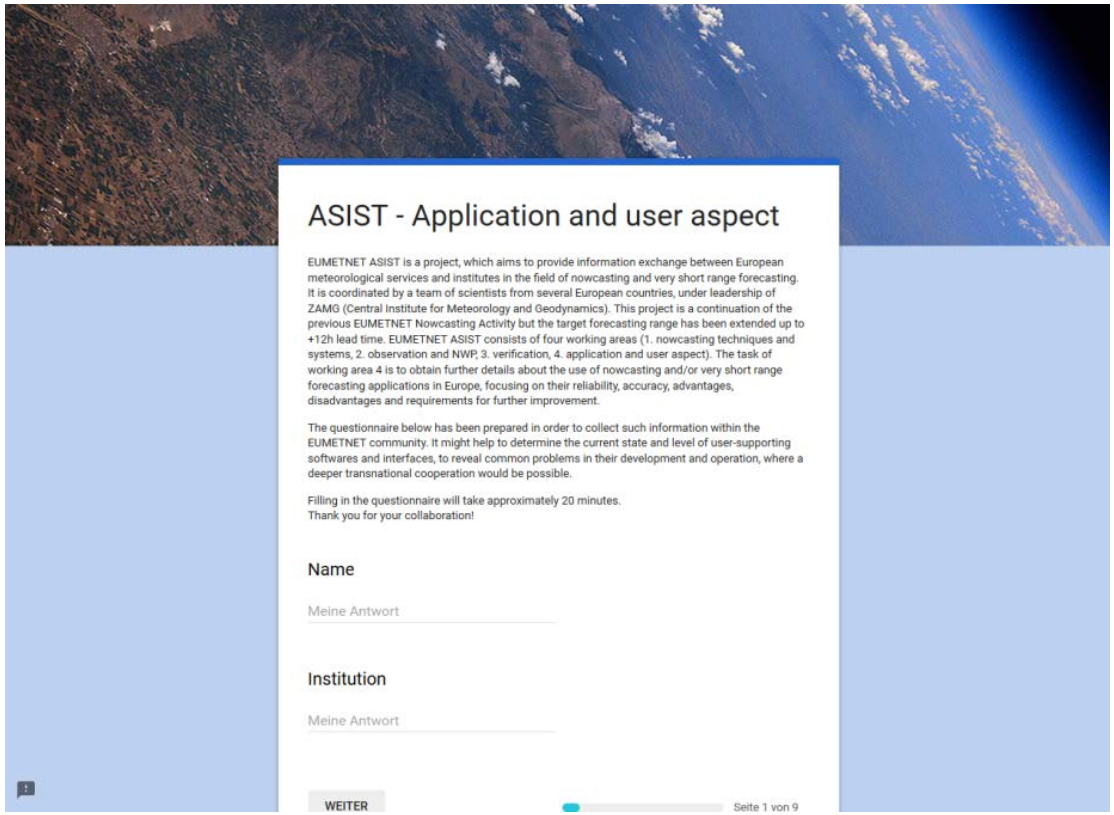
Target status

1. **Description of end users' needs and system requirements**
   - Survey on the relation of NMSs with end users was elaborated and distributed



ASIST - Application and user aspect

EUMETNET ASIST is a project, which aims to provide information exchange between European meteorological services and institutes in the field of nowcasting and very short range forecasting. It is coordinated by a team of scientists from several European countries, under leadership of ZAMG (Central Institute for Meteorology and Geodynamics). This project is a continuation of the previous EUMETNET Nowcasting Activity but the target forecasting range has been extended up to +12h lead time. EUMETNET ASIST consists of four working areas (1. nowcasting techniques and systems, 2. observation and NWP, 3. verification, 4. application and user aspect). The task of working area 4 is to obtain further details about the use of nowcasting and/or very short range forecasting applications in Europe, focusing on their reliability, accuracy, advantages, disadvantages and requirements for further improvement.

The questionnaire below has been prepared in order to collect such information within the EUMETNET community. It might help to determine the current state and level of user-supporting softwares and interfaces, to reveal common problems in their development and operation, where a deeper transnational cooperation would be possible.

Filling in the questionnaire will take approximately 20 minutes.
Thank you for your collaboration!

Name

Meine Antwort

Institution

Meine Antwort

WEITER

Seite 1 von 9

   - Analysis of results is ongoing

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Target status

2. Benefit of exchanging additional observations for nowcasting

– List has been elaborated with possible projects to follow and with projects where cross border data exchange was/is a central issue

Nowcasting projects

In the table below presents a (incomplete) list of projects that have some kind of nowcast focus (last update 2016/04/25)

EDHIT	European Demonstration of a rainfall and lightning induced Hazard ...	EU	http://ec.europa.eu/echo/files/funding/projects/2013/EDHIT_Kick_Off.pdf
EUMETSAT-project	extreme convective cases - the use of satellite products for storm ...	EUMETSAT/IMWM	https://www.eumetsat.int/website/wcm/idc/idcplg?IdcService=GET_FILE&dDocName=PDF_CONF_P_S8_34_PAJEK_V&RevisionSelectionMethod=LatestReleased&Rendition=Web
Forecasting	Forecasting | eumetnet.e	EUMETNET	http://www.eumetnet.eu/forecasting
HYMEX			http://www.hymex.org/?page=observation_strategy
INCA-CE	INCA-CE	EU/AUT	http://www.inca-ce.eu/CE-Portal/
MTG-IRS demo		EUMETSAT	
Nowcast-DE	nowcast - Meteorological Service ...	DE	https://www.nowcast.de/en/sectors-lightning-detection/lightning-data-meteorological-service.html
NWCSAF	Automatic cloud analysis - the Nowcasting SAF project | SMHI	EUMETSAT	http://www.smhi.se/en/research/research-departments/atmospheric-remote-sensing/automatic-cloud-analysis-the-nowcasting-saf-project-1.4875
OCN	RAL Aviation | Oceanic Convection Diagnosis and Nowcasting	USA	https://www.ral.ucar.edu/projects/ocn/
PLURISK	Nowcasting research in the PLURISK project - Radar and ...	BE	http://radar.meteo.be/en/10756004-Nowcasting+research+in+the+PLURISK+project.html
project	Lake Victoria Pilot project for severe weather nowcasting | TAHMO	INT	http://tahmo.org/lake-victoria-pilot-project-for-severe-weather-nowcasting/
RainGain	Precipitation nowcasting at Finnish Meteorological Institute - RainGain	FIN	http://www.raingain.eu/sites/default/files/raingain_2014_fminowcasting_koistinenetal.pdf
SCOPE	SCOPE- Nowcasting Pilot Project 3: u201cPrecipitation/ Severe Rainfall ...	WMO	http://www.wmo.int/pages/prog/sat/meetings/documents/IPET-SUP-1_Doc_08-01-03_SCOPE-Nowcasting-PP3-Rainfall.pdf

Cross border data exchange

In the table below an overview is given on projects that have some kind of data exchange (last update 2016/04/25)

	URL	data	availability
EDHIT	http://edhit.eu	Radar precipitation	yes? ftp?
EUMETNET-ADD	http://mode-s.knmi.nl	Aircraft Derived Data (T,ff,dd)	ftp
HYMEX	http://www.hymex.org	all kinds	?
INCA-CE	http://www.inca-ce.eu	Radar precipitation Surface observations	yes?
MTG-IRS demo	N/A	IASI L2 T,q	ftp EUMETCAST terestial
Nowcast-DE	https://www.nowcast.de	Lightning	?
NWCSAF	http://nwcsaf.org	Satellite data	ftp EUMETCAST
OPERA	http://www.eumetnet.eu/opera	Radar data (refl, Vrad)	ftp GTS
SCOPE	http://www.wmo.int/pages/prog/sat/scope-nowcasting_en.php	Satellite data	?

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Target status

3. **Verification and testing of the European ASIST systems**
   - Collaboration with ESSL has started
   - Contact with EUMETCAL was established and cooperation between both projects was agreed upon
   - Possibilities of integrating training material are discussed
4. **Initiating and coordinating future EU project(s) supporting ASIST goals**
   List of projects
5. **Establishment of specific ETs**
   Expert team established

Function	Name	Institution	Country
PM	Yong Wang	ZAMG	Austria
FPM	Dick Blauboer	KNMI	Netherlands
WA1 lead	Luis Banon	AEMET	Spain
WA2 lead	Siebren de Haan	KNMI	Netherlands
WA3 lead	Alexander Kann	ZAMG	Austria
WA4 lead	Paul Gunderson	UKMET	United Kingdom
WA1	Kathrin Wapler	DWD	Germany
WA1	Matteo Buzzi	Meteoswiss	Switzerland
WA1	Hana Kyznarova	CHMI	Czech Republic
WA1	José Antonio García-Moya Zapata	AEMET	Spain
WA1	Cecilia Marcos	AEMET	Spain
WA2	Henrik Vedel	DMI	Denmark
WA2	Maarten Reyniers	RMI	Belgium
WA2	Malte Muller	MET Norway	Norway
WA3	Goran Mihajlovic	RHMSS	Serbia
WA4	Eivind A. Martinsen	MET Norway	Norway
WA4	Wayne Elliott	UKMET	United Kingdom
WA4	André Simon	OMSZ	Hungary

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Target status

6. **Potential for delivering probabilistic nowcasting to end users Recommendations for implementation**
   Open
7. **Network building and coordination of knowledge exchange**
   - Kick-off held on 13 January 2016, Vienna, Austria

   - 2nd European Nowcasting Conference: **3-5 May 2017, DWD Offenbach**

http://www.dwd.de/DE/fachnutzer/forschung_lehre/seminare/2017/enc/enc_node.html

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ASIST targets: Outlook and upcoming activities

1. **Description of end users' needs and system requirements**
   - Summary of questionnaire results
2. **Benefit of exchanging additional observations for nowcasting**
   - Agree on projects/experiments that may provide best practices in cross border data exchange
   - Evaluate possible cooperation with ASIST
3. **Verification and testing of the European ASIST systems**
   - Discuss possible training material (printed or online training course), target groups etc. internally
   - Coordination with EUMETCAL – ASIST contributions
   - Follow activities at ESSL testbed 2016/2017
4. **Initiating and coordinating future EU project(s) supporting ASIST goals**
   - Summarize relevant project calls and distribute among members
5. **Establishment of specific ETs**
   Completed
6. **Potential for delivering probabilistic nowcasting to end users**
   Recommendations for implementation
   - Investigate possibilities for further cooperation with SRNWP-EPS
7. **Network building and coordination of knowledge exchange**
   - Organisation of ENC2017 (session topics, etc.)

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Thank you !