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TITLE:

GMES SERVICE ELEMENT

PROMOTE

C6 Validation Report
POLLEN OBSERVATION AND FORECAST
Version 1

DOCUMENT STATUS SHEET

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1.1		Template updated and distributed
1.2	[date]	[action]

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LIST OF ABREVIATIONS AND ACRONYMS

[Update list]

ASTHMA	Advanced System of Teledetection for Healthcare Management of Asthma
FMI	Finnish Meterological Institute
MM5	PSU/NCAR mesoscale model
N/A	not available
n.a.	not applicable
NRT	Near Real Time
n.s.	not specified
PACA	Provence Alpes Côte d'Azur
SILAM	Finnish Emergency and Air Quality Modelling System
tbc	To Be Confirmed
UTM	Universal Transverse Mercator

[Use abbreviations below. Please, do not delete list]

N/A	Not Available
n.a.	not applicable
n.s.	not specified

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1 POLLEN OBSERVATION AND FORECAST

1.1 Service Summary

[Update/complete contents of this rsection]

This service provides a forecast and analysis of near surface pollen concentration and risk index.

Figure 1.1-1 Structure and position of the Pollen Observation and Forecast Service within PROMOTE 2 Air Quality. [Will be inserted upon doc delivery]

Service is/will be operational since/after: Spring 2007 in pre-operational mode.

Research partners: ACRI, FMI

Provider(s): ACRI, FMI
Validation contact: Antoine Mangin (Southern Europe Sub service, ACRI), Mikhail Sofiev (Northern Europe Sub service, FMI)

1.2 Pollen observation and forecast products characterization

[Update/complete table]

Cypress pollen concentration	
Parameter	Concentration
Typical range	10 – 2000 grains/m^3
Determination of the typical range (Method, criteria)	na
Maximum range [New]	0 – 10000 grains / m3
Units	Grains/ m^3
Standards	*n.a.*
Cypress pollen risk index	
Parameter	Index
Typical range	Low / Medium / High
Determination of the typical range (Method, criteria)	Algebraic formulation based on pollen concentration, meteorology and air quality
Maximum range [New]	
Units	No standard unit
Standards	*n.a.*
Olive pollen concentration	
Parameter	concentration
Typical range	50 – 1000 grains m^3
Determination of the typical range (Method, criteria)	na
Maximum range [New]	
Units	Grains/ m^3
Standards	*n.a.*

Olive pollen risk index	
Parameter	Index
Typical range	Low / Medium / High
Determination of the typical range (Method, criteria)	Algebraic formulation based on pollen concentration, meteorology and air quality
Maximum range [New]	
Units	No standard unit
Standards	*n.a.*
Wall-pellitory pollen concentration	
Parameter	Concentration
Typical range	50 – 500 grains/ m^3
Determination of the typical range (Method, criteria)	na
Maximum range [New]	
Units	Grains/ m^3
Standards	*n.a.*
Wall-pellitory pollen risk index	
Parameter	Index
Typical range	Low / Medium / High
Determination of the typical range (Method, criteria)	Algebraic formulation based on pollen concentration, meteorology and air quality
Maximum range [New]	
Units	No standard unit
Standards	*n.a.*
Ragweed pollen concentration	
Parameter	concentration
Typical range	50 – 500 grains/ m^3

Determination of the typical range (Method, criteria)	na
Maximum range [New]	
Units	Grains/ m^3
Standards	*n.a.*
Ragweed pollen risk index	
Parameter	Index
Typical range	Low/Medium/High
Determination of the typical range (Method, criteria)	tbd
Maximum range [New]	
Units	No standard unit
Standards	*n.a.*
Birch pollen concentration	
Parameter	concentration
Typical range	0-1000
Determination of the typical range (Method, criteria)	Analysis of observational and model data
Maximum range [New]	0 - 10000
Units	grains/ m^3
Standards	-
Birch pollen risk index	
Parameter	Index, Area of Risk (AOR)
Typical range	0-1 (AOR)
Determination of the typical range (Method, criteria)	Definition of the AOR as a probability to be affected by the specific source area
Maximum range [New]	0 – 1

Units	relative
Standards	*n.a.*

Table 1.2-1 Characterization of the products of the Pollen Observation and Forecast service

1.3 Pollen forecast for South Europe

1.3.1 Validation plan and validation data

[UPDATE/COMPLETE SECTION IN CLUDING/ REALIZATIONS DURING PHASE 2 AND PHASE 2. ONGOING ACTIVITIES. RESULTS OBTAINED SO FAR AND EXPECTED RESULTS]

The validation plan is based on off-line processing and statistical analysis.

The validation process involves representative of Users including:

1. Measurement network representatives
2. Medical professionals
3. Allergy sufferers

The validation of the system will be based on:

- Simulation of products from models and comparison with measured data to encompass characteristic weather conditions for representative allergen dispersion scenarios and thus, appreciate the sensitivity of the results accuracy with respect to the meteorological conditions.
- Cross-comparison with several other observation or prediction systems to assure quality

The validation of the pollen forecast should include a sensitivity analysis to external parameters such as uncertainty on the vegetation map, on the blossoming date or on the precipitation occurrence.

The pollen forecast system validation will be based on different periods which may vary depending on the taxon.

To what concern the pollen service, the validation can be split in three levels:

1. Validation of inputs data and preparatory data
2. Validation of modelling output (pollen concentrations)
3. Validation of derived indicators for specific use

It is worth indicating that these three steps can have different impacts on the service (e.g. a limited quality at the second level may not impact the final quality of the final indicators – in case – for instance – of statistical indicators).

1.3.1.1 Validation of inputs data and preparatory data

1.3.1.1.1 What to validate?

This validation addresses several points that are used as inputs of the pollen emission model:

- C1 - Computation of the blossoming date for a given taxon
- C2 - Computation of the rate of pollen emission
- C3 - Computation of the meteorological fields (used for C1 and C2)

1.3.1.1.2 How to validate?

C1: Error bar on the **blossoming date** will be characterised with historical data, while blossoming date in itself will be validated by actual available results.

C2: The **emission** is the most delicate point to validate. It will be compared with all in situ measurements available. Problem is here that we will compare emissions and imissions.

C3: The **meteorological field** shall be validated by using in situ truth wherever available.

VALIDATION DATA	
***In-situ* observations for C1 and C2**	
Hirst sensors	Data availability and access: archive data Spatial coverage and resolution: 80 stations in France Temporal coverage and resolution: daily data – available since a date that depends on the location Location(s) (coordinates): France Accuracy: tbc
***In-situ* observations for C1 and C2**	
Cour sensors	Data availability and access: archive data Spatial coverage and resolution: approximately 10 stations in Rhone valley (France) Temporal coverage and resolution: weekly data – available depending on the location Location(s) (coordinates): France Accuracy: tbc
Ground based observations for C3	
Meteorological stations	Data availability and access: archive data Spatial coverage and resolution: France Temporal coverage and resolution: hourly data Location(s) (coordinates): France Accuracy: N/A

Table 1.3-1 Data for the validation of the South Europe pollen observation and forecast sub-service

1.3.1.2 Validation of modelling outputs (pollen concentrations)

1.3.1.2.1 What to validate?

This validation addresses mainly the concentration of pollen, result of the dispersion model

- C4 – Pollen concentration at ground level for different taxa.

1.3.1.2.2 How to validate?

C4: The pollen concentration will be compared with available in situ data, which best sampling frequency is the day. This is important to consider when performing comparison with model outputs since errors are added from emission, dispersion and integration in time. For this reason, validation is often done "qualitatively" i.e. either under the form of a level of values (for instance low/medium/high level) or under the form of spatial representativity of the results (if pollen fronts are well represented regardless of the absolute value). Both validations will be performed.

VALIDATION DATA	
***In-situ* observations for C4**	
Hirst sensors	Data availability and access: archive data Spatial coverage and resolution: 80 stations in France Temporal coverage and resolution: daily data – available since a date that depends on the location Location(s) (coordinates): France Accuracy: tbc
***In-situ* observations for C4**	
Cour sensors	Data availability and access: archive data Spatial coverage and resolution: approximately 10 stations in Rhone valley (France) Temporal coverage and resolution: weekly data – available depending on the location Location(s) (coordinates): France Accuracy: tbc
Model outputs potentially used for validation	
POLLEN System (Northern Europe)	As a result of geographical expansion of both models, cross comparison of two models is foreseen for phase 3 of the PROMOTE 2
EO Data	
Imagery (MERIS FR /SPOT5/Pléaides)	This data could potentially be used for validation for location of ragweed emitters

Table 1.3-2 Data for the validation of the South Europe pollen observation and forecast sub-service

1.3.1.3 Validation of derived indicators for specific use

1.3.1.3.1 What to validate?

This validation addresses two indicators that have been requested by users (through SLA)

- C5 – Health risk index
- C6 - Delimitation of impacted areas

1.3.1.3.2 How to validate?

The validation for both C5 and C6 will be done through correlation studies performed with epidemiologists of CHU. The way to strictly validate this risk index is still under discussion. It can be done either with a statistical study involving a lot of people to extract some statistical significance and trends or with dedicated set of people (so called “cohorte”) with fine and specific attention paid to each individual behaviour.

1.3.2 Validation of individual components

1.3.2.1 Overview

As stated above, pollen season is characterised by four main parameters: 1) the Julian date at which the blossoming starts, 2) the delay of the period during which concentration of pollen in the air is increasing 3) the maximum of the pollen concentration curve and 4) the “severity”, i.e. the sum during the season of all daily concentrations observed at a given point (which corresponds to a temporal integration of pollen concentration).

To characterise all these parameters, distinct neural networks have been deployed. Inputs are meteorological relevant parameters such as rain data, temperature and humidity.

These neural networks have been trained with a subset of available in-situ data. The complementary set of in-situ data has been used to validate the neural network outputs.

We present here below results for blossoming date computation and, from that date of daily forecast concentration. Results and validation of severity forecast are presented for different taxa along with some meteorological validation (which are used as inputs for neural networks).

1.3.2.2 C1 - Blossoming date and first part of the season

Figure 1.3-1 sketches forecast daily evolution of the ascending phase of the season for olive tree pollen for three different years. Red lines represent the forecast while black lines are the observations. This result is remarkable in the sense that this is pure forecast, i.e. neural network have been trained without these data and the forecast for one day is based on meteorological parameters and pollen concentration forecast from the day before (pure extrapolation).

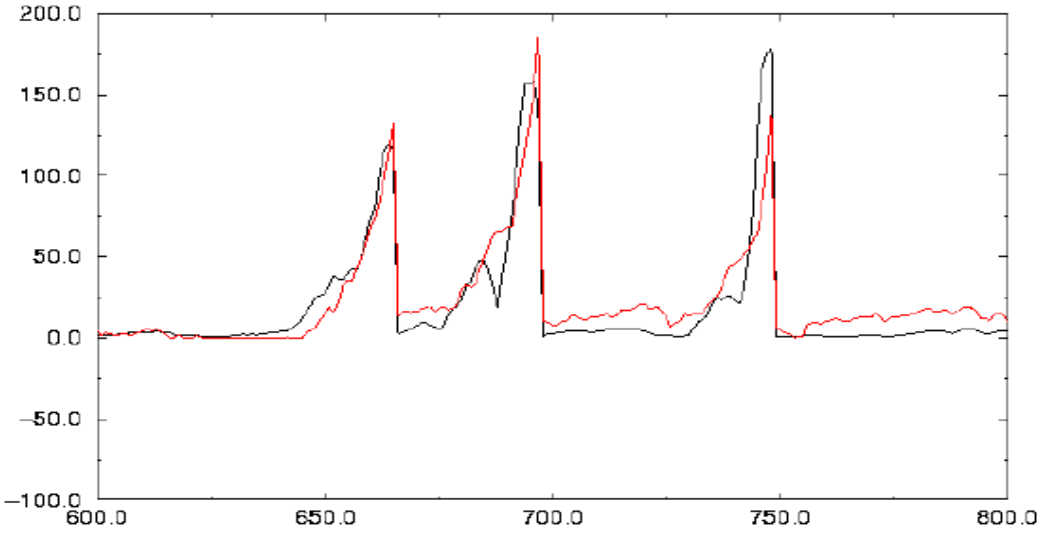

Figure 1.3-1 Pollen concentration daily evolution – forecast and observed (olive tree pollen at Cordoba)

1.3.2.3 C2 - Emissions rate

An example of comparison between measured and computed severity is shown on next graph. Although it was felt to be initially easy to derive the severity, it has been found rather fluctuant and not always in good agreement with observation. The reason is that the severity is based on the tree/plant memory and shall account for all past events of the previous year (which is not the case here). An error bar has been computed (also from NN) and is presented on figure below.

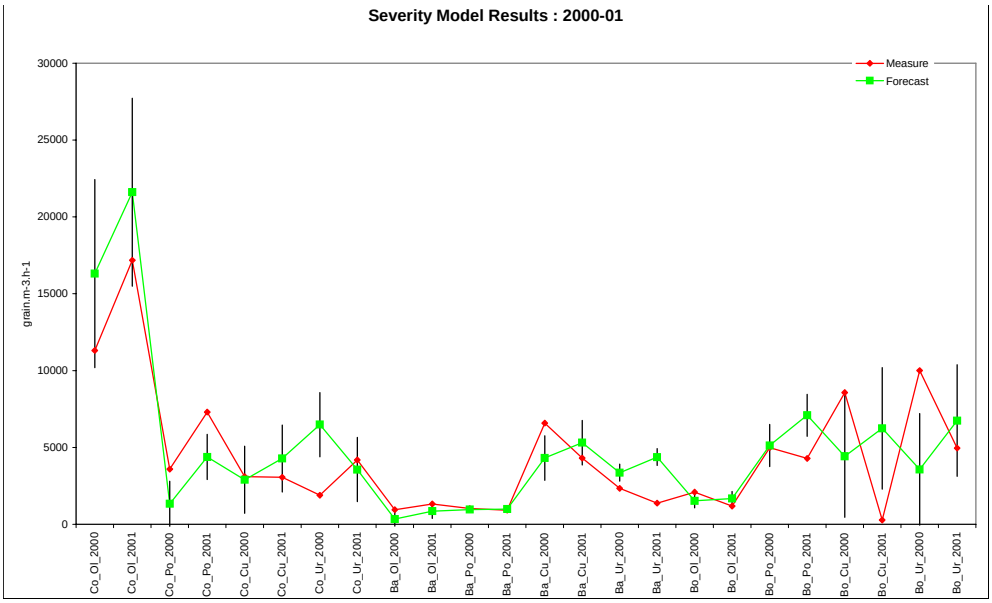

Figure 1.3-2 Severity forecasts (Co: Cordoba ; Ba: Barcelona ; Bo: Bologna ; Ol: Olea ; Po: Poaceae ; Cu: Cupressaceae ; Ur: urticacea)

Here again are represented forecast for severity for four taxa (that have been derived during the precursor service ASTHMA). Although being certainly the more harmful for health, the amount of cuprecassee pollen is unfortunately not well reproduced here.

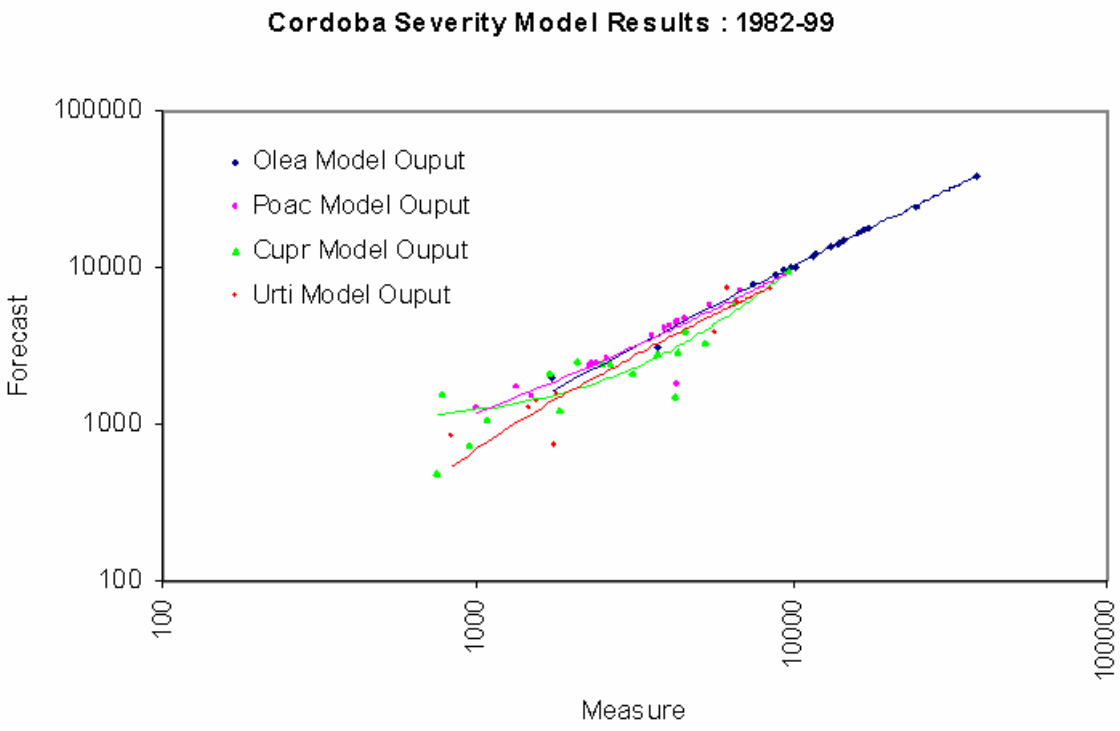

Figure 1.3-3 Severity validation (Cordoba)

NOTE: the term "parameter" is used here in reference to a number resulting from a mathematical/statistical relationship having as a result a numerical description of a certain property (e.g. error, uncertainty, accuracy,…) of the product/population

VALIDATION OF INDIVIDUAL COMPONENTS	
Uncertainty estimators	
Bias	$\sqrt{\frac{1}{n}\sum_{i=1}^{nstations} Modele - Measure}$
RMSE	$\sqrt{\frac{1}{n}\sum_{i=1}^{nstations} Modele - Measure}^{2}$
Severity of the season	[give name abbreviation/symbol-Summarize calculation method and/or indicate formula- references]
Quality assessment	
Uncertainty analysis parameter vegetation map	Parameter: vegetation map; quantification of variation of the emitting area over concentration field.
Uncertainty analysis parameter blooming date	Parameter: blooming date; quantification of variation of the resulting concentration field to the blooming date over simulation. Percentile 90
MODELS/ASSIMILATION	
CALMET Meteorology 5.546	Soil data, sea temperature, land use cover
	Parameter=wind, temperature, stability field; comparison with in-situ meteorological data. Bias = [Result; Procedure/method – ref data (ref)] Rmse = [Result; Procedure/method – ref data (ref)] Other indicators will be defined if needed
MM5 Meteorology 3.6	Soil data, sea temperature, land use cover
	Parameter=wind, temperature, stability field; comparison with in-situ meteorological data. Bias, Rmse,Other indicators will be defined if needed [Validation Parameter - Result; Procedure/method – ref data (ref)]

CALPUFF Dispersion 5.723	Soil data, sea temperature, land use cover
	Parameter=concentration field; comparison with in-situ data (Hirst and Cour Sensor) [Validation Parameter - Result; Procedure/method – ref data (ref)] Bias, Rmse,Other indicators will be defined if needed
SILAM v4.2 Validation	[A priori constraints/initial conditions/boundary conditions/sensitivity]
	[Validation Parameter - Result; Procedure/method – ref data (ref)]
Consistency	
Emission computation by Neural network of semi-empiral law	Parameters=blossoming date and severity; Comparison with in-situ data (Hirst and Cour sensors) for the blossoming date Estimator: RMSE
Risk index	All inputs data quality / reliability and consistency of all ingredients for risk index computations
	Parameter= risk evaluation (low, medium, high); Procedure/method – in elaboration
Delimitation of impacted areas	Same as above
	Parameter=geographical delineation of impacted areas; Procedure/method – in elaboration
[Validation against measurements]	[Constraints/Information content]
	[Validation Parameter - Result; Procedure/method – ref data (ref)]

Table 1.3-3 Validation of the individual components of the South Europe pollen observation and forecast sub-service

A sensitivity analysis is under progress in order to qualify effects of uncertainties of the vegetation map and the blooming date. These data are certainly the most sensitive for the model. For instance, olive production map is based on Corine Land Cover data. As olive parcels can often be smaller than the dataset resolution, that causes an uncertainty about the obtained map. Also vegetation is subject to change in time and using CLC 2000 may lead to strong uncertainties.

The forecast of pollen is very delicate in the sense that localisation of emitters is not well known (in case of annual plants) as well as season monitoring. This adds a large level of uncertainties to the results. Therefore, here, the quantification of the uncertainties associated with the results is of prime importance (as results may be considered as good in one area and inefficient in others) and it is one main task of the validation activities.

1.3.3 Validation against specifications and against user requirements

[Update/complete text and table below]

The pollen forecast and observation system is at a pre-operational stage. First validation will be performed during the present season and after a year. Pre-operational service delivery shall be ready for olive season (end of April for PACA region)

NRT delivery of 4 taxa pollen concentration observations over the PACA Area at the end of April 2007, first results of olive data will be delivered. Other taxa pollen will be included during the next years when the methodology will be validated.

The forecast system will deliver daily updates at end of April 2007. A **health risk index** will be derived after first validations of forecast system, in year 2008 by far.

Monthly delivery quality check will be delivered as soon as the forecast system will be implemented.

Service operational during 3 months in Phase 1 (end-April to end-june). This period can be extended if olive is still flowering.

*Requirements written in *Italics* are recommended and not compulsory for Phase 2.

VALIDATION AGAINST SERVICE SPECIFICATIONS			
[Indicate here limitations/delays for compliance between theoretical and actual service specifications]			
VALIDATION AGAINST USER REQUIREMENTS			
SPECIFICATION	**S5** **[do not modify this column]**	**REQUIRED*** **[do not modify this column]**	**ACTUAL** **[Update contents of the fields below; Keep Phase 2 info preceeded by a "P1" in case it is different from Pahse 2 info (identified by "P2")]**
Parameters	-Pollen concentration for olive -Pollen concentration for cypress, wall-pellitory, ragweed (N/A In this phase) -Health risk index (N/A in this phase, 2008) -Area of risk		
Accuracy	N/A	n.s.	N/A
Accuracy minimum	80%	n.s.	N/A
Accuracy target	35% in concentration and 80% of good score when using classification of [high/medium/low level]	n.s.	35% in concentration
Spatial coverage	Phase 1: Specific zoomed areas PACA Region with focus on Alpes-Maritime (2007/2008) Phase 2: Europe	PACA Region with focus on Alpes-Maritime	Zoom on Alpes Maritimes
Horizontal resolution	1 km	n.s.	4km
Vertical resolution	20 m	n.s.	20 m
Grid/Projection	UTM	n.s.	UTM
Temporal coverage	Warm season	3 months (spring summer)	3 months (spring summer)
Temporal resolution	Daily (72 hours forecast in Phase 3)	Daily	Daily – 48 hours forecast

User Interfaces			
PROMOTE Web	Operational, complete and up to date	Operational, complete and up to date	Operational, incomplete not up to date
ftp	ACRI-ST	n.s.	Tbd
Data formats and data delivery			
Data availability	Operational data available during spring and summer (End April to end June extendable depending on olive flowering). Daily updates.	n.s.	Operational
Data access	online	PROMOTE Web	Operational
Delivery Mode	NRT	NRT	Operational
Delivery frequency	At any time of the day with a monthly quality check delivery	At any time of the day with a monthly quality check delivery	Operational
Data Format	n.s.	Shapefile,PNG, SMS	PNG
Historical archive	Database of forecasting since Summer 2007	n.s.	N/A
Visualization	PNG	JPEG	PNG
REMARKS			
[remarks]			

*Requirements written in *Italics* are recommended and not compulsory for Phase 2.

Table 1.3-4 Validation against specifications and against user requirements for the South Europe pollen observation and forecast sub-service

1.3.4 Quality assessment and control procedures

[Update/complete text and table]

In order to reduce differences between accuracy targets and actual accuracy of the product; a geostatistical analysis will be used to optimise emissors location and rate of emission.

Optimal accuracy results could be obtained with better quality of vegetation status and emitters location (by EO). These two parameters are certainly of very high value for the improvement.

For optimal validation, in-situ observation for emission levels and occurrence wrt meteorological daily conditions are necessary.

Service delivery start date: [Indicate (actual) date from which the Web Page is operational, complete and up-to-date during Phase 2 Service delivery period. If before 1st of March, indicate date or just "Phase 1"]

SPECIFICATION	S5 [Please do not modify this column]	REQUIRED* [Please do not modify this column]	ACTUAL [Update contents of the fields below]	N checks/Delivery period ° [Indicate here actual period of service delivery during Phase 2] [indicate below number/occurrence (#)and/or frequency(f)]
Quality checks	Every forecast cycle by comparing prediction with available measurements	Monthly	n.s.	[# checks, f?]
Product confidence data	n.s.	n.s.	n.s.	[# checks, f?]
Error bar definition and representation	1 x standard deviation	n.s.	n.s.	[#, f?]
Representation of missing data	Not enabled. The result of the service is model simulations, thus the maps do not have missing values	n.s.	n.s.	[# checks, f?]

Documentation of process failure	The products are delivered in NRT through web interface. However, analysis of the results (for validation and application to health concerns) is done off line so timeliness is not a key parameter.	n.s.	n.s.	[# checks, f?]
Version control mechanisms and representation	Users have detailed description of the operational version, which is then frozen for the entire season. Shorter description is also available from the service Web site.	n.s.	n.s.	[# changes, f?]

*Requirements written in *Italics* are not compulsory for Phase 2

°Between 1st March and 30th of May

Table 1.3-5 Validation of quality assessment and control procedures for the South Europe pollen observation and forecast sub-service

1.4 Pollen forecast for North and Central Europe

1.4.1 Validation plan and validation data

[UPDATE/COMPLETE SECTION IN CLUDING/ REALIZATIONS DURING PHASE 2 AND PHASE 2. ONGOING ACTIVITIES. RESULTS OBTAINED SO FAR AND EXPECTED RESULTS]

The validation plan is based on off-line processing and statistical analysis.

The validation process involves representative of Users including:

1. Measurement network representatives
2. National pollen forecasters
3. Medical professionals

The validation of the system will be based on comparison of the model results with measured data.

The validation of the pollen forecast will include a sensitivity analysis to external parameters, such as uncertainty of the vegetation map, total pollen developed during previous vegetation season, quality of meteorological information (wind and temperature profiles) and parameterization of phenological processes (first of all, heat sum thresholds).

The pollen forecast system validation will be based on different periods which may vary depending on the taxon.

The validation addresses several points and acts at different level of the processing chain:

- Computation of the flowering starting date
- Computation of the actual emission of pollen grains
- Computation of the pollen dispersion

The overall evaluation will be based on comparison of modelled and observed concentrations over Europe. A summary of the datasets used/to be used for validation is given in Table 1.4-1.

Individual components mentioned above will be evaluated wherever the corresponding data become available. In particular, the flowering date will be compared with actual phenological observations.

The **emission** is the most difficult parameter to verify. Within the scope of the supporting POLLEN project a model for the emission flux has developed. The model is based on objective characteristics and established biological and physical processes and includes minimum number of adjustable parameters. During 2007 and 2008 demonstration

forecasting, the model accuracy has been evaluated by direct comparison of the results of dispersion simulations with the observations near- and far from the source areas.

Since the SILAM modelling system is used in several other forecasting and re-analysis projects, the characteristics of the model performance with regard to dispersion processes will be mainly taken from there. Within this service, the emission module is considered as the most uncertain part of the system.

VALIDATION DATA	
SAMPLE Name SOURCE/NETWORK Phase: (1, 2 OR 1+2)	Data availability and access (include access details if data is freely available): Spatial coverage and resolution: Temporal coverage and resolution: Location(s) (coordinates): Uncertainty quantification (e.g. Accuracy):

[Use these sample if you need to add datasets to the table below]

VALIDATION DATA	
***In-situ* observations**	
European Awroallergen Network	Data availability and access: pollen counts, Web access from protected site Spatial coverage and resolution: Europe, single-point data Temporal coverage and resolution: whole season, 1 day, rarely 2 or 3 hours Location(s) (coordinates): over 100 stations all over Europe Accuracy: n.s. but believed to be within 20-30% for high-concentration data, grows to 100-300% for near-zero concentrations
Model outputs	
SILAM v.4.2	Data availability and access: SILAM model Web site, protected and public parts Spatial coverage and resolution: Europe, 30km Temporal coverage and resolution: whole season, 1 hour Location(s) (coordinates)/computational domain: Europe Accuracy: to be verified, preliminary rough estimates suggest to be within a factor of 5 for >90% cases, within a factor of 3 for ~40% cases
EO Data	

Composite of several space products, Schuck *et al.* (2002), Päivinen *et al.*(2001)	Data availability and access: metadata: forest map Spatial coverage and resolution: Europe, 1 km Temporal coverage and resolution: n/a Location(s) (coordinates)/computational domain: Europe Accuracy: n.s. but believed to be generally within a factor of 3-5

Table 1.4-1 Data used for the validation of the Pollen Forecast sub-service for Noth and Central Europe sub-service

1.4.2 Validation of individual components

[Update/complete text and table below]

The following main characteristics of the pollen season are the most important ones: 1) the start date for the season, 2) temporal evolution of the concentrations, 3) dates and absolute levels of maximum concentrations, 4) overall severity of the season, i.e. an integral of the pollen concentrations throughout the season.

The season start is usually considered as the date when the integral of pollen concentrations reaches the prescribed fraction of seasonal sum (e.g. 5%). Thus, it cannot be computed exactly until the end of the season and is useful only for re-analysis purposes. The second complexity of the parameter is that it strongly depends on the long-range transport of pollen. Therefore, instead of the start date of pollen season, we use the start date of flowering, which is well-localised parameter with comparatively precise phenological definitions (though, varying from country to country).

Temporal evolution of the pollen release is approached via deterministic modelling using the actual meteorological conditions as main input parameters.

Overall strength of the pollen season entirely depends on amount of grains developed during the previous year vegetation season. At present is not computed by the model because statistical analysis of historical data have not revealed any sufficiently pronounced dependence on the objective meteorological or biological parameters of the previous year. It is introduced into the model as an expert estimate. Corresponding information is collected throughout the winter preceeding the flowering season.

After the pollen release, it becomes a subject for atmospheric transport at various scales. An insight into the model formulations can be found in Sofiev *et al.* (2006). A detailed description of the emission model will be available in the forthcoming publications.

A strong step towards evaluation of the maximum achievable accuracy of the pollemn season representation in the models has been made by Siljamo et al (2008) where the maps of the objective uncertainties of the phenological data have been compiled and analysed for the whole of Europe.

VALIDATION OF INDIVIDUAL COMPONENTS
Uncertainty estimators

Severity of the season	A relative amount of pollen grains produced during during the whole season as compared with climatologic value

Quality assessment	
Validation against measurements	Bias, accuracy of the season start (shift from actual one, days)
OmF Statistics 1	[give name abbreviation/symbol-Summarize calculation method and/or indicate formula- references]
MODELS/ASSIMILATION	
ECMWF Meteorology, current	A priori constraints/initial conditions/boundary conditions/sensitivity
	Validation Parameter=Result; Procedure/method – ref data (ref)
HIRLAM Meteorology v.7.1	A priori constraints/initial conditions/boundary conditions/sensitivity
	Validation Parameter=Result; Procedure/method – ref data (ref)
CONSISTENCY	
Validation against measurements [>Specify dataset(s)]	[Constraints/Information content]
	[Validation Parameter=Result; Procedure/method – ref data (ref)]

Table 1.4-2 Validation of the individual components of the Pollen Forecast sub-service for North and Central Europe

Validation of the individual components of this sub-service for 2008 spring/summer is on-going, Results will be available at the end of the season. Results for the season of 2007 are available (see Figure 5, results for Stockholm forecast with two different model versions utilising different meteorology inputs).

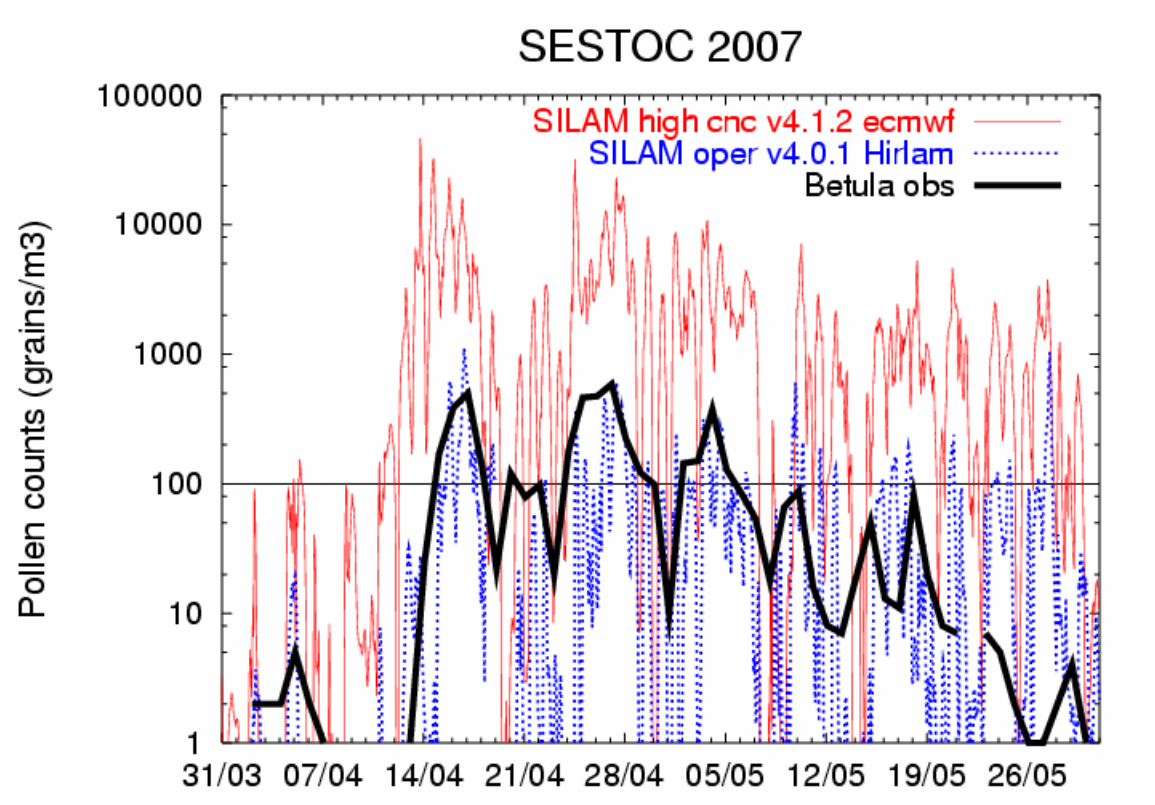
SESTOC 2007
SILAM high cnc v4.1.2 ecmwf
SILAM oper v4.0.1 Hirlam
Betula obs
Pollen counts (grains/m3)
100000
10000
1000
100
10
1
31/03
07/04
14/04
21/04
28/04
05/05
12/05
19/05
26/05

Figure 4

1.4.3 Validation against specifications and against user requirements

[Update/complete section]

[Comment on the specific Phase 2 requirements:]

-Derivation of pollen index

-zooms on specific taxa

-progres in service validation (if not commented in previous sections)

*Requirements written in *Italics* are recommended and not compulsory for Phase 2.

VALIDATION AGAINST SERVICE SPECIFICATIONS			
The service has been provided without delays and its availability was in line with the user expectations.			
VALIDATION AGAINST USER REQUIREMENTS			
SPECIFICATION	**S5** **[do not modify this column]**	**REQUIRED*** **[do not modify this column]**	**ACTUAL** **[Update contents of the fields below; Keep phase 1 info preceeded by a "P1" in case it is different from Pahse 2 info (identified by "P2")]**
Parameters	Birch pollen concentration		
Accuracy	N/A	n.s.	Actual concentrations within a factor of 5
Accuracy minimum	N/A	n.s.	qualitatively correct dispersion pattern, actual concentrations within an order of magnitude from observations
Accuracy target	N/A	n.s.	Actual concentrations within a factor 3-5 for >80% of the cases
Spatial coverage	Phase 1: Central and northern Europe (2007/2008) All Europe (2009)	Europe	Europe

	Phase 2: Europe		
Horizontal resolution	1 km	n.s.	30 km
Vertical resolution	n.s.	n.s.	varying 100 m - 3 km
Grid/Projection	Standard geographical long-lat	n.s.	Standard geographical long-lat
Temporal coverage	54-72 hr	season, forecast for 54-72 hr	season, forecast for 54-72 hr
Temporal resolution	Daily (72 hours forecast in Phase 3)	*Daily*	1 hr
User Interfaces			
PROMOTE Web	n.s.	Complete, operational and up-to-date	Complete, operational and up-to-date
ftp	n.s.	n.s.	Web-based
Data formats and data delivery			
Data availability	Operational data available during spring and summer (flowering season)	during spring and summer (flowering season)	Pictures and site-specific data are available
Data access	Online PROMOTE Web	Online PROMOTE Web	Online PROMOTE & POLLEN Web
Delivery Mode	NRT	*NRT*	NRT
Delivery frequency	At any time of the day with a monthly quality check delivery	Daily new 48 h forecast	Daily, new 54-hr forecast
Data Format	maps	ASCII, PNG	ASCII, PNG
Historical archive	Database of forecasting since Summer 2007	n.s.	2008, on request
Visualization	PNG, animations	PNG, animations	PNG, animations
REMARKS			
Phase 1: A spatial resolution of 1 km indcated in Specifications (S5 Document) is both unfeasible and not needed. 20 Km could be considered as an ambitious target, 30 Km is the current resolution http://pollen.fmi.fi			

Phase 2: [remarks]

*Requirements written in *Italics* are recommended and not compulsory for Phase 2.

Table 1.4-3 Validation against specifications and against user requirements of the North and Central Europe pollen observation and forecast sub-service

1.4.4 Quality assessment and control procedures

[Update/complete section]

Service delivery start date: [Indicate (actual) date from which the Web Page is operational, complete and up-to-date during Phase 2 Service delivery period. If before 1st of March, indicate date or just "Phase 1"]				
SPECIFICATION	**S5** **[Please do not modify this column]**	**REQUIRED*** **[Please do not modify this column]**	**ACTUAL** **[Update contents of the fields below]**	**N checks/Delivery period °** **[Indicate here actual period of service delivery during Phase 2]** **[indicate below number/occurrence (#)and/or frequency(f)]**
Quality checks	Validation at every forecast cycle	Comparison with French sub-service data (once every forecast cycle)	Yes	[# checks, f?]
Product confidence data		n.s.	n.s.	[# checks, f?]
Error bar definition and representation		n.s.	n.s.	[#, f?]
Representation of missing data	Not enabled. The result of the service is model simulations, thus the maps do not have missing values	n.s.	n.s.	[# checks, f?]

Documentation of process failure	Not enabled. The products are delivered in NRT through web interface. However, analysis of the results (for validation and application to health concerns) is done off line so timeliness is not a key parameter.	n.s.	n.s.	[# checks, f?]
Version control mechanisms and representation	Users have detailed description of the operational version, which is then frozen for the entire season. Shorter description is also available from the service Web site.	n.s.	n.s.	[# changes, f?]

*Requirements written in *Italics* are recommended and not compulsory for Phase 2.

°Between 1st March and 30th of May

Only Table 1.4-4 Validation of quality assessment and control procedures for the final product of North and Central Europe pollen observation and forecast sub-service

1.5 References

[Update/complete section]

1.5.1 Electronic references and online data access paths

http://www.enviport.com/cgi-bin/exe.pl?asthma&fr&home&ini&0

http://pollen.fmi.fi

http://silam.fmi.fi

1.5.2 Bibliographic references

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