RETROPOLLEN

Reconstructing four decades of spatio-temporal airborne pollen levels for Belgium to assess the health impact

DURATION	BUDGET
15/12/2019 - 15/03/2024	**830.894 €**

PROJECT DESCRIPTION

Background

Large-scale air pollution enhances the worldwide burden of allergic respiratory diseases Anthropogenic emissions affect both the allergens as the allergic subjects by increasing the immune reaction and by intensified biogenic emissions of allergenic airborne pollen. In Europe, a quarter of the population suffers from pollinosis. While medical management of allergic rhinitis and asthma is feasible, aeroallergen avoidance is usually the most effective approach to reduce symptoms and pollinosis morbidity. Avoidance can be achieved only if the allergenic pollen exposure can be predicted and if the effects on public health are well understood. Forecasting the spatio-temporal distribution of allergenic pollen, however, requires a modelling approach.

Objectives

RETROPOLLEN aims at assessing the public health effects of birch and grass airborne pollen levels in relation to surface air pollution and climate change using up to four decades of historical observations. This will be accomplished by

(i) reconstructing the spatio-temporal distributions of birch and grass airborne pollen using SILAM – operating at RMI - ingesting ECMWF's (European Centre for Medium-Range Weather Forecasts) reanalyzed meteorological datasets and four decades of land-use and land-use change data estimated from the heritage of long time series of vegetation indices derived from satellite remote sensing platforms such as NOAA-AVHRR, VEGETATION, etc.

(ii) compiling and making available historical datasets on airborne allergenic pollen observations (from 1982 on, partner Sciensano), medical data on patients suffering from cardiovascular and respiratory diseases including rhinitis and asthma (~500 patient files from 1998 on, Erasme Hospital-ULB, partner; ~750 patient files from 1989 on, Zeepreventorium De Haan, partner), mortality rates (from 1987 on), surface air pollution data (from 1990 on, IRCEL-CELINE, partner) collected at regional networks, and ECMWF and RMI in-house meteorological data.

(iii) evaluating the impact of co-exposure to pollen biogenic particles with anthropogenic air pollutants and meteorological processes on the allergic population health based on statistical health and epidemiology models (from UHasselt, partner).

Methodology

The baseline of RETROPOLLEN is the use of historical observations carried out and made available by the project partners and datasets that are publicly accessible. These long data series are combined in physical and statistical models that are routinely used by the partners to assess public health effects of allergenic airborne pollen levels in relation to surface air pollution and meteorology using mortality data and clinical data on hospitalized patients.

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Apart from the historical observations the focus is put on applying the transport model SILAM for modelling and forecasting the spatio-temporal distribution of birch and grass airborne pollen levels near the surface for Belgium. This model has recently been set up and designed to operate for Belgium and will ingest ECMWF's reanalyzed meteorological datasets and four decades of land-use and land-use change data estimated from the heritage of long time series of vegetation indices derived from satellite remote sensing platforms such as NOAA-AVHRR and VEGETATION.

Potential impact

RETROPOLLEN is based on the analysis and combination of various datasets of long time series of observations collected at the earliest from 1982 on by the partner scientific institutes of the consortium into statistical and mechanistic models routinely used by the partners.
The ultimate goal is to provide a framework for an information system (website, app) that may alert the general public for possible airborne birch and grass pollen allergy risk episodes 3-days ahead taking into account the contributions of meteorology, air pollution and climate change. An allergy risk index will be developed that considers the combined effect of weather, air pollution and allergenic pollen and climate on public health in Belgium.

Expected outcome

This targeted and feasible research project RETROPOLLEN is expected to generate multiple scientific and social relevant outcomes for Belgium:
* **Compiling historical datasets** on airborne allergenic pollen observations, medical data on patients suffering from cardiovascular and respiratory diseases including rhinitis and asthma, mortality rates, surface air pollution data from regional networks, and ECMWF and in-house meteorological data.
* **Set-up, calibration and validation** of a **transport model** for simulating and forecasting airborne grass and birch pollen near the surface.
* **Estimates** of the effect of air pollution, climate change, allergenic pollen on **mortality rate**.
* Developing of an **allergy risk index** considering the multiple effects from weather, pollen and air pollution and its impacts on public health.
* A **framework** for an information system (website, app) for the public at large.
* **Promoting** the project and its results to different players such as the **scientific research communities, citizens, innovators** and **policymakers**

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LINKS

https://ozone.meteo.be/projects/retropollen