

IMPACT

Improved Meteorological Predictions for Airport Capacity Tuning HSMS 03

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The impact of climate change on Mainport Schiphol is determined largely by the effect that future weather has on the airport operation. Adverse weather good lead to an enormous loss of available airport capacity and, if not foreseen in time, to delays and diversions, resulting in increased costs. In order to reduce the negative effect the weather has on the Schiphol operations, our level of understanding of local weather processes at the airport, both in our present and future climate, needs to be increased. This will be even more urgent when climate adverse weather may occur more often in the future, may be more intense and may change more suddenly. This knowledge should be used to improve the quality of our weather forecasts for the airport and the ability to provide timely weather warnings. These are the main objectives of IMPACT. Knowledge from IMPACT will be used for decision support of the daily airport operation, but can also be used to develop adaptation strategies, for example for environmental planning in the Schiphol area.

1. Schiphol requirements

Schiphol operations are sensitive to adverse weather conditions and sudden changes in:

- Wind: direction, intensity, fluctuations,
- Precipitation: type (snow, hail, rime) and intensity,
- Surface and upper-air temperature,
- Low visibility (fog) and low clouds,
- Thunderstorm, lightning, downbursts.

Flight safety and efficiency during flight operations requires reliable information on these parameters and their changes on local scales, especially when adverse weather may change more suddenly and occur more often and intense in a future climate.

Several users of aviation weather forecasts, such as Schiphol authorities, Air Traffic Control and KLM, are questioning the ability of present forecasting methods to forecast weather extremes for wind, low visibility and heavy precipitations in time and with sufficient accuracy and even more in the perspective of climate change.

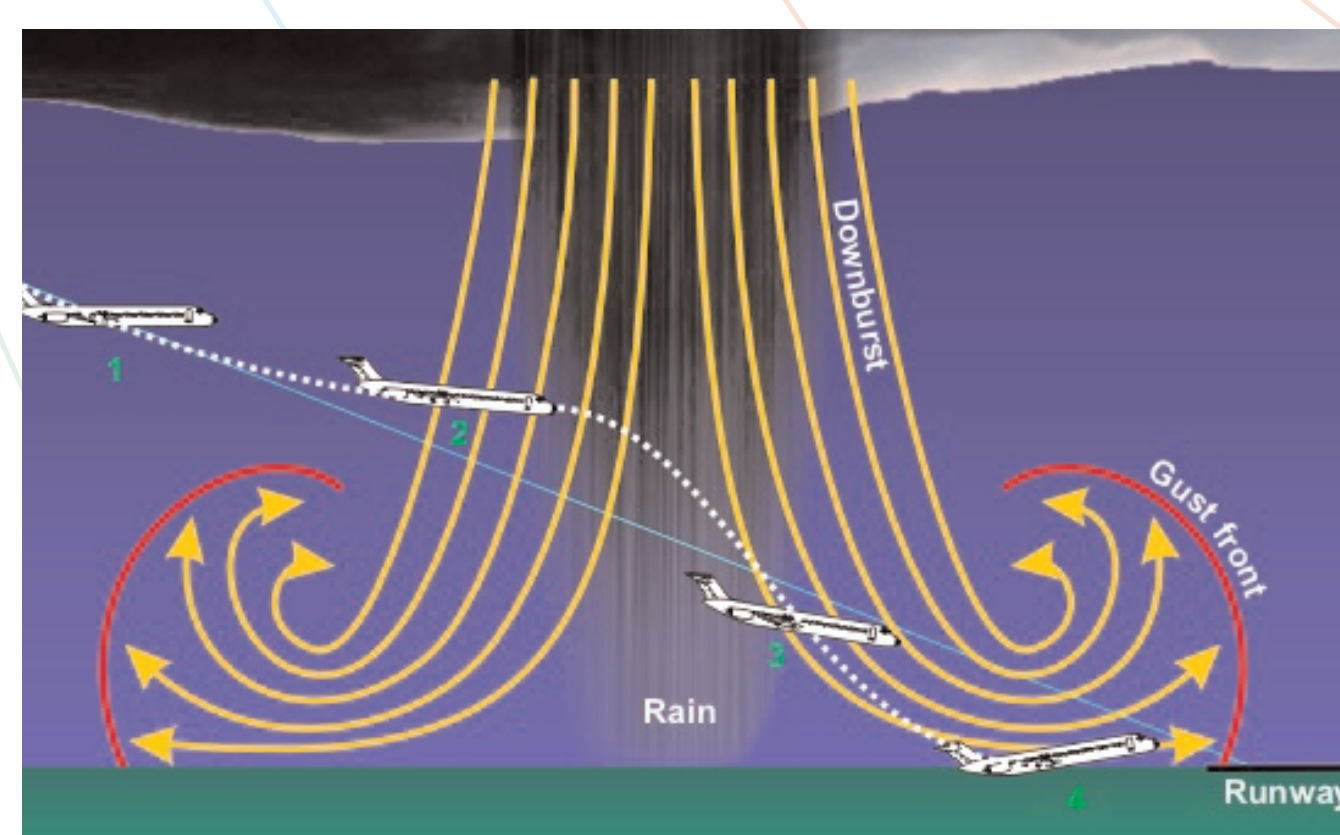


Figure: A rapid change in wind speed and/or direction poses a threat to airplanes during take-off and landing (downburst image).

IMPACT aims to provide answers to these question. New weather forecasting tools and methods, which are better adjusted to the requirements of Schiphol, will be developed for this purpose.

2. Renewing the models

Adequate weather analysis and forecast tools are needed to support the airport operations, but also to better understand how climate change affects the airport operation.

Present-day tools are not suited for this. Their forecasting skills are poor, especially for heavy showers, local winds, fog and low clouds. The shortcomings are due to a coarse model resolution (10-20 km), the hydrostatic model assumption, and a poor physical description of land surface and boundary layer processes in the model.

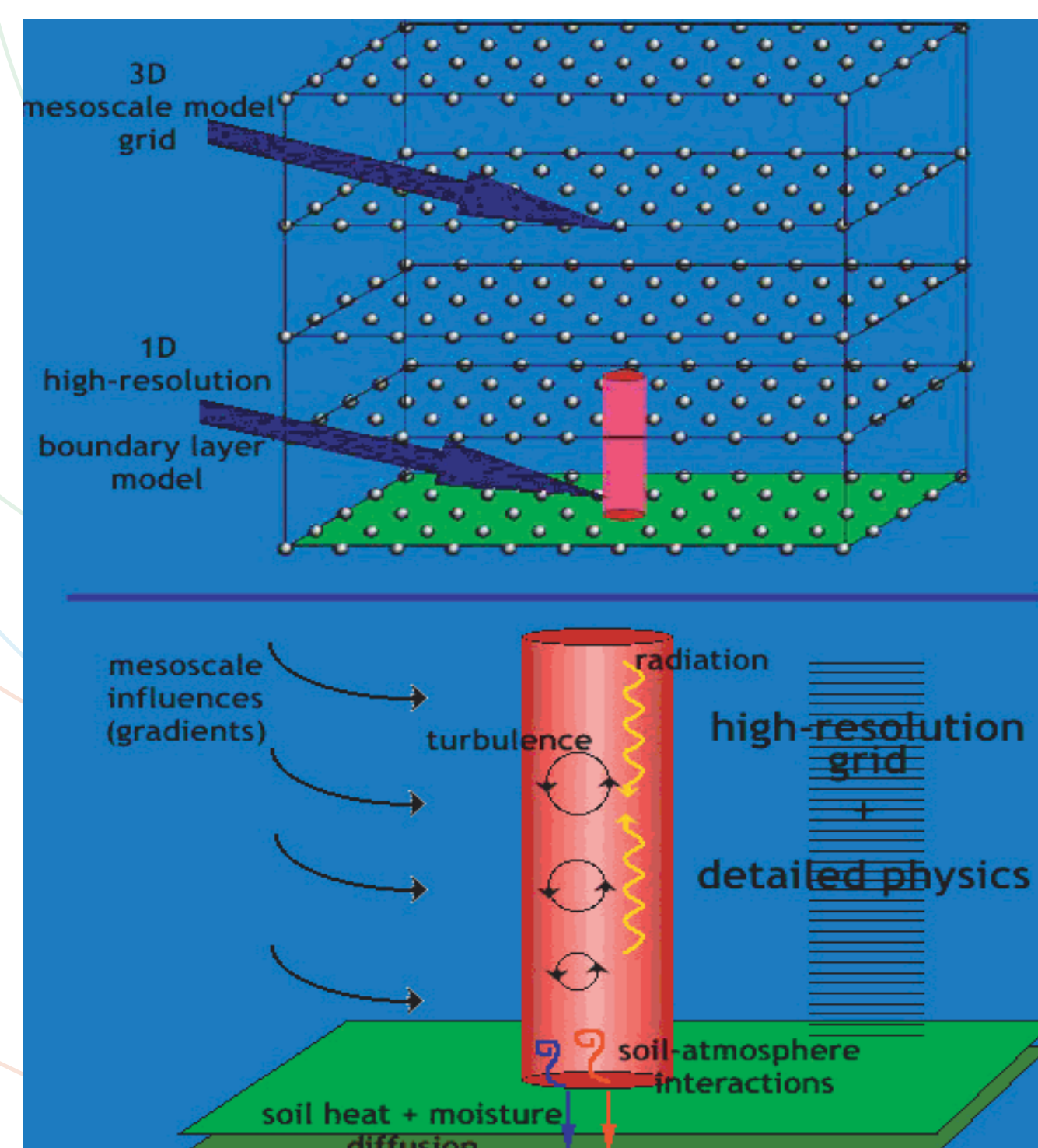


Figure: High-resolution 1D column model nested in 3D model (COBEL image).

IMPACT will contribute to renew model tools and adjust them to the local situation at Schiphol airport. In Phase 1 of IMPACT, a research version of the 3D model HARMONIE will be provided for this purpose, delivering basic weather information on wind, precipitation and clouds on spatial scales of 1-2 km.

This model will be implemented at KNMI and several Dutch universities (Wageningen and Delft) for further research.

Next, an additional 1D column model, named COBEL, will be implemented to provide more specific weather information on fog and low clouds. In the long-terms both models will be integrated.

3. Case studies

The potentials and shortcomings of the new models in real practice at Schiphol airport will be shown to the users by several case-studies. IMPACT Phase 1 will mainly focus on cases concerning the occurrence of fog in relation to land properties, such as land-use, soil-type and vegetation, the intensity of rainfall and local winds related to heavy showers, and the formation of low clouds.

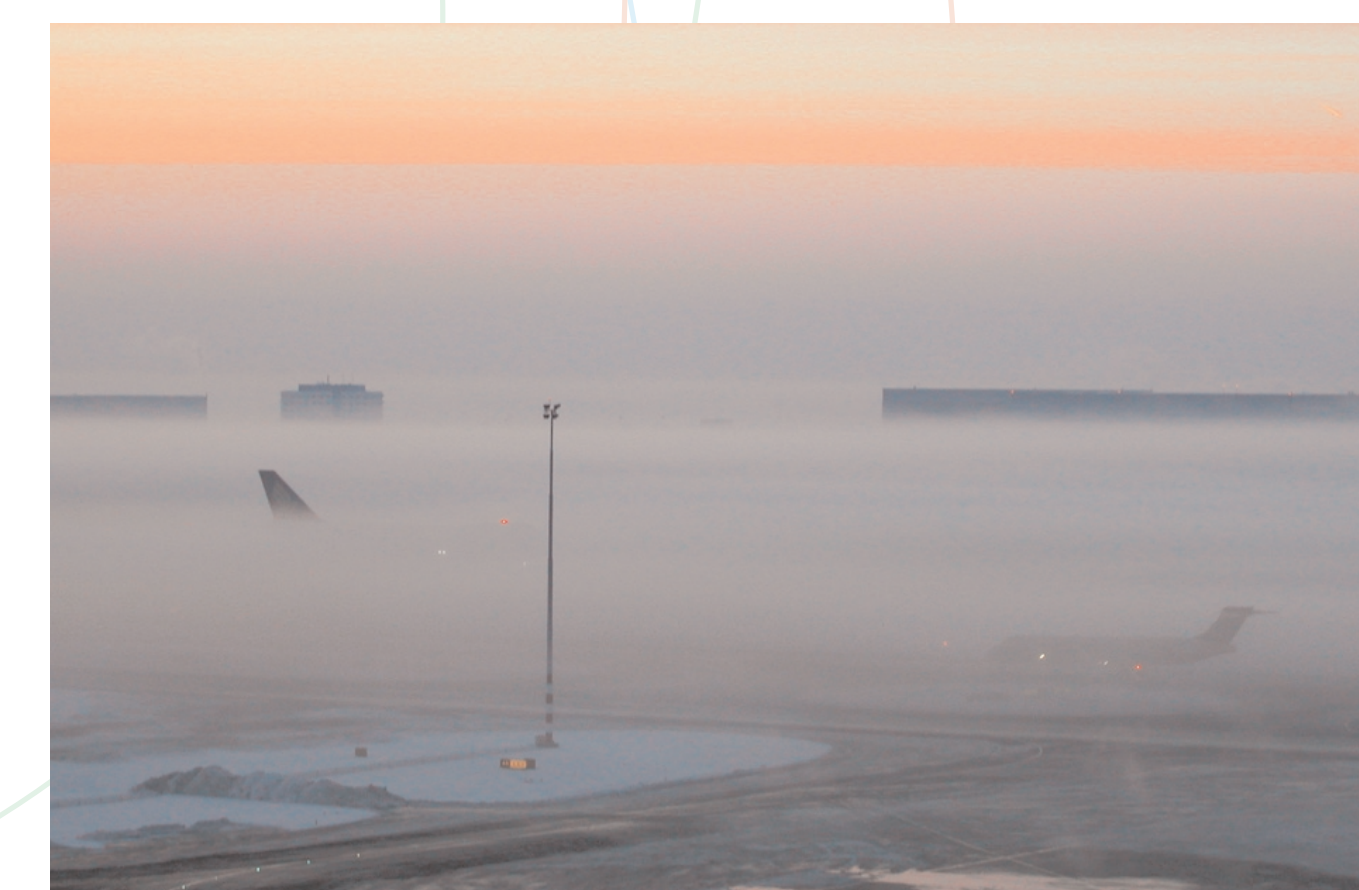


Figure: Early morning fog at Schiphol airport, (photo: Peter de Vries (KNMI)).

4. Adaptation strategies

In follow-on phases the IMPACT models will be used as dynamical downscaling tools. By subjecting the models with large scale future climate conditions, which are produced by climate models, assessments can be made on the climatology of local weather extremes such as fog, low clouds and precipitation amounts.

This knowledge can be used to develop adaptation strategies, for example for spatial planning in the Schiphol area and for infrastructural design and water drainage management at the airport.

**HOTSPOT
SCHIPHOL**