Project Results Summary: CONTRAILS

What results were achieved?

CONTRAILS has produced key innovations at the interface of artificial intelligence (AI) and operational weather forecasting. The focus was on the detection of climate-relevant contrails and the integration of observation data and AI components into weather models. The most important results: (1) **AI-supported detection of contrails** in camera and satellite images with connection to a forecasting framework – crucial for climate-optimised flight routes. (2) **Hybrid AI parameterisation of cloud processes**, for the first time with dynamic integration of observations through online learning. (3) **AI-based forward operator** that realistically integrates satellite observations into the data assimilation and thus improves the forecast quality. (4) **Allsky data assimilation**, which robustly integrates satellite images into the operational process for the first time. This represents a consistent integration of AI into weather forecasting systems – an innovative step for aviation and energy forecasting.

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"With CONTRAILS, we have succeeded to seamlessly integrate artificial intelligence into operational weather forecasting. This strengthens our ability to provide international aviation with precise, climate-relevant data – and to further expand our strategic role in climate-neutral flying."

***Professor Roland Potthast*, PhD**
Head of the Meteorological Analysis & Modelling Department at Deutscher Wetterdienst

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Programm begleitung

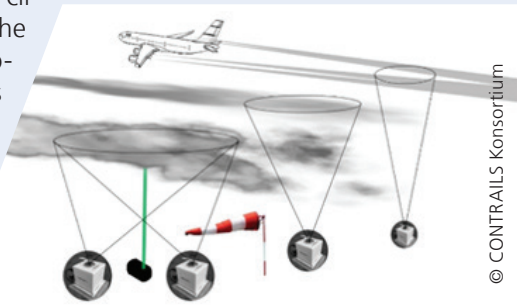
DLR Projektträger

What is the benefit for the industry?

The methods developed in the CONTRAILS project improve the prediction of contrails, cloud cover and radiation processes. This opens up prospects for climate-optimised flight routes and more reliable energy forecasts. The integration of AI into operational weather models significantly increases the quality of forecasts. In addition, the results form the basis for further applications in weather forecasting, such as the use of additional observation systems or the integration of new data sources.

What are further plans after the project ends?

The project results are to be transferred to operational use. This requires consolidation and further development of the code in order to increase performance and robustness. This work will be continued in follow-up projects. The topic of climate-neutral flying is of high strategic relevance for the DWD. Providing international aviation with meteorological data and services is one of its core tasks – and is becoming increasingly important in view of growing scientific and regulatory requirements.



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5 Partners

Germany:
Deutscher Wetterdienst (DWD) (German consortium leader)
Xelera Technologies

France:
Laboratoire atmosphères, milieux, observations spatiales (French consortium leader)
Thales Research & Technology
Reuniwatt SAS

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