

The graphic features a green-to-blue gradient background. On the left, a large globe shows North America with yellow wavy arrows pointing upwards from the continent. A white airplane flies above the globe. On the right, a smaller globe shows Europe with a white airplane flying in front of it. The bottom right corner has stylized green plants. The text is centered in white.

ICAO Symposium on Non-CO₂ Aviation Emissions

16 — 18 September 2024
Montréal, Canada

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ICAO non-CO₂ symposium - Sept 17th 2024 philippe.masson@airbus.com

Speaker

Session 3: Mitigating Non-CO₂ Aviation Emissions –
What is possible
Part II - Innovative Operations

CICONIA objectives 2023 - 2026

CICONIA gathers **scientists and operators**, to design non-CO2 mitigation operations and evaluate their benefits and costs

1- Design **weather forecasting service** useable for operational decisions (level of confidence),

2- Design a **climate meteorological service** for operations, evaluating climate sensitive areas and impact of trajectories (balanced CO2/non-CO2),

3- **Evaluate the potential of different Concepts of Operations** during flight planning up to flight execution phases (Airline led decisions, NM and ANSP decisions), with simulations and flight trials.



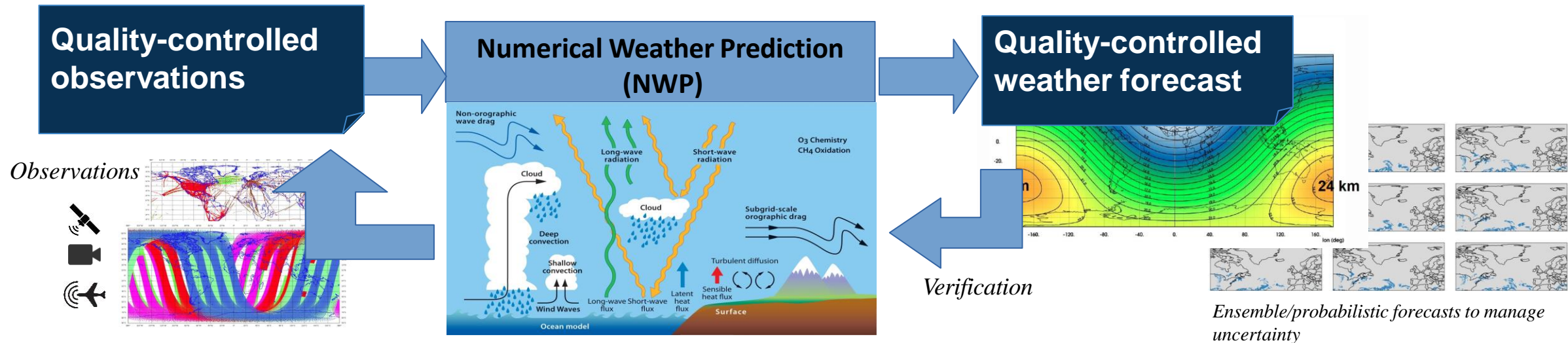
founding members



Project funded by



1. Design quality controlled weather forecast



Observations:

- Aircraft measurements IAGOS, AIRBUS (humidity)
- Pilot observation reports with AIR FRANCE COOP extension
- Lidars and ground cameras ONERA, Meteo-France, EUROCONTROL, IMPERIAL

Assess and improve ISSR forecasts with level of confidence

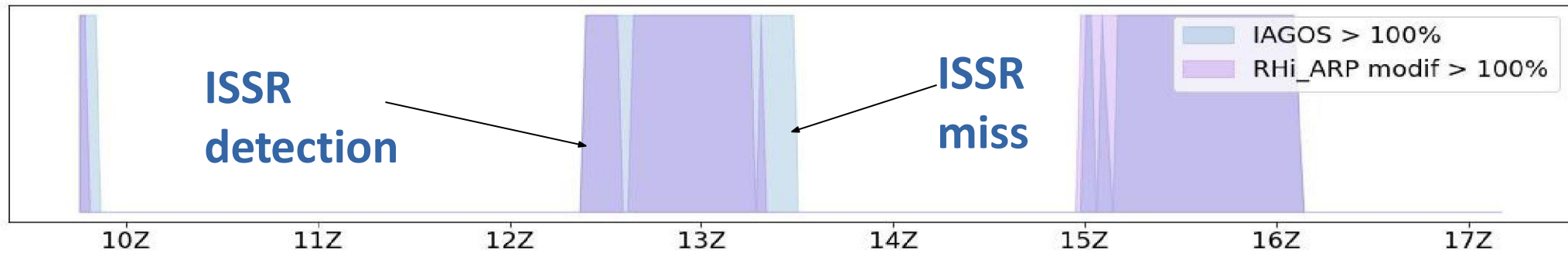
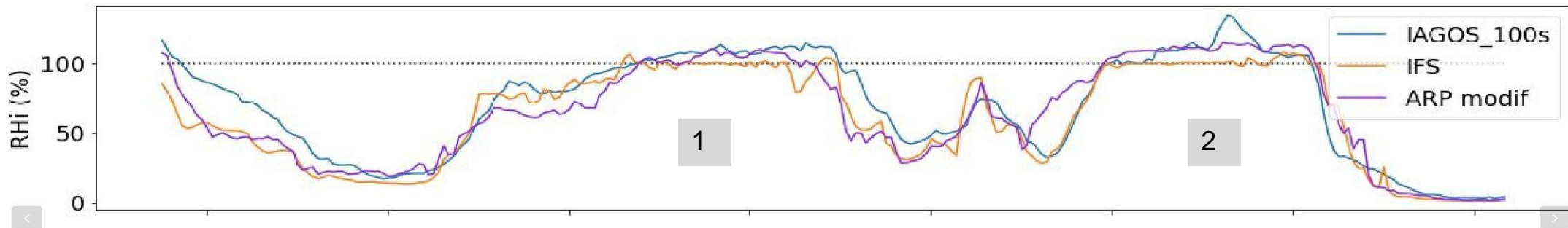
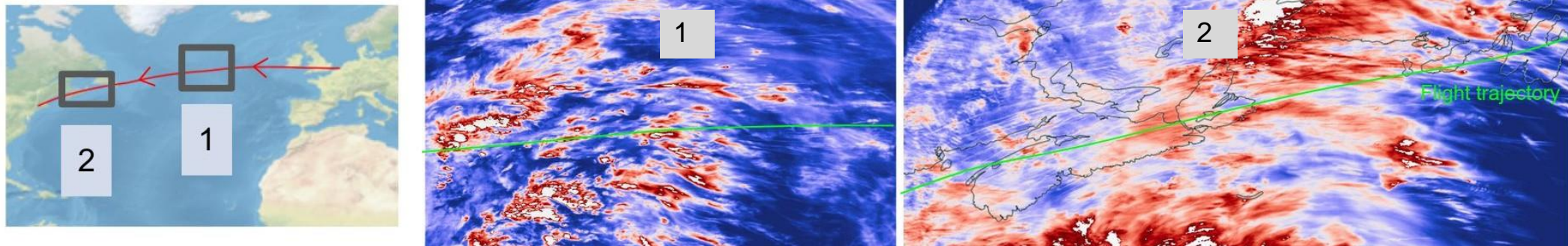
- ARPEGE NWP model enhancement (up to 48h forecast)
- Development of quality-control method for NWP models, benchmarking models

Deliver Meteo data with Level of confidence for simulation and trials (WIMCOT)

1.1 ARPEGE ISSR forecasting initial results

Preliminary results: a case study – Transatlantic IAGOS flight 23th July 2023

Satellite Imagery: Suomi NPP *Cirrus Reflectance*

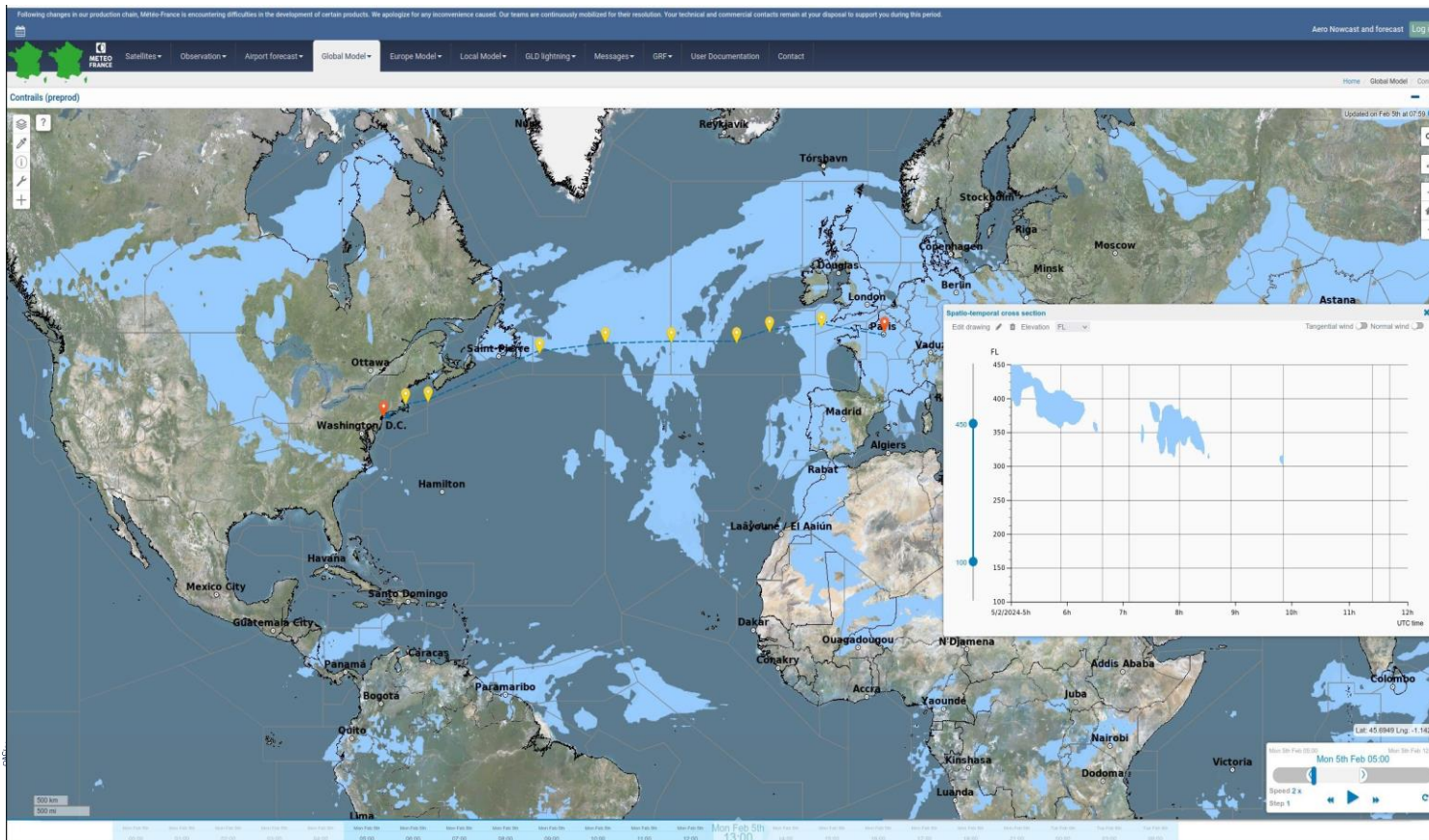


1.2 Weather forecasting service WIMCOT and validation

WIMCOT tool provides forecast of areas favorable to persistent contrails formation (ISSR + SAc) with a criteria on likelihood based on Ensemble Forecast NWP (ECMWF-EPS, ARPEGE-EPS)

Validation with pilot observations in COOP (July 2022-Nov 2023)

First results on 1566 observations (ground and flight observations from COOP, nearest run)



	OBS	COTRA	NO COTRA
MOD			
COTRA		tp 168	fp 60
NO COTRA		fn 46	tn 1292

Contingency table

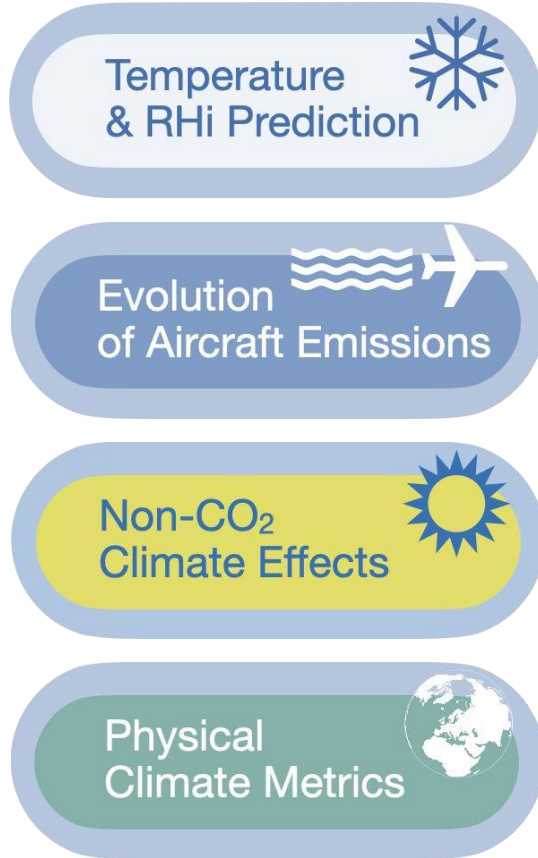
Hit Rate : 78.5%

FA_obs : 4.4%

FA_forecast : 26.3%

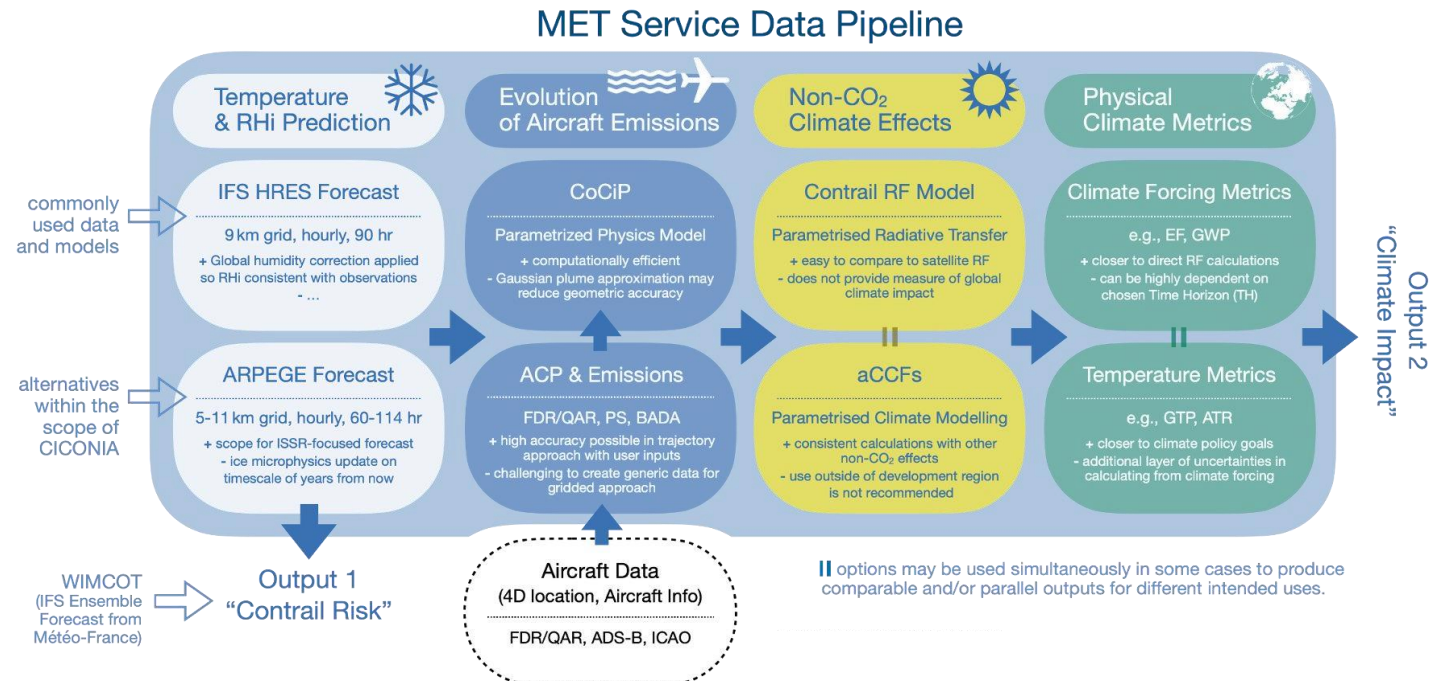
Accuracy : 93.2%

2. Provision of a Climate MET service



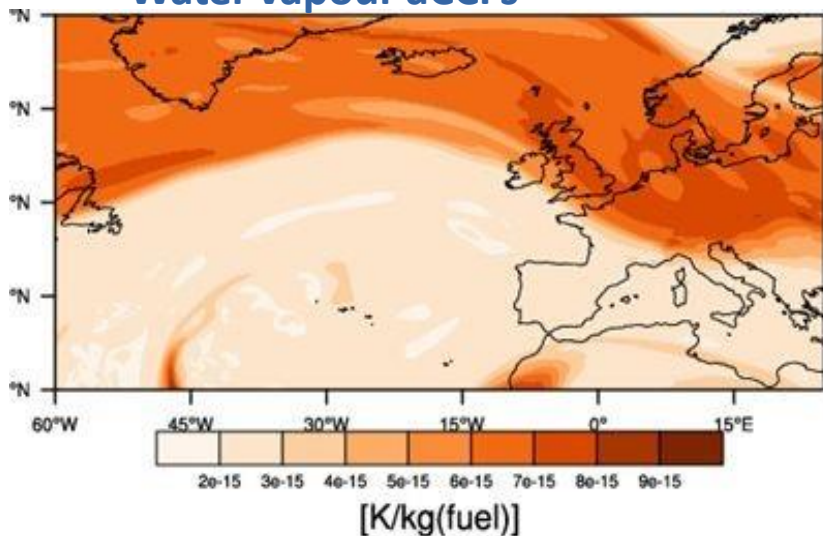
Climate MET service architecture

- integrable in Airlines and ANSPs processes with stable interfaces
- flexible to integrate further evolutions of models

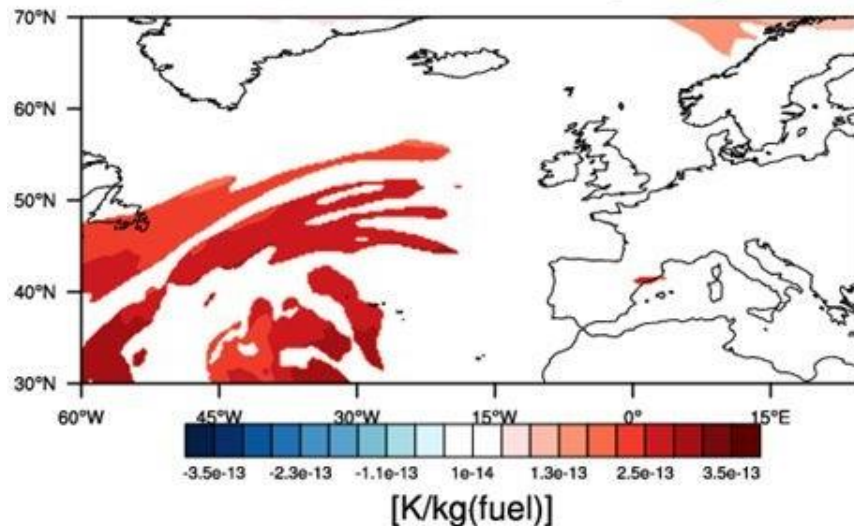
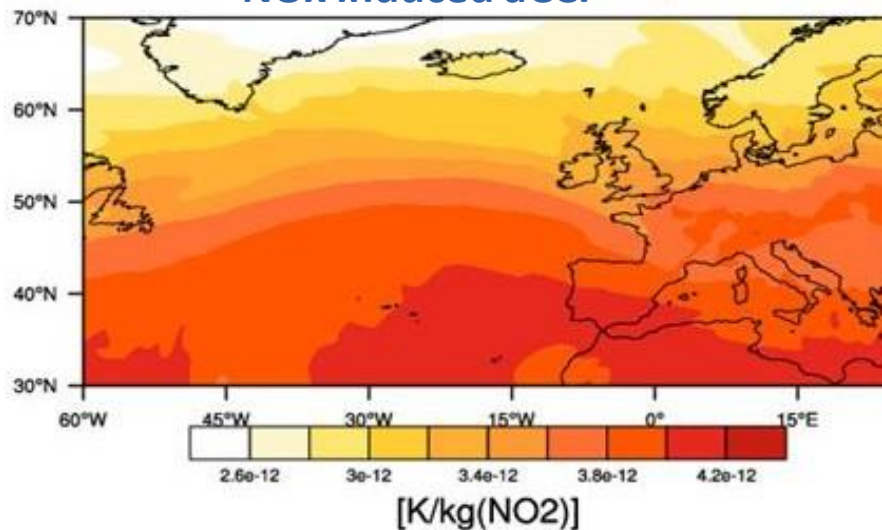


2.1 An example with aCCF

Water vapour aCCFs




NOx induced aCCF




Night-time contrail aCCF

Temperature & RHi Prediction 

Evolution of Aircraft Emissions 

Non-CO₂ Climate Effects 

Physical Climate Metrics 

CLIMaCCF
python library

Dietmüller et al. (2023)



3. CONOPS options under evaluation

1. Short haul, airline led



For Short flights, the forecast service is envisaged sufficiently stable to optimise during flight planning

2. Long haul, airline led



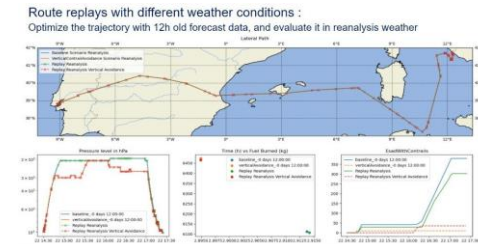
For long haul flights, the MET conditions might evolve during the flight and the airline operation centre may propose climate flight optimisation during the flight

3. ANSP led



Additionally, the climate MET forecast can enable network optimizations in pre-tactical, and provide ANSPs with a capability to propose optimised trajectory options

3. Validation with simulations and trials

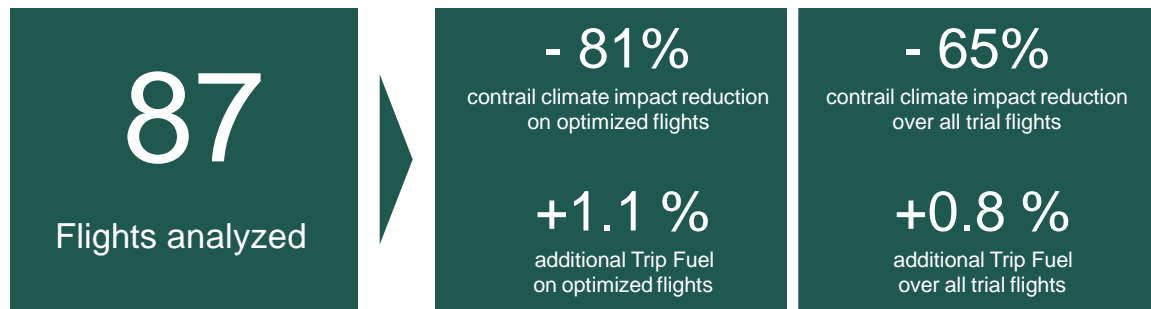


More than 10 operational partners will lead Flight test, Air Traffic controllers simulations, and network impact simulations

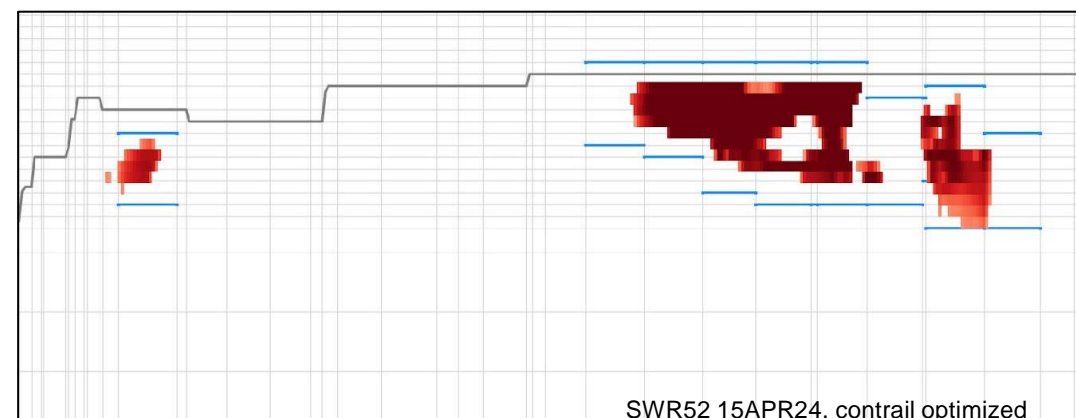
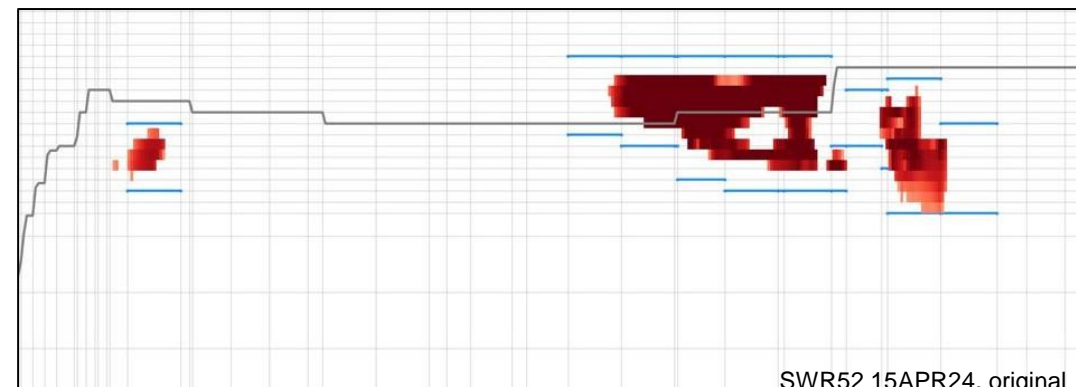
- Exercises just started and will ramp up in 2025.
- More figures about CONOPS evaluations to come



3.1 SWISS exercises preliminary results



5 Flights (LX17 - LX18 - LX23 - LX52 - LX87) in MAR24



Conclusions (intermediate results, quantified figures to come)

CICONIA believes that Airline led trajectory optimization is the most promising short term approach, based on reliable forecast tools, and on the consideration that the most anticipated trajectory is the easiest to integrate for ATC,

The collaboration between individual airlines optimizing their flight, and the Network level, addressing the possible congestions mitigation will be key,

But, when weather condition changes compared to flight planning hypothesis (at a pace that is not so well understood), provision for inflight re-routings has to be considered, involving a more complex collaborative decision making between Pilots and ATC, Airline Operational Centres, with Network considerations.

a Climate MET service is needed, capable of providing the level of quality of the information, to enable climate efficient operational decisions

CICONIA

more info:

- <https://www.sesarju.eu/projects/CICONIA>
- Join our Stakeholders Outreach Body!
- Visit us today on the SESAR or AIRBUS booth