

MAPPING EUROPE'S AVIATION ENERGY TRANSITION WITH OPENSky

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Departures from the 165
airports, Oct 2024 – Sept 2025

46.5 Mt

Of departure fuel over twelve
months

98.8%

Exact origin airport attributed
using the methodology

158 / 165

Airports at within 95% of the
fuel consumption estimates
based on ADRR

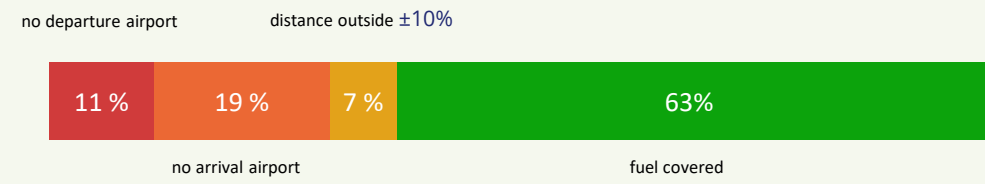
INTRODUCTION

ReFuelEU Aviation regulation sets minimum sustainable aviation fuel (SAF) share requirements on the fuel supplied to flights departing European Union airports: 2% in 2025, 6% in 2030, 20% in 2035.

How much fuel departs from each airport? What will be the fuel demand at the airport level by 2035?

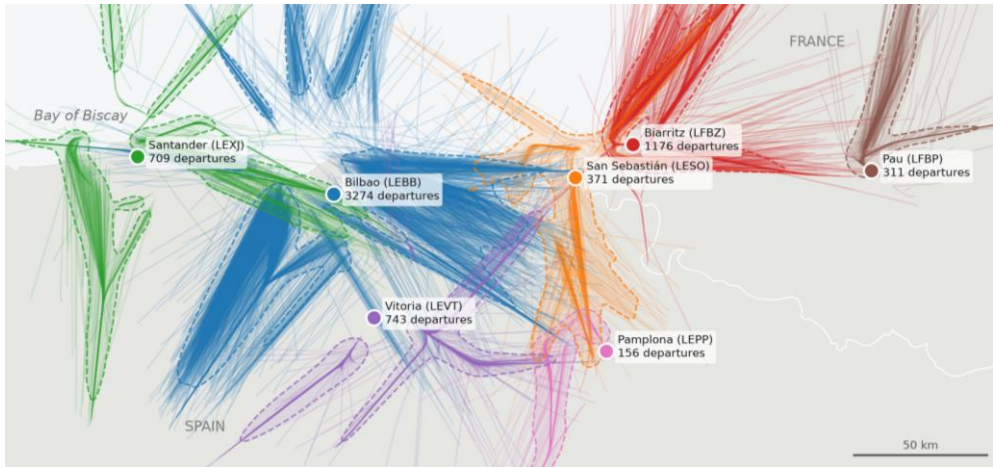
Existing studies rely on closed data, but can an independent, reproducible estimate be built from open-source data?

WHY THE RAW DATA IS NOT ENOUGH



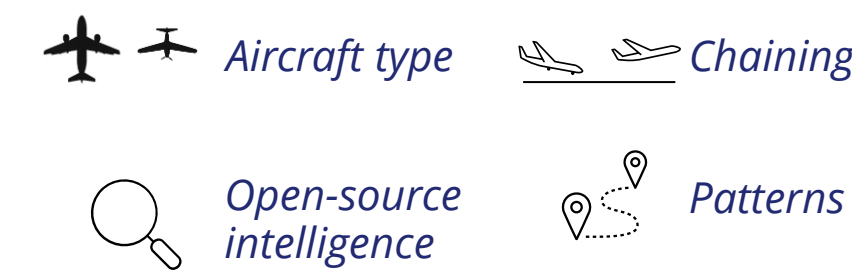
OpenSky's own departure and arrival data recover **only 63% of the fuel consumption estimates**: one flight track out of nine has no departure airport, one out of five no arrival, and a quarter of the remaining distances are off by more than 10%. There is strong heterogeneity in the data: half of the airports have more than 92% correctly identified departures, a quarter of airports have fewer than 23%.

The Basque Cluster: attribution of departure airports using flight paths (over July and August 2025)

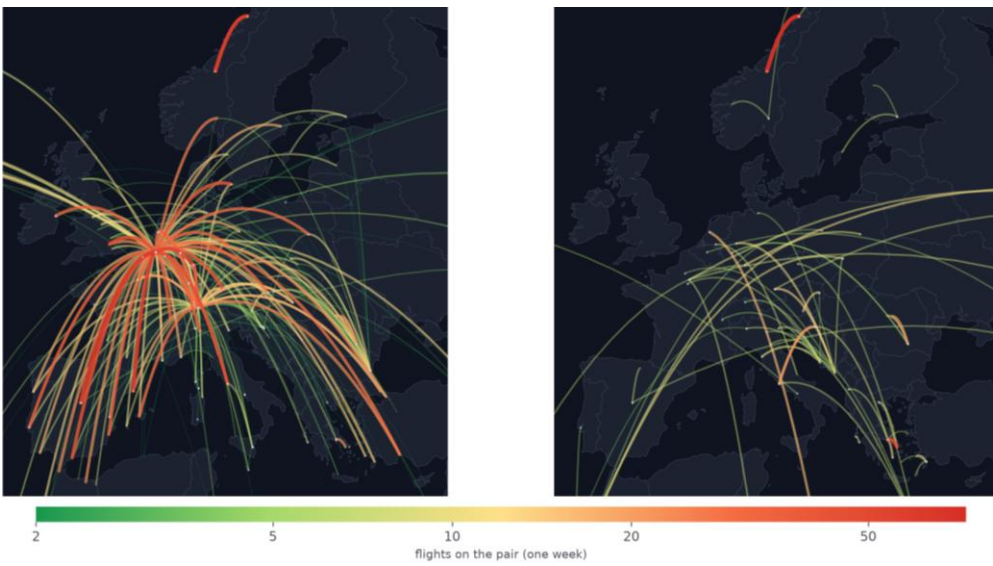


Geometric analysis allows for the identification of departure and arrival airports.

ADDITIONAL VARIABLES OF INTEREST



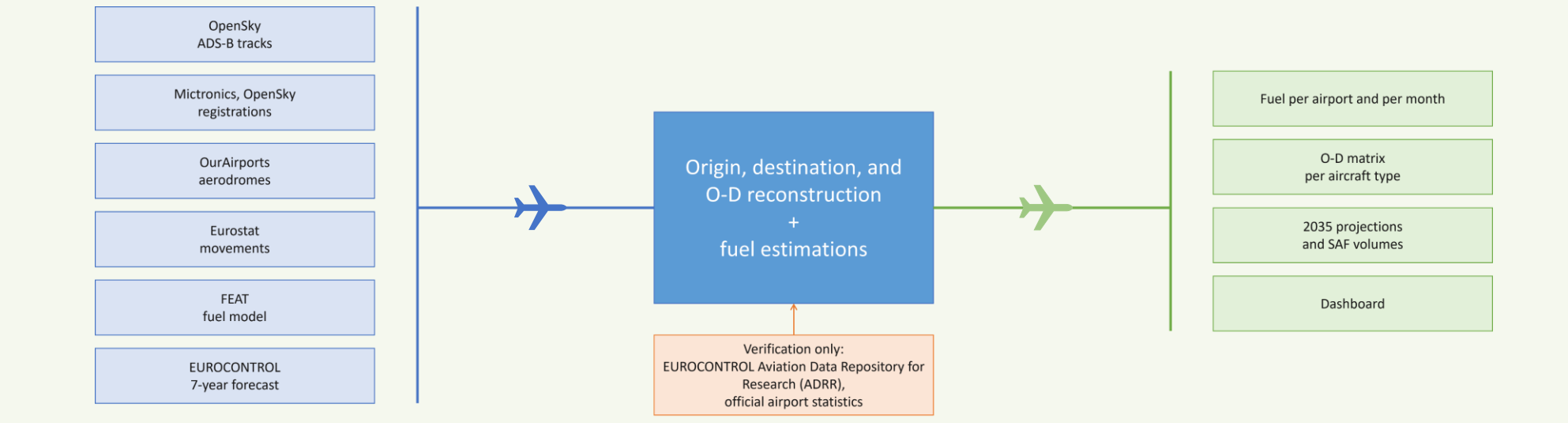
Pre- and post-correction: origin-destination pairs with an error in distance estimations (shown in red) ($\pm 10\%$ of the ADRR)



VERIFICATION

Verification is done using EUROCONTROL ADRR and Eurostat air traffic movement bounds. When available, estimations were audited against official airport statistics.

METHODOLOGY

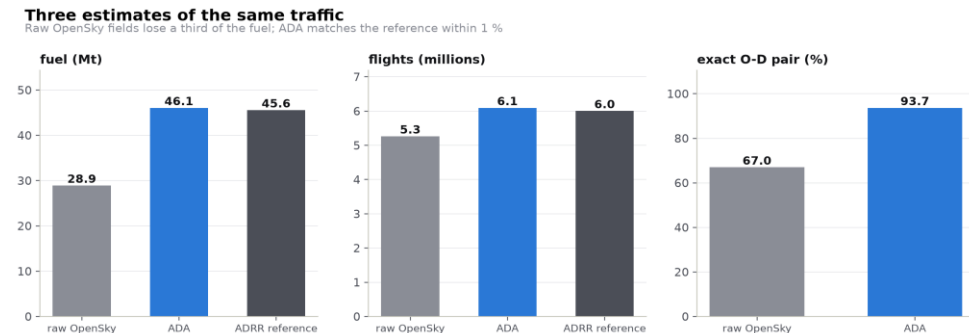


ORIGIN, DESTINATION, O-D ATTRIBUTION

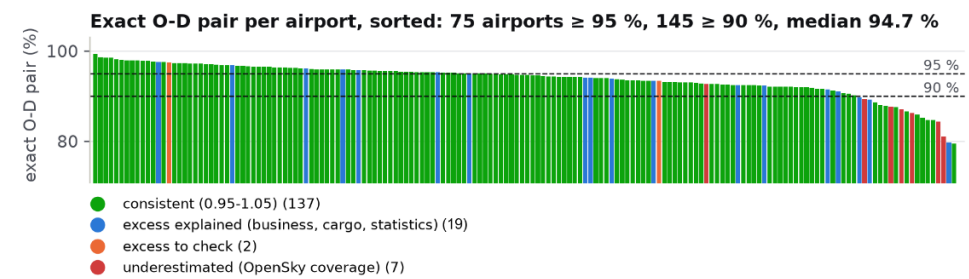


OpenSky tracks are cut into flights, and the *origin airport* is assigned as the aerodrome near the first point or are assigned using fallbacks such as: back-projected from the altitude, heading, a learnt climb profile, or callsigns. The *destination airport* comes from an observed landing, ground chaining, or a callsign consensus. The FEAT model is applied to estimate the fuel, with a floor track for the minimum distance traveled and a directional imputation for flights that are lost without destination.

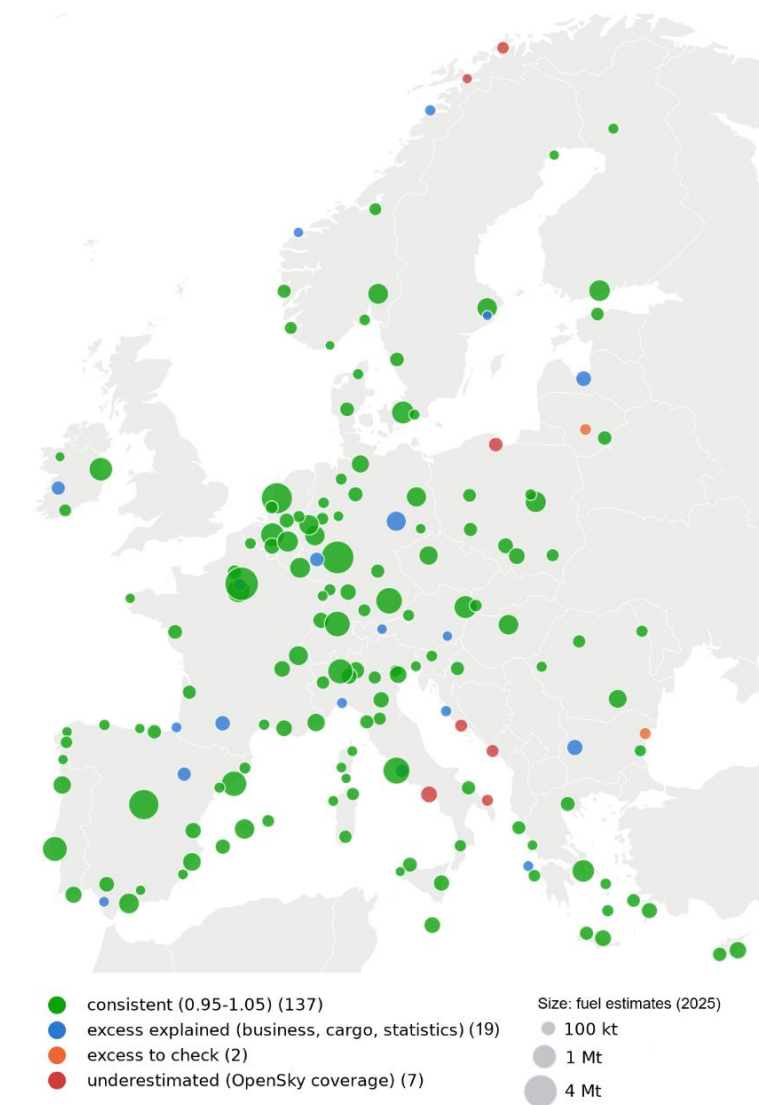
RESULTS: O, D, and O-D ATTRIBUTION



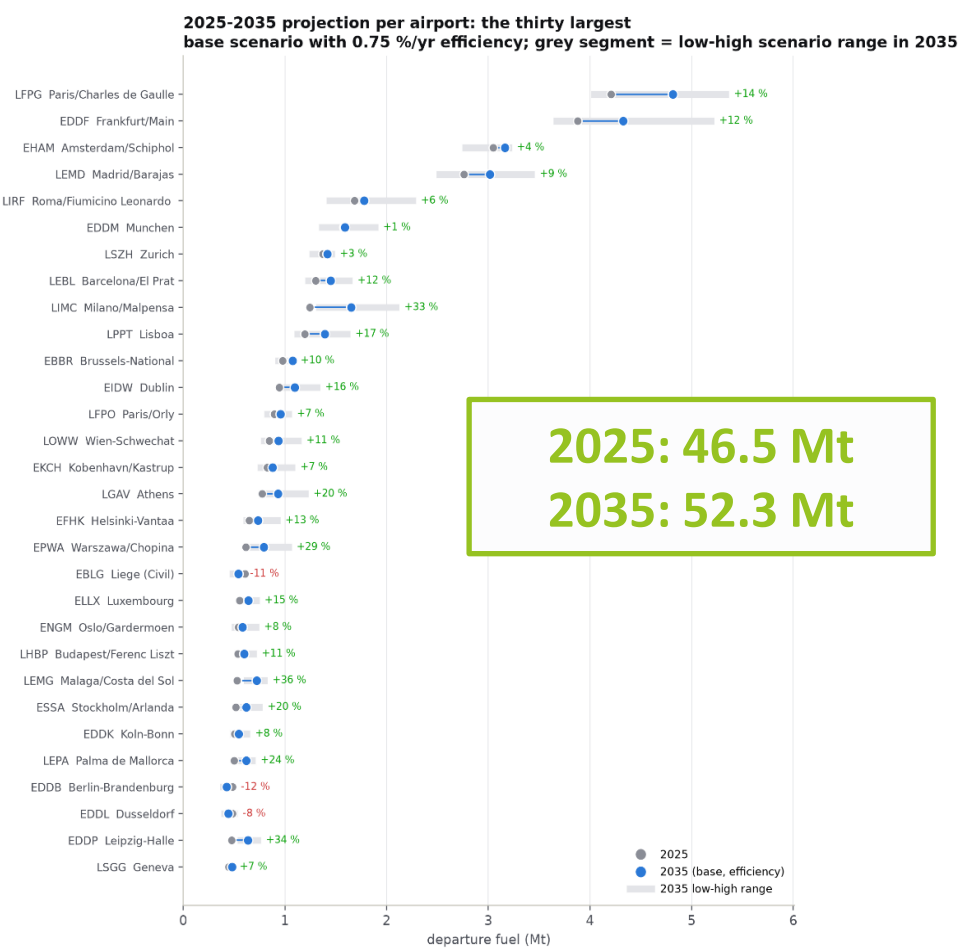
Accuracy holds across the 165 airports, not only on average



The origin, departure, and O-D attribution method **correctly assigned 97.6% of flights** to within $\pm 10\%$ of the actual distance traveled. Per airport, the percentage of the **exact O-D pair identified exceeds 90% at 145 airports out of 165**.



RESULTS: FUEL AND SAF PROJECTIONS



TAKE-AWAYS & FUTURE STEPS

Open data is enough. Outputs of the model can be validated against official airport statistics.

The reference is not always the truth. ADRR does not account for all flights: business and cargo are underestimated.

The methods used and data produced are important diagnostic and prognostic tools for future planning and policy

