

CALIBSUN



NEXT

## Backtests

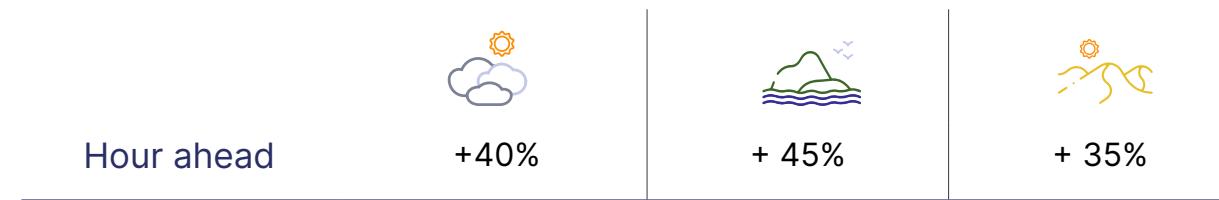
Deterministic forecast  
Intra-day + Day ahead



## Executive summary

- CalibSun is realizing backtests on BSRN meteorological stations to assess the performance of solar forecasts across different climates
- CalibSun forecasting algorithms are trained on 2022 data, and 2023 GHI forecasts are compared with 2023 GHI actual measurements
- **NEXT Access** uses as inputs NWP forecasts (GFS, Arpege...) and Satellite images (MSG, Himawari, Goes), while **NEXT Advanced** also considers Real-time GHI measurement
- NEXT forecasts are then benchmarked with other common forecasting models to qualify their adding value:

### NEXT Advanced vs. GFS (% of RMSE improvement)



✓ NEXT Advanced is always beating reference models across all horizons and on every type of climate

✓ Intraday forecast accuracy strongly benefits from on-site real-time measurements

*NEXT Advanced vs. NEXT Access : RMSE improvement up to 40% for hour ahead forecasts based on on-site real-time measurements*

ASSESS OUR PERFORMANCE  
IN 2 WEEKS



Share with us 2 years of historical data and assess NEXT Advanced

## Backtest methodology

### 1.

#### Measurement dataset

BSRN meteorological stations

Accessible & high quality data

Spread worldwide &  
across all climate

Replicable & transparent

→ Other stations coming soon

### 2.

#### Quality-check

Based on **IEA PVPS**

**Task 16 data quality control**  
handbook recommendations

### 3.

#### Backtest / hindcast

2022 training year  
**simulation run on 2023**

✓ Intraday backtest

resolution: 15 min / horizon: 6h

✓ Day-ahead backtest

resolution: 1h / horizon: 48h

### 4.

#### KPIs

RMSE

Deterministic stats plot  
per horizon for each station

No night values

Quality-check flagged values removed

→ Additional KPIs  
available on demand  
(deterministic & probabilistic)

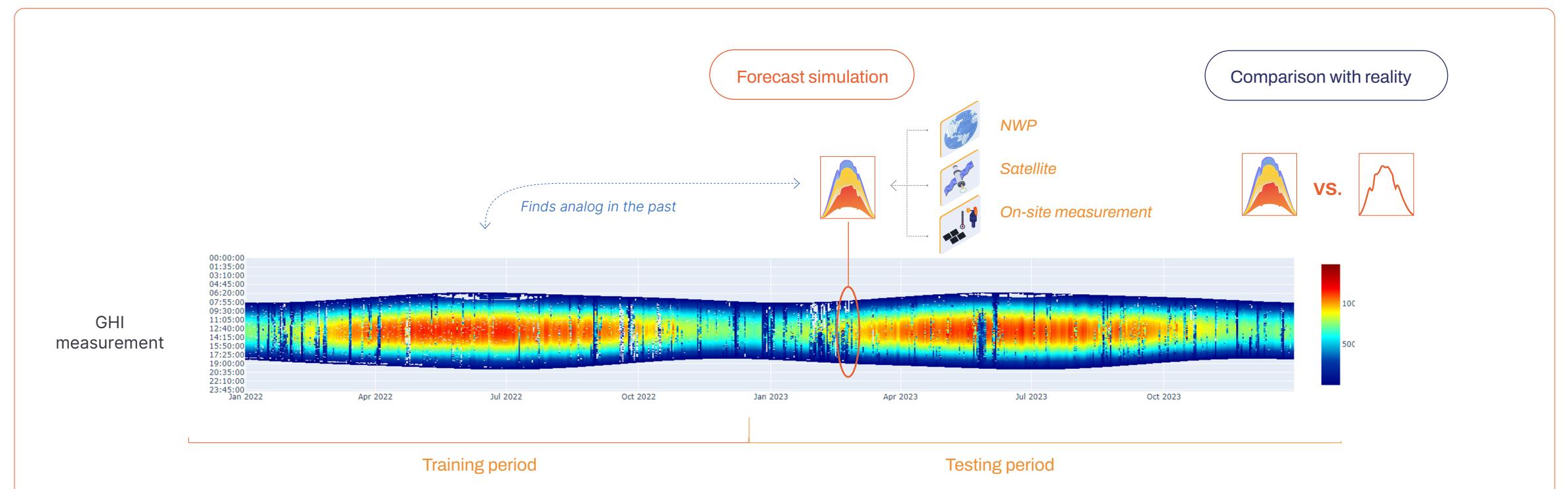
### 5.

#### Comparison with baseline

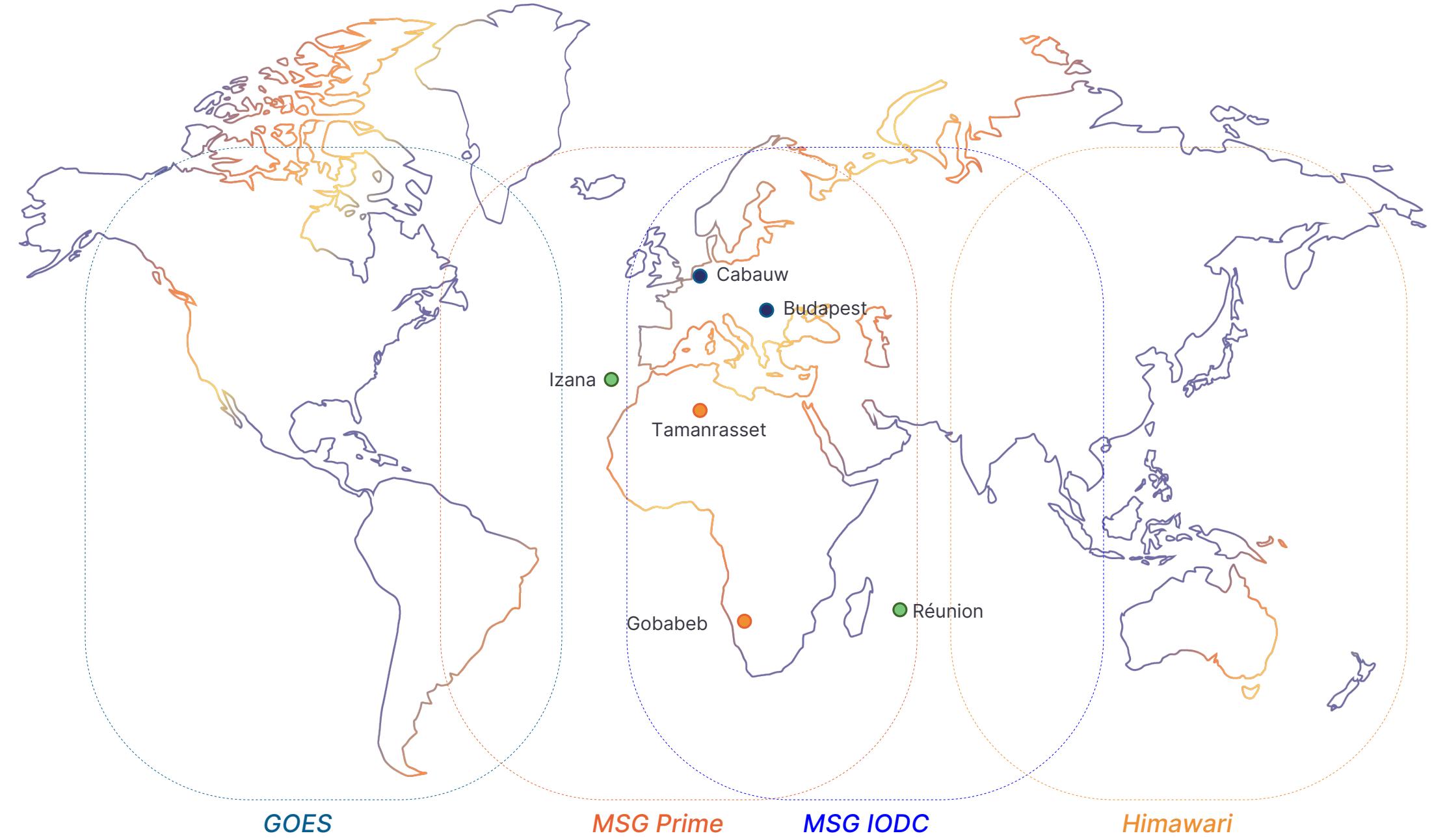
**NEXT Access & NEXT Advanced**  
compared to reference models:

- GFS
- Persistence

→ Other models coming soon



## Measurement data from BSRN stations

 Budapest  
Cabauw Tamanrasset  
Gobabeb Réunion  
Izana

## Forecast models tested Deterministic forecasts



*Model target:* Satellite based GHI estimation

*Inputs:*

- NWP forecasts (GFS, Arpege...)
- Satellite (MSG, Himawari, GOES)
- Solar geometry (SG2)

&



*Model target:* Real-time on-site GHI measurement

*Inputs:*

- NWP forecasts (GFS, Arpege...)
- Satellite (MSG, Himawari, GOES)
- Solar geometry (SG2)
- Measurements

Compared to

### Meteo only

Forecast value for each horizon is GFS model  
DSWRF interpolated value

*Inputs:*

- NWP forecasts from GFS

&

### Smart persistence

Maintaining constant cloud cover over time.

$$\forall k \in [1, n], K_c(t+k*dt) = K_c(t)$$

*Inputs:*

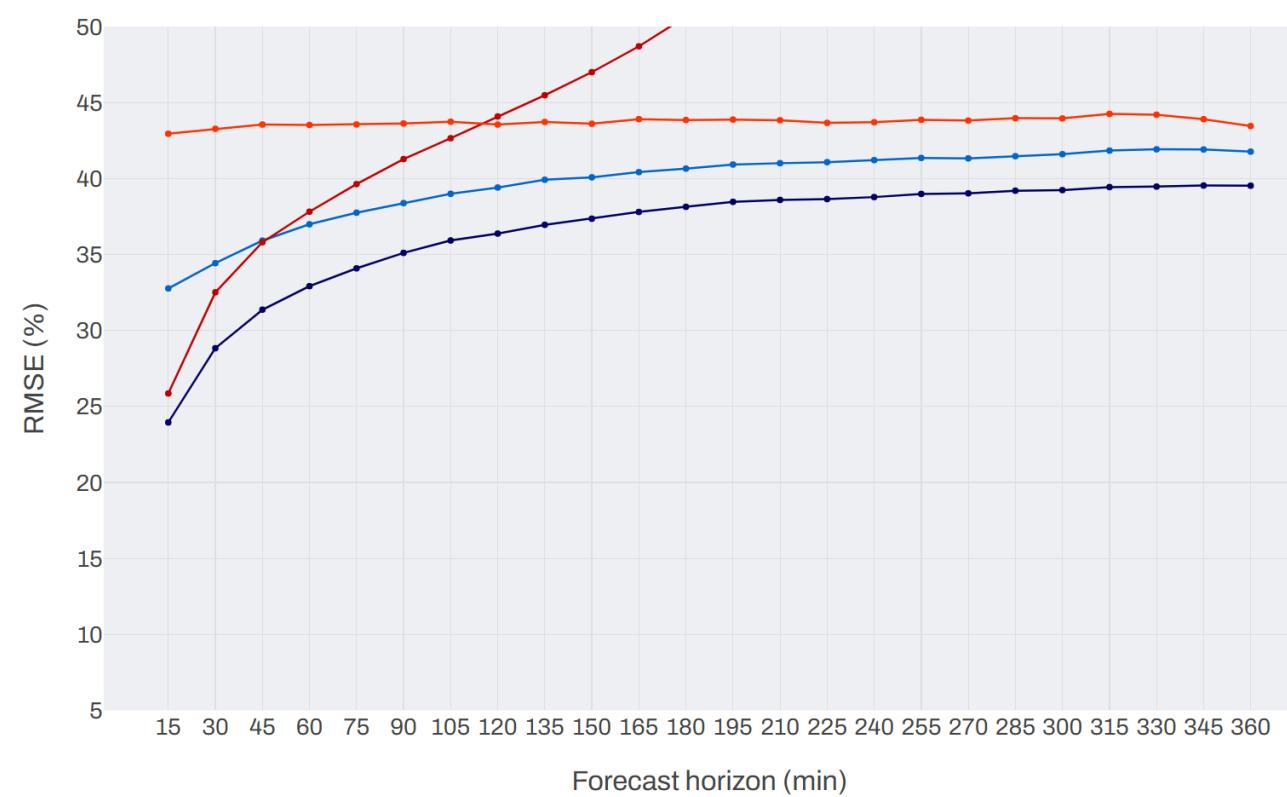
- Measurements
- Solar geometry (SG2)



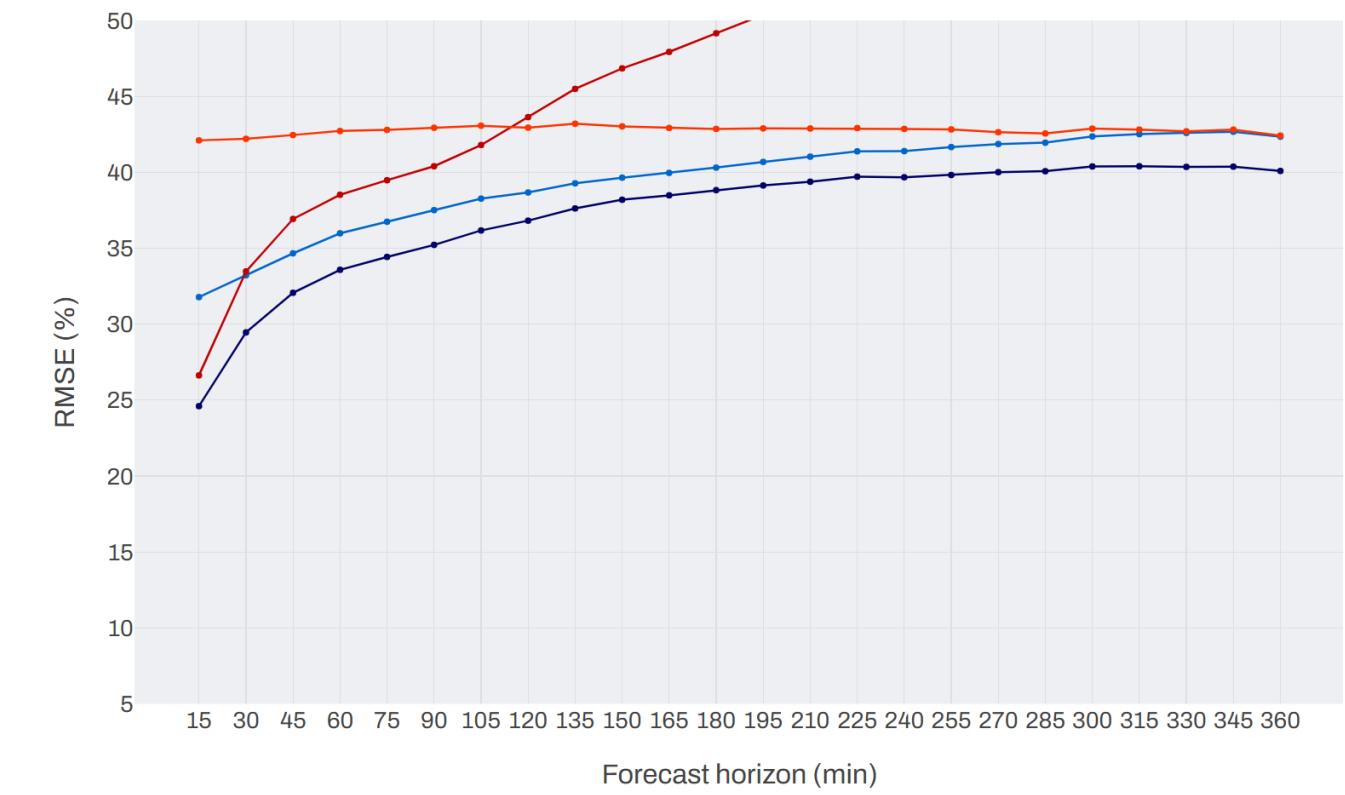
## Results

Intra-Day – 6 h / 15 minutes frequency  
RMSE [%] per forecast horizon

Cabauw



Budapest





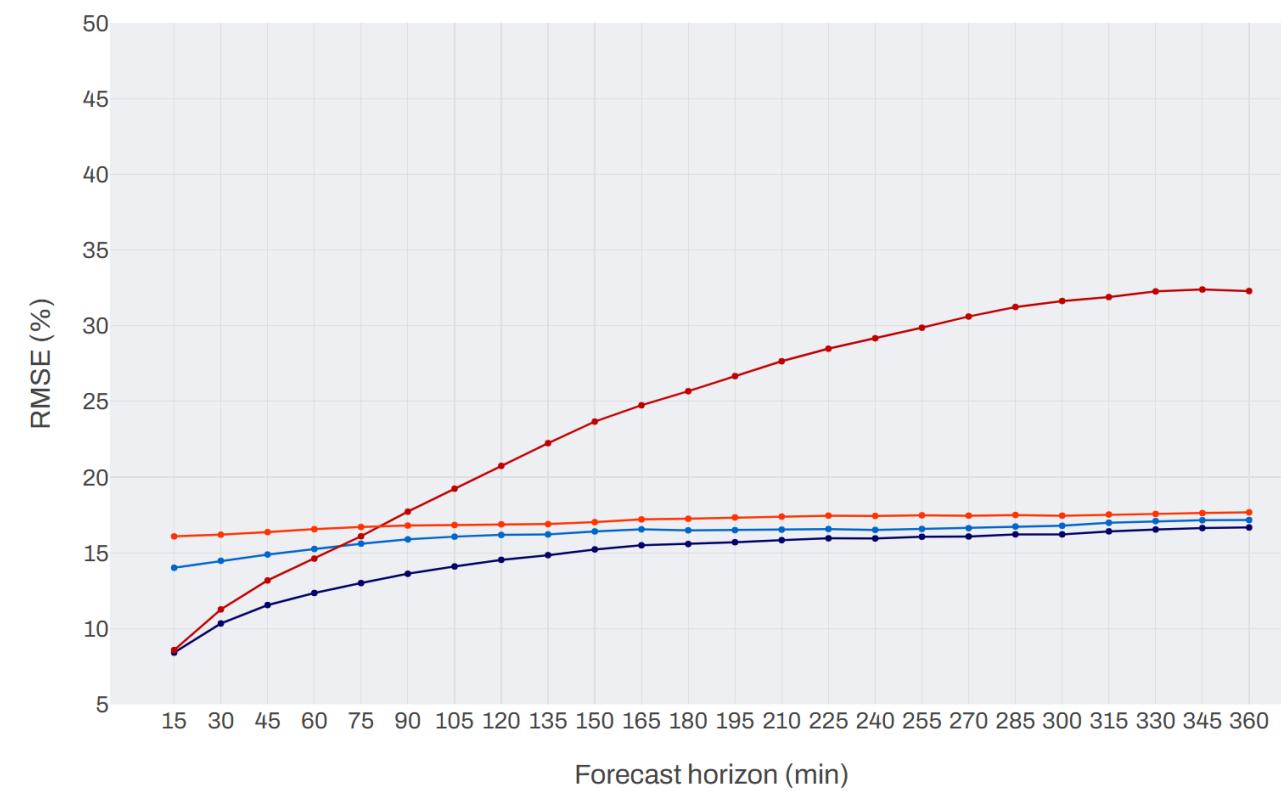
## Results

Intra-Day – 6 h / 15 minutes frequency

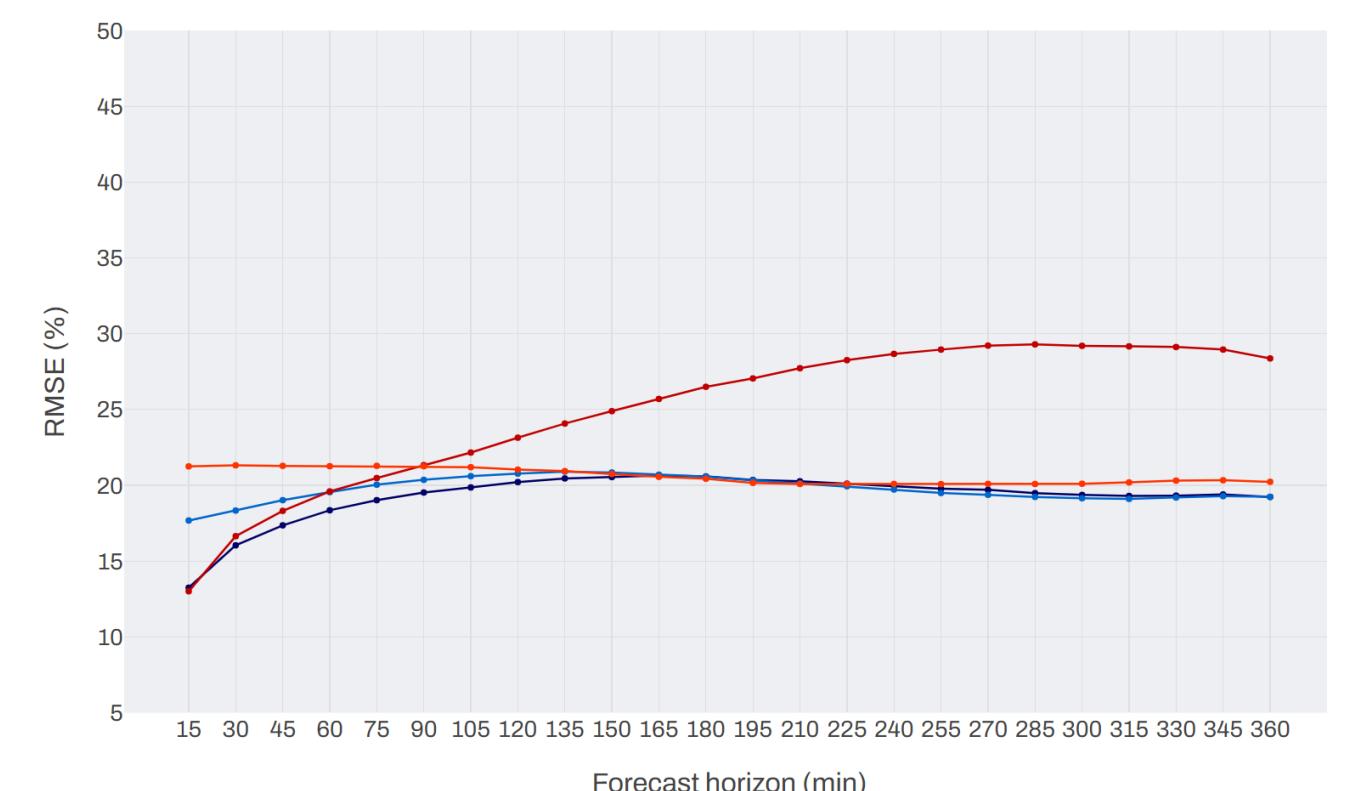
RMSE [%] per forecast horizon

- NEXT ADVANCED
- NEXT ACCESS
- Persistence
- GFS only

Gobabeb



Tamanrasset



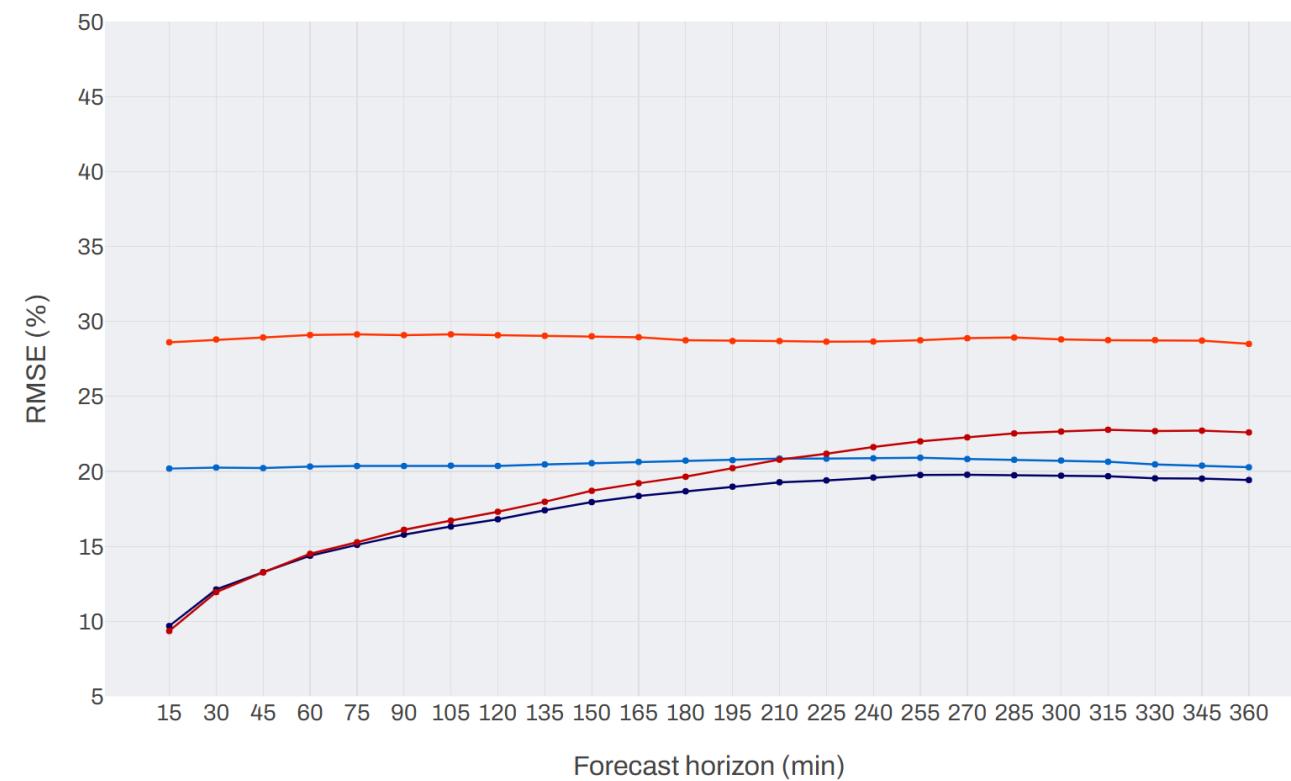


## Results

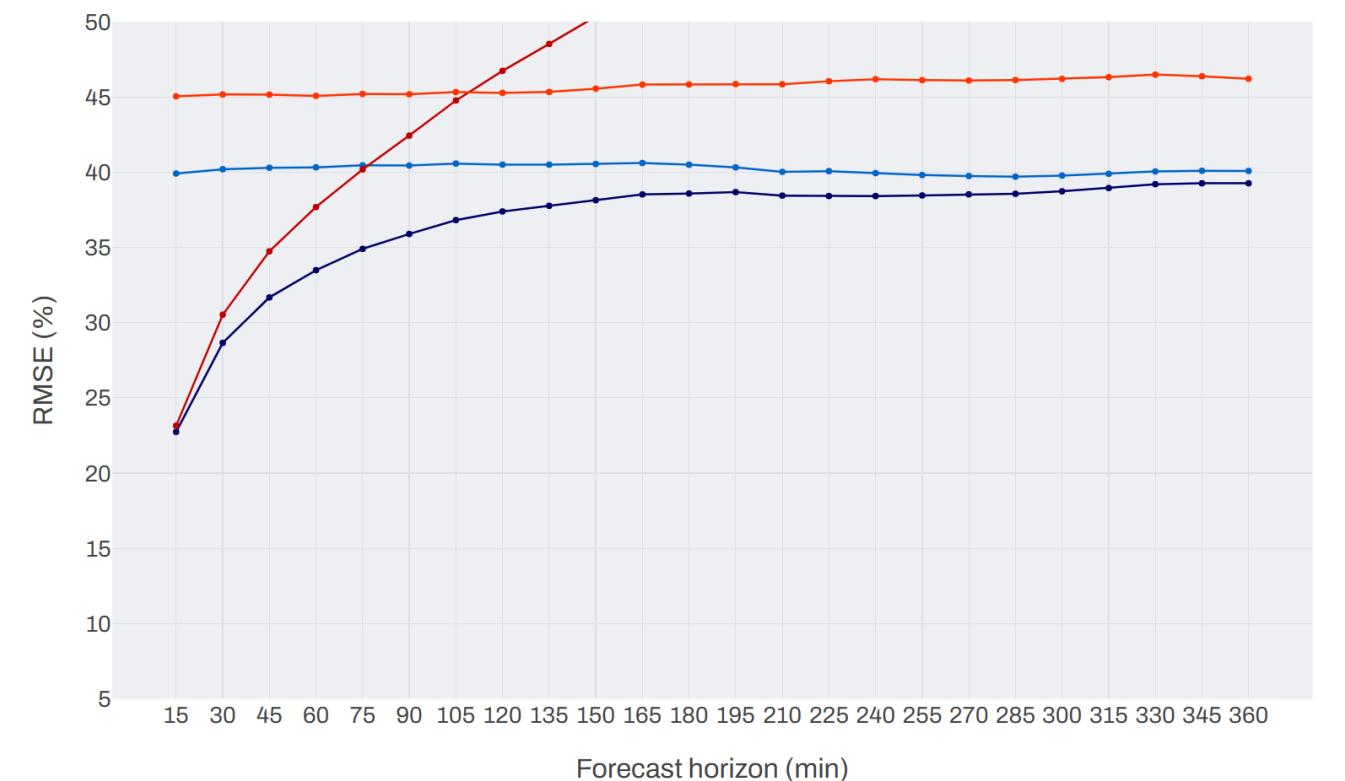
Intra-Day – 6 h / 15 minutes frequency

RMSE [%] per forecast horizon

Izana



Réunion



## Results summary

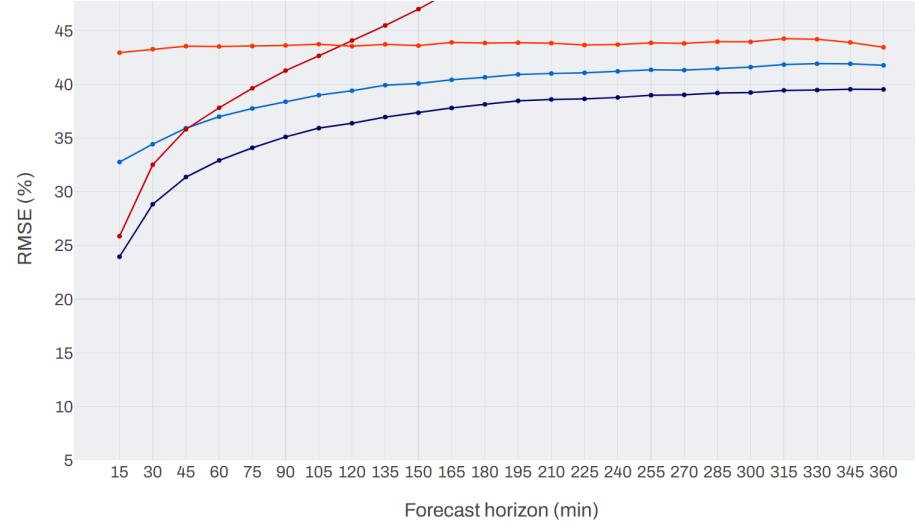
Intra-Day – 6 h / 15 minutes frequency

RMSE [%] per forecast horizon

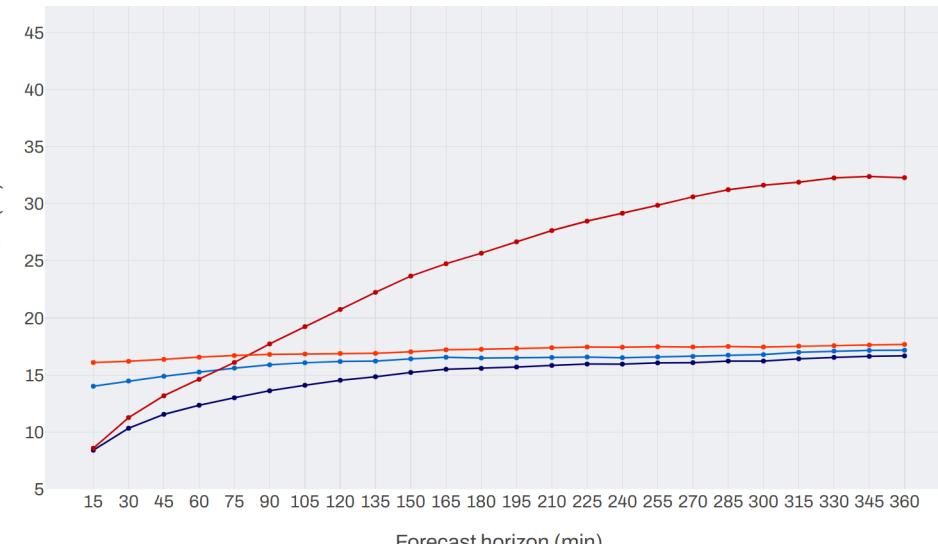
- NEXT ADVANCED
- NEXT ACCESS
- Persistence
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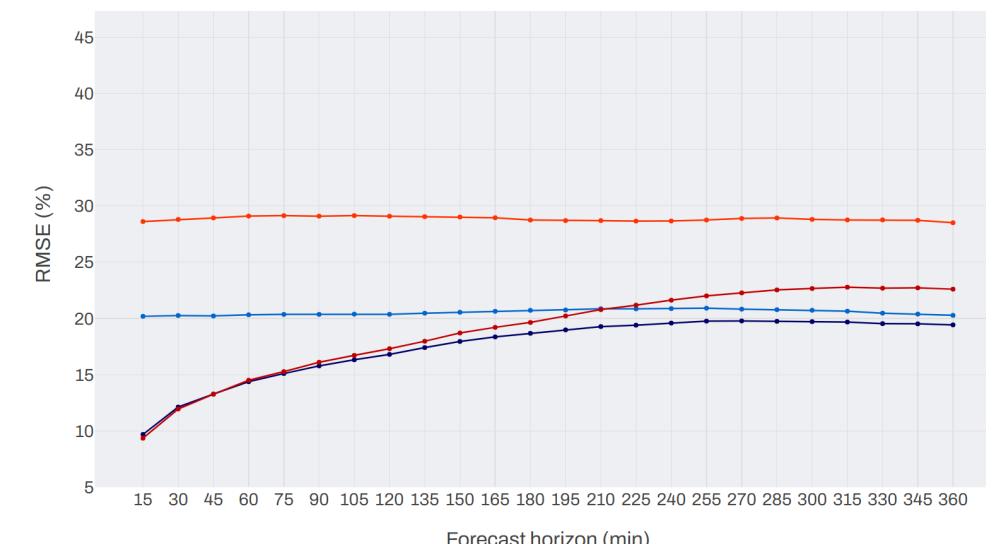
Cabauw



Gobabeb

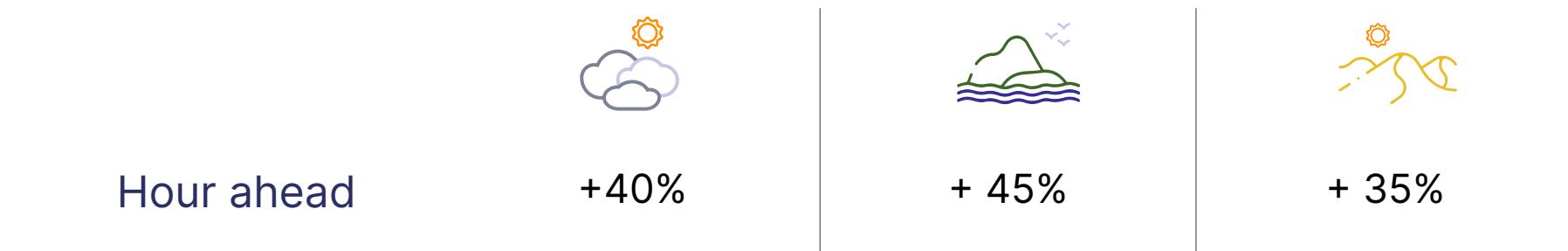


Izana



## Results analysis

NEXT Advanced vs. GFS (% of RMSE improvement)



- ✓ NEXT Advanced is always beating reference models across all horizons and on every type of climate
- ✓ Intraday forecast accuracy strongly benefits from on-site real-time measurements

*NEXT Advanced vs. NEXT Access :* RMSE improvement up to 40% for hour ahead forecasts based on on-site real-time measurements

## Results

Day ahead – 48 h / 1 hour frequency  
RMSE [%] per forecast horizon

- NEXT ADVANCED
- NEXT ACCESS
- Persistence
- GFS only

