

# Long-term evaluation of the Météo-France Quantitative Precipitation Estimation product.

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Météo France – WXRCALMON 2021

## MF QPE – Monitoring

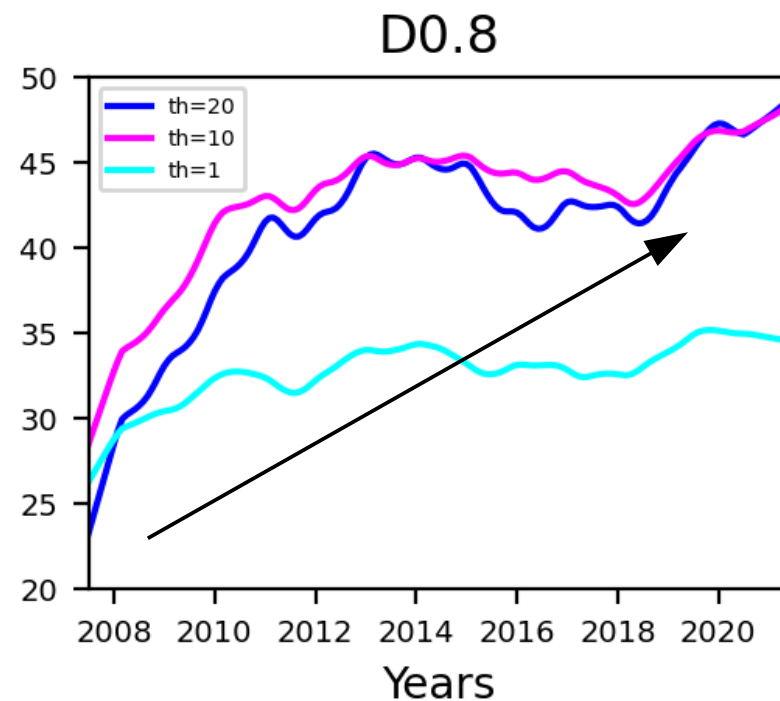
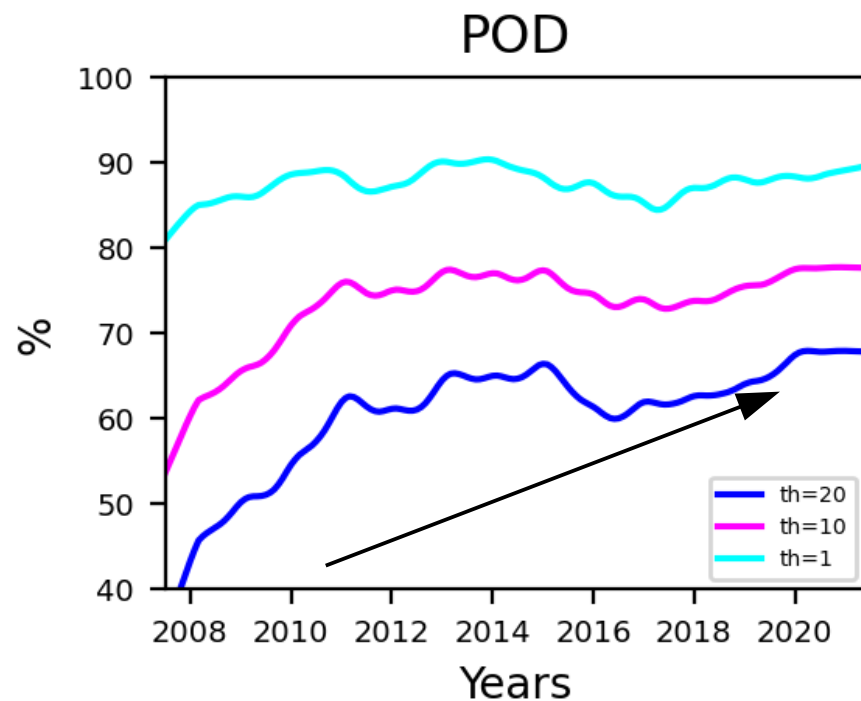
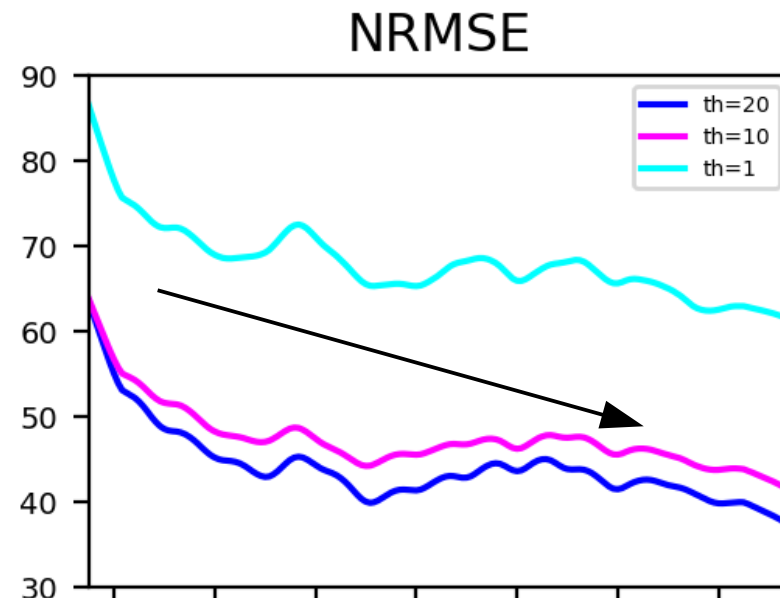
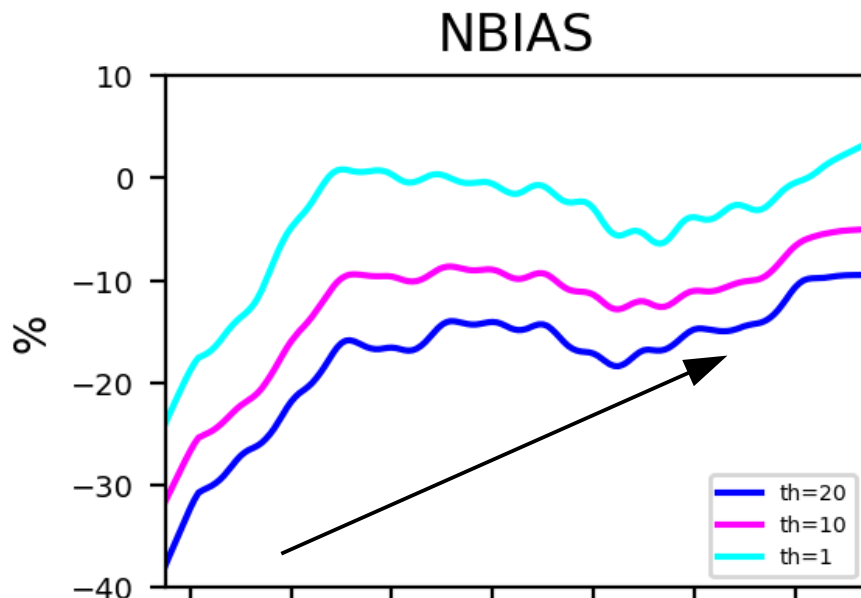
- The performance of QPE has been monitored over the past 15 years
- Scores are calculated using 24H gauge and radar accumulations and for different thresholds [ 1mm, 10mm, 20mm]:
  - Normalised Bias
  - Normalised Root Mean Square Error
  - Probability Of Detection
  - Dispersion (pc of ratios in [0.8 1.25])
- The calculation uses mainland France mosaic product (that includes Corsica) and all available QC gauges.
- Centred running window of one year to remove the seasonal component.
- The dispersion (D0.8) at 10mm threshold is used to track the overall performance of the network (Corporate target)

# QPE – Monitoring

**Clear improvement of all the scores at all the thresholds.**

**BUT**

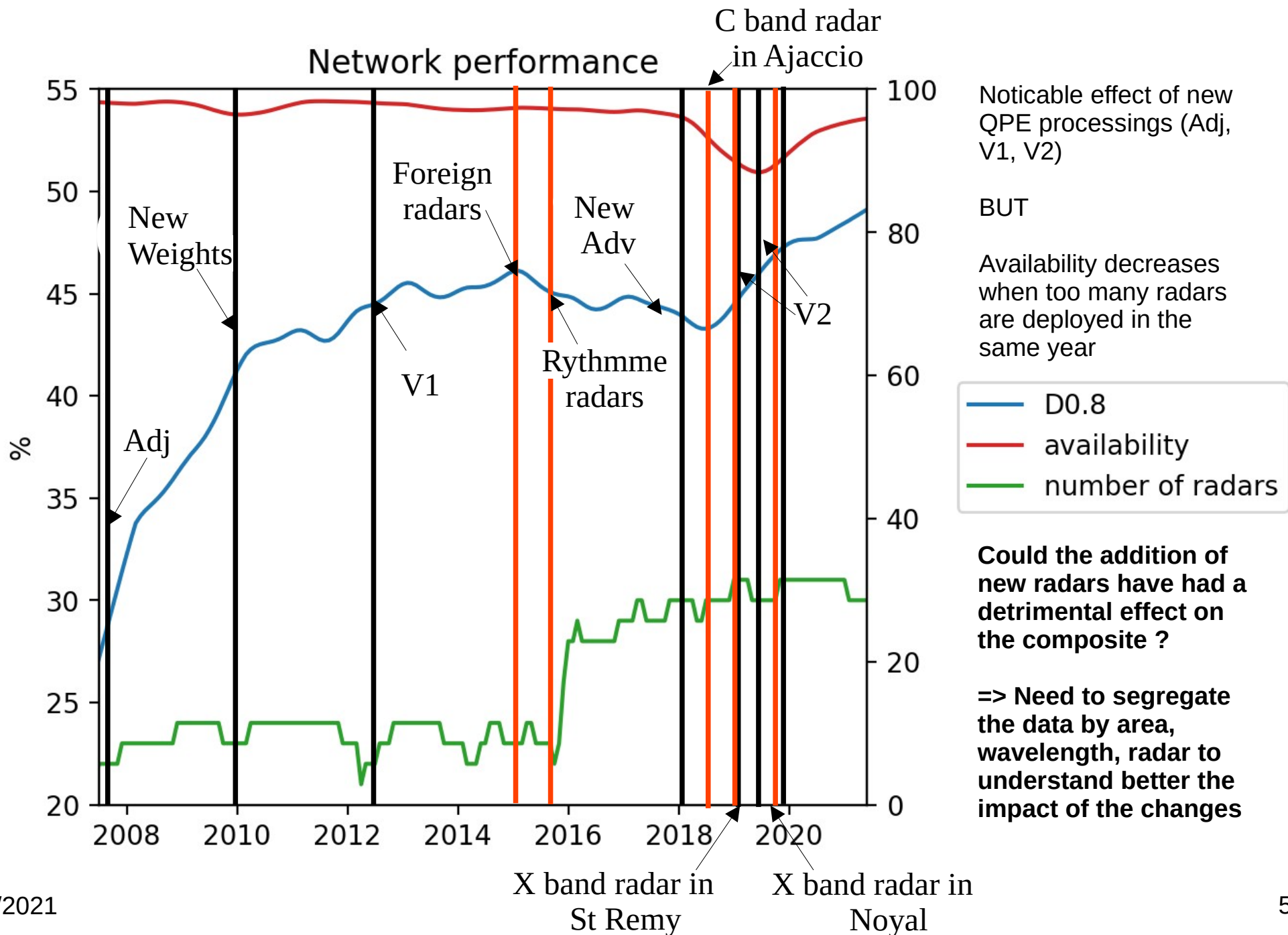
Progress is not uniform with time and changes made to the network and products might not have always been optimal.



# Changes to the QPE product between 2007 and 2021

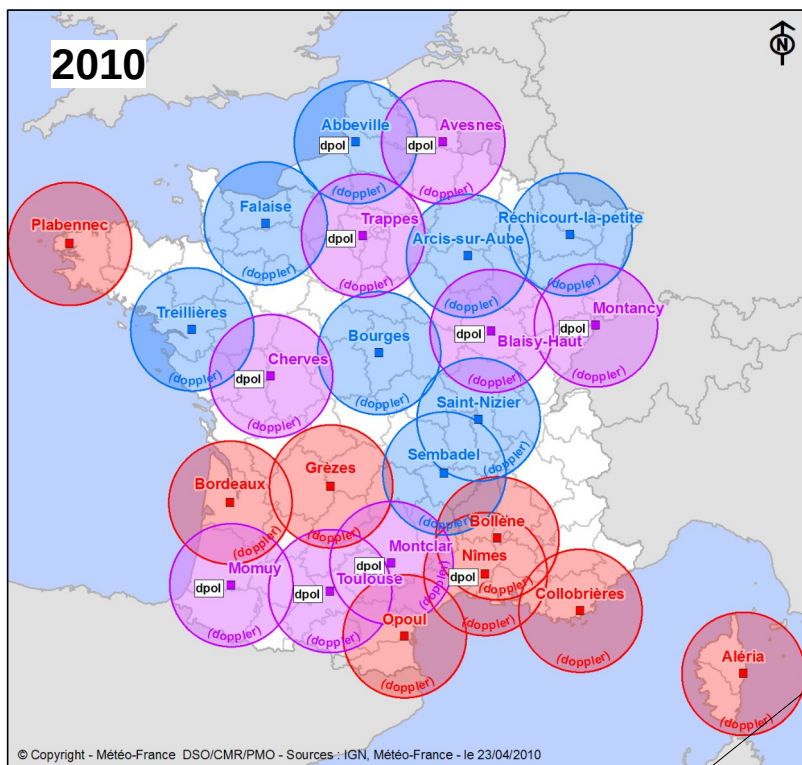
- 1) T1 2007 : Gauge adjustment applied to single site QPE.
- 2) T3 2009 : New tuning of the compositing weights.
- 3) T1 2012 : V1 of the dual-polarisation processing.
  - Fuzzy logic scheme for non precipitation echos identification.
  - Attenuation correction based on PHIDP
- 4) T4 2014 : Foreign QPE products (C band) added to the composite
- 5) T2 2015 : 4 X-band radars from RYTHMME project added to the composite (including Mt Vial - Novimet)
  - Kdp used at X band.
  - Compositing weights take into account attenuation at X band
- 6) T4 2017 : New advection field use for synchronising volume data
- 7) T2 2018: New C band radar in Ajaccio
- 8) T4 2018 : New X band radar in St Remy
- 9) T2 2019 : V2 of dual polarisation processing
  - Kdp used at C and S band
- 10) T1 2019 : New X band radar in Noyal
- 11) T4 2019 : V2 modified to remove gauge adjutement where Kdp is used.

# Impact of changes on D0.8 at 10 mm threshold



# Impact of the addition of new radars

## The French metropolitan network in 2010



### Légende

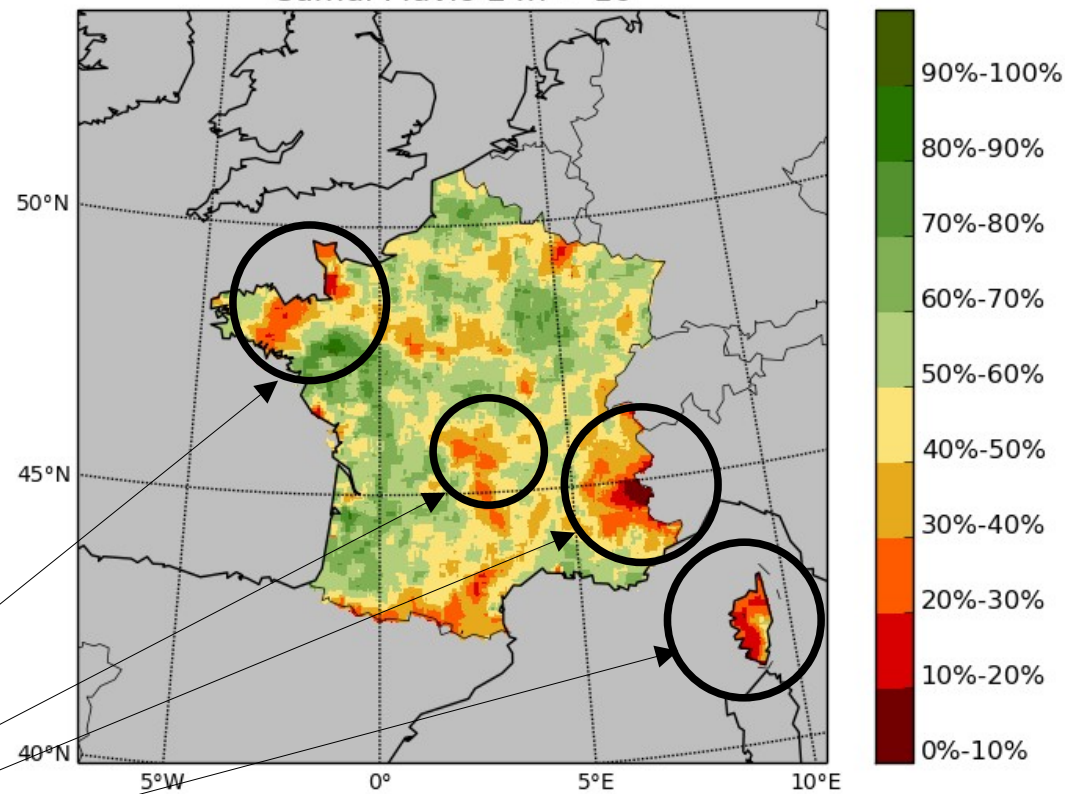
#### Type de radar

- bande S (10 cm)
- bande C (5 cm)
- bande C (5 cm), radar PANTHERE

D0.8 – 10 mm

20100101 - 20101231

Cumul Pluvio 24h > 10

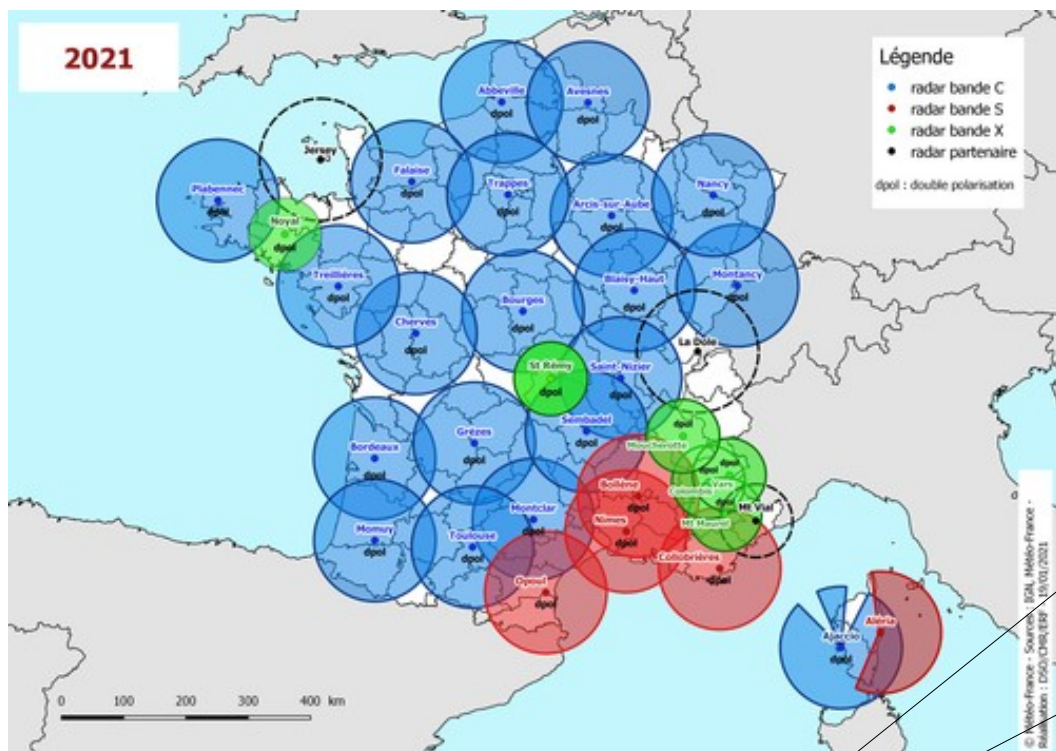


Target area were identified at the begining of the PUMA project (2012-2018)



# Impact of the addition of new radars

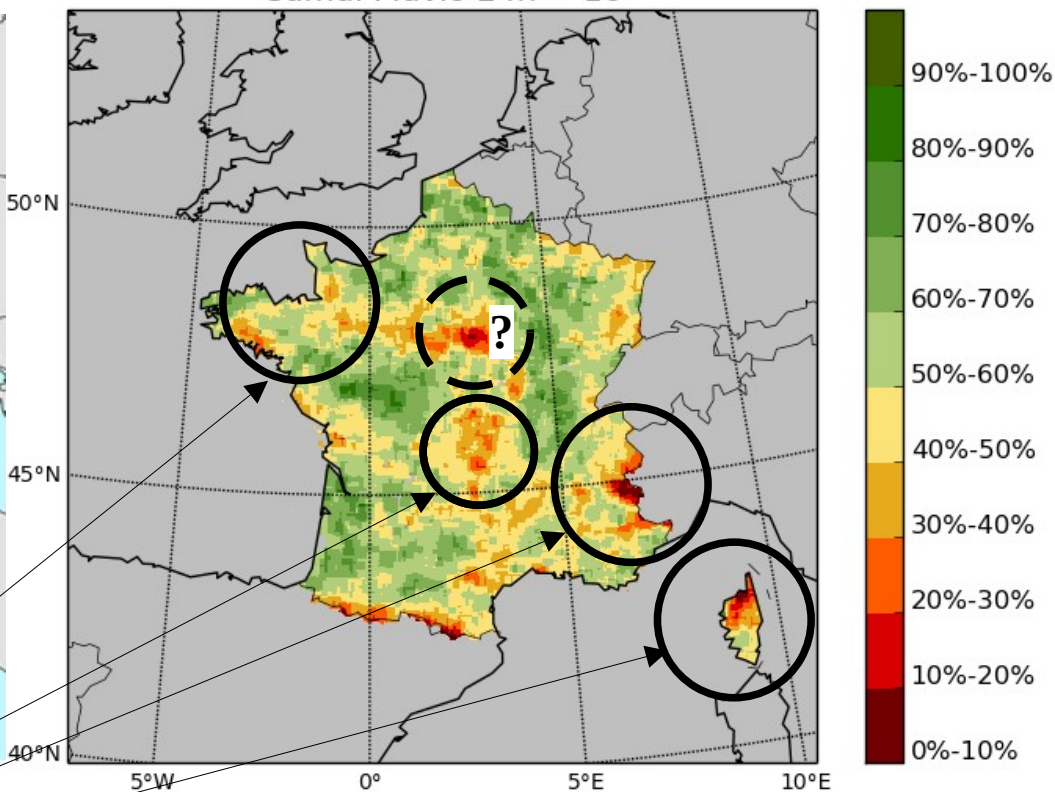
## The French metropolitan network in 2021



D0.8 – 10 mm

20200101 - 20201231

Cumul Pluvio 24h > 10



10 year later ...

- Large positive impacts of the addition of new radars
- Some deteriorations in areas that used to be good: problems with masks ? windfarms ?

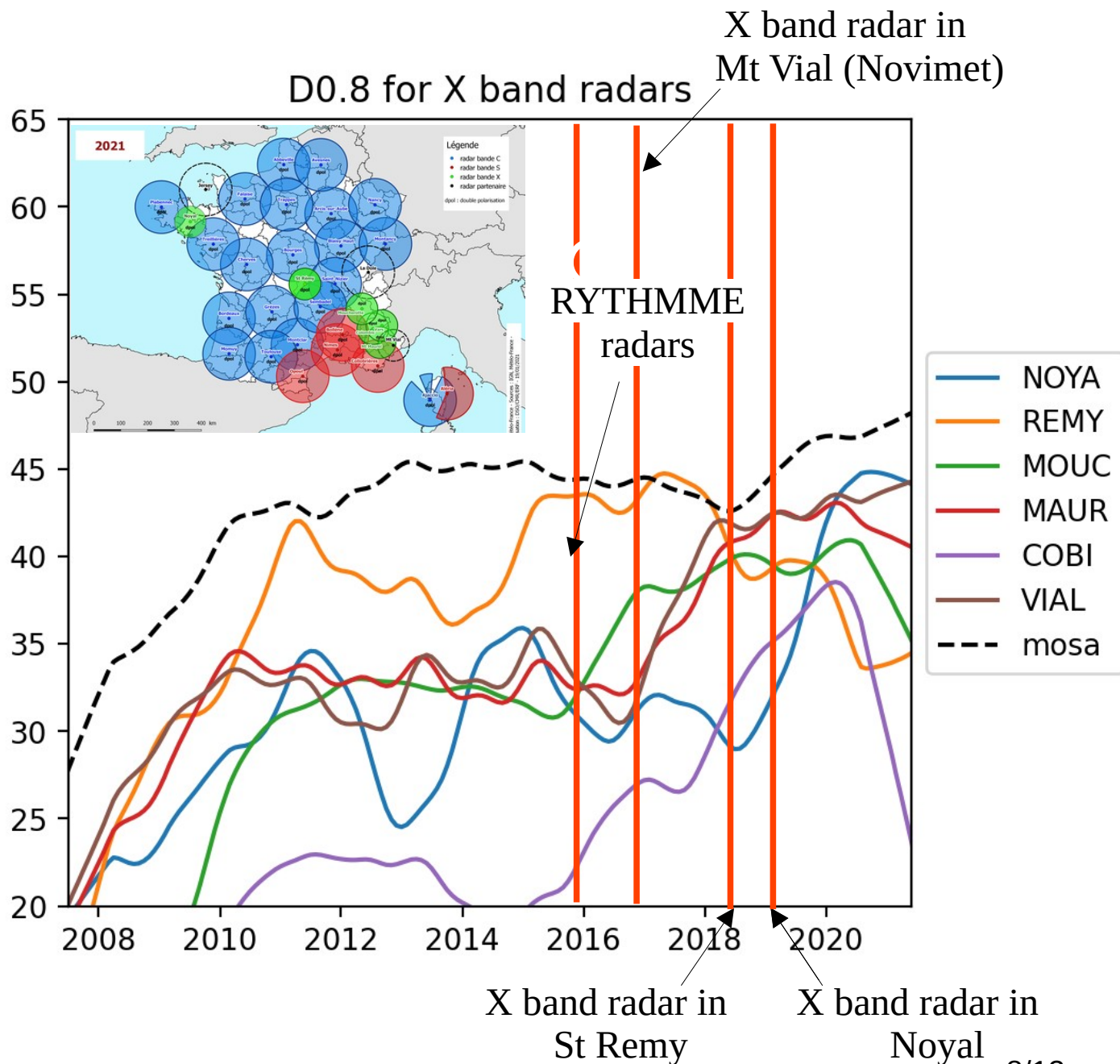
# D0.8 at 10 mm score analysis – X band

**Analysis by radar :**  
D0.8 -10 mm score is calculated using the composite data but in the vicinity (60 km) of each radar location

Most RYTHMME radars are above 1500m

All X band radars except St Remy have a positive impact.

But all X band radars are below average





# D0.8 at 10 mm score analysis by radar – C band

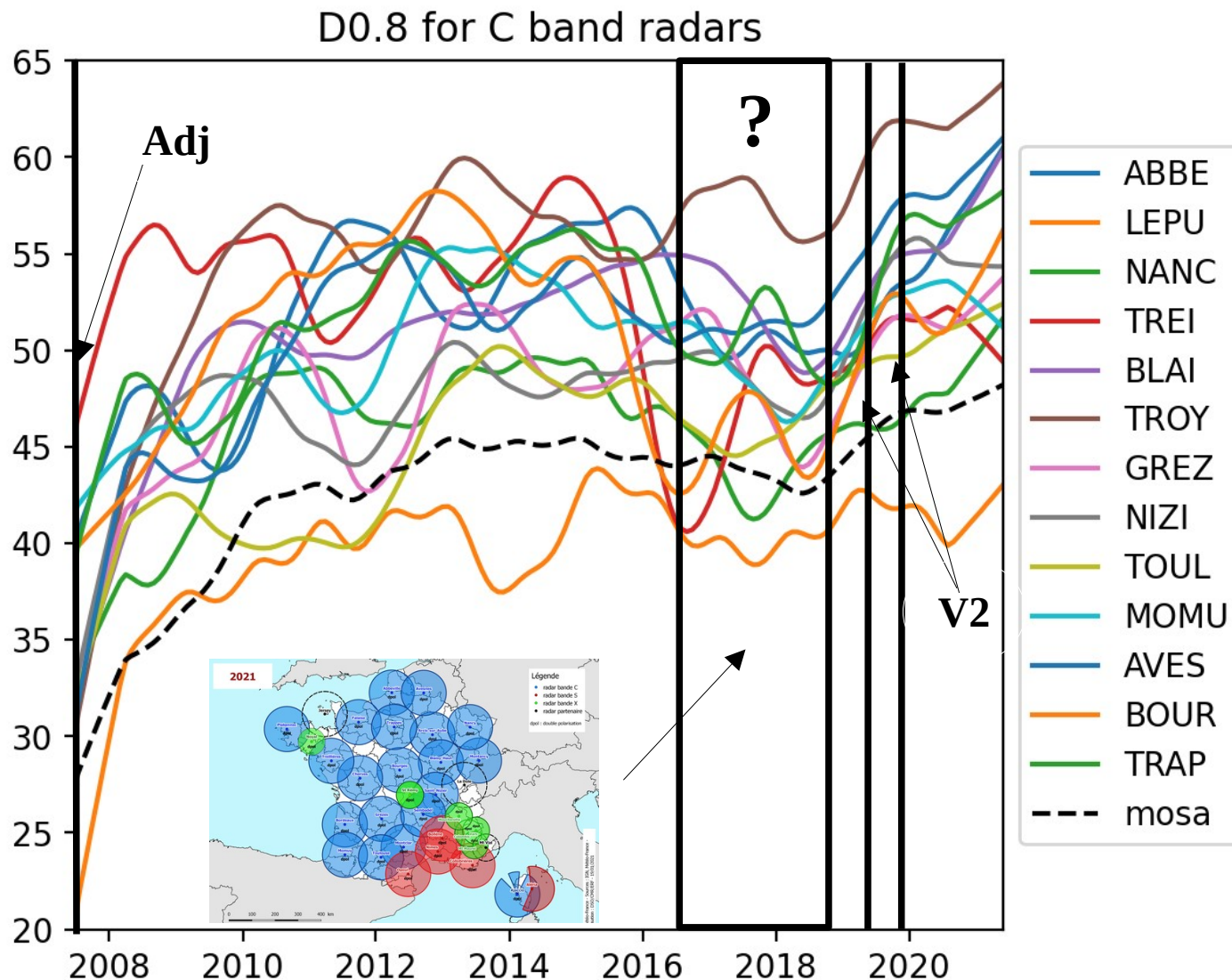
## Analysis by radar :

D0.8 -10 mm score is calculated using the composite data but in the vicinity (80 km) of each radar location

All C band radars are performing better than average except one (Sembadel)

Large positive impact of Adj and V2 dualpol processing.

Some radars are under-performing in 2017-2019 and maybe still are



# D0.8 at 10 mm score analysis by radar – C band

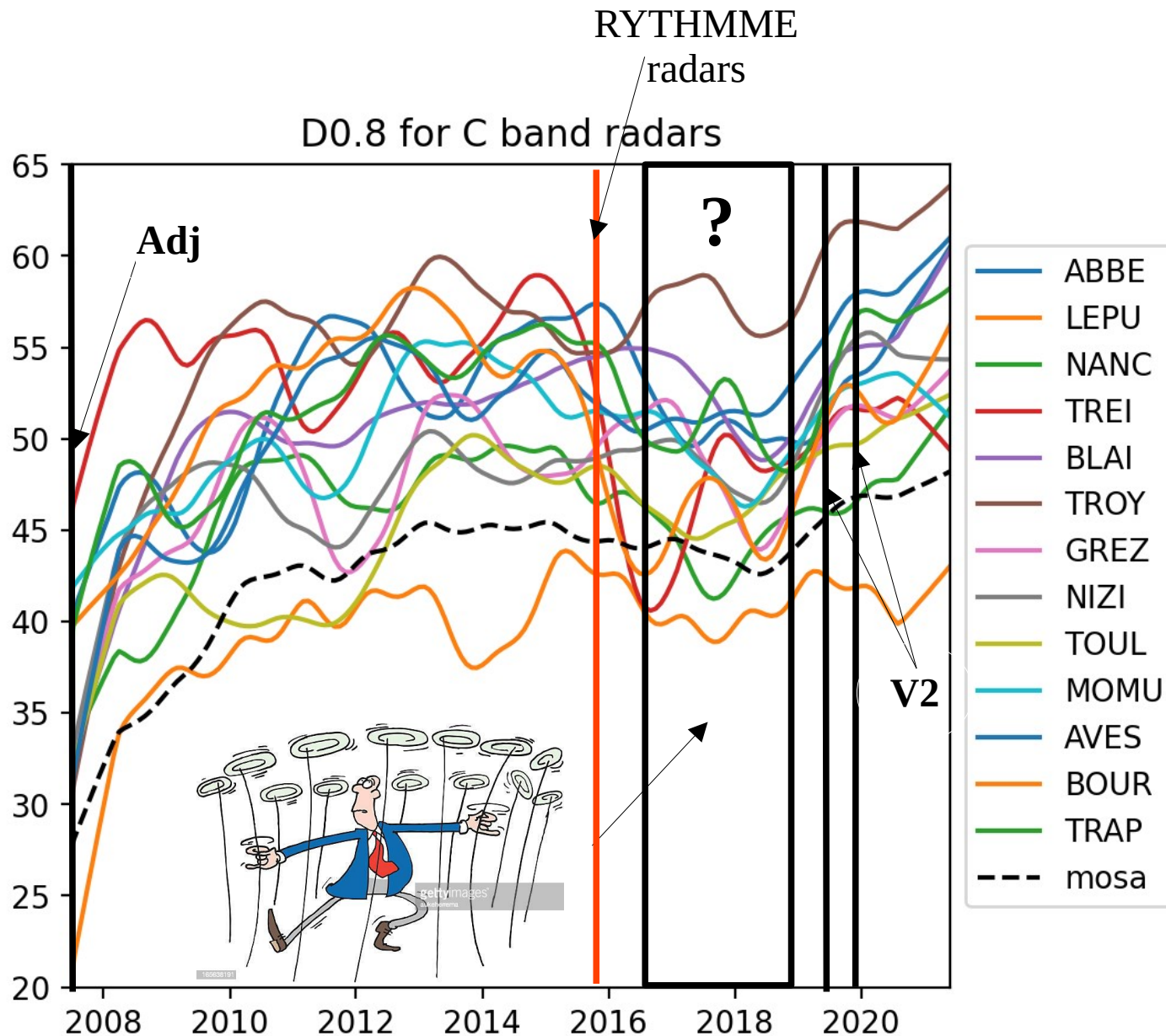
## Analysis by radar :

D0.8 -10 mm score is calculated using the composite data but in the vicinity (80 km) of each radar location

All C band radars are performing better than average except one (Sembadel)

Large positive impact of Adj and V2 dualpol processing.

Some radars are under-performing in 2017-2019 and maybe still are.



=> too many radars to maintain?

# D0.8 at 10 mm score analysis – S band

## Analysis by radar :

D0.8 -10 mm score is calculated using the composite data but in the vicinity (80 km) of each radar location

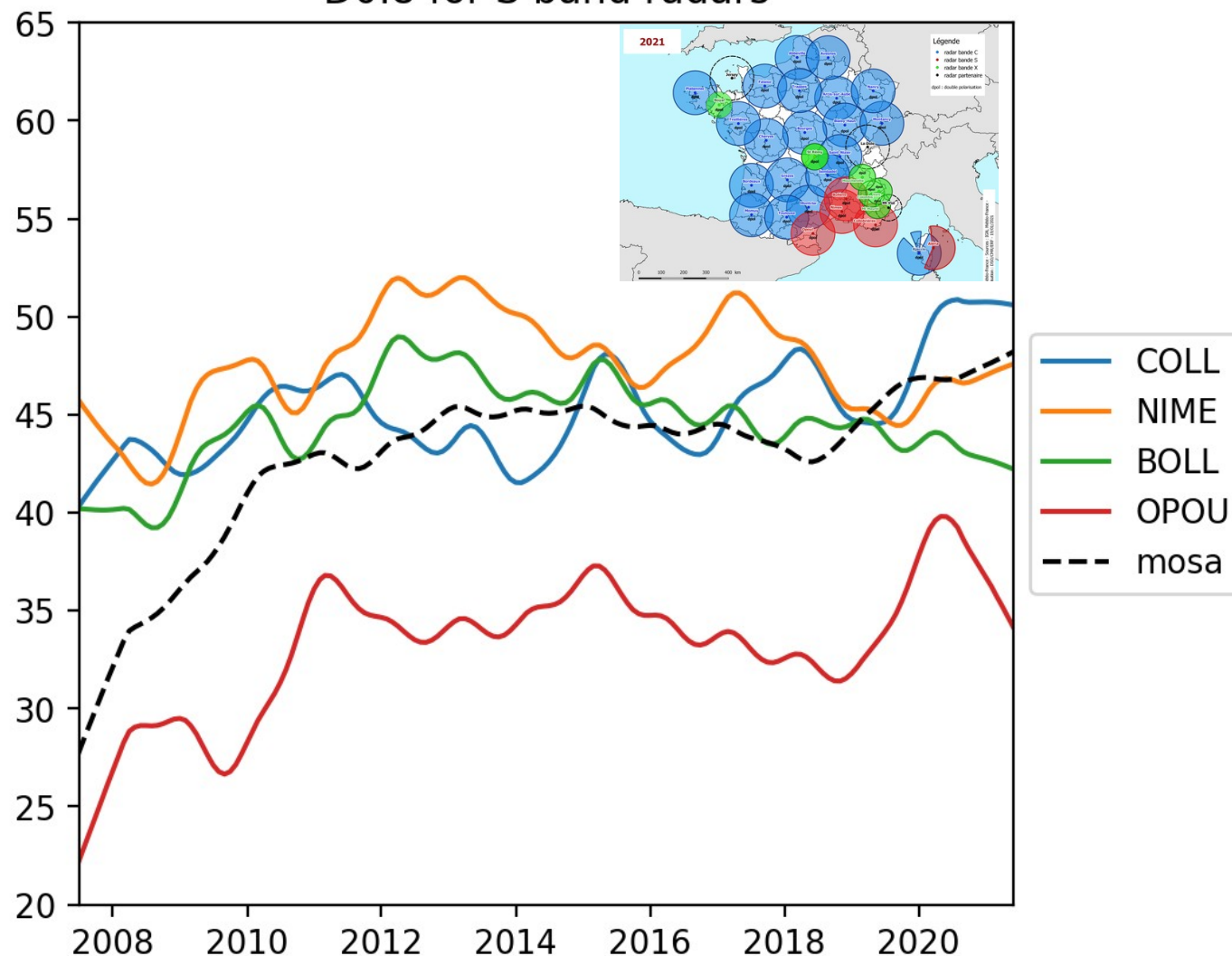
All S band radars performance is close to average except one (Opoul)

No impact of adjustment

No significant impact of DPOL processing at S band.

At S band like at X and C band still large year on year variability

D0.8 for S band radars





# Scores analysis by season

## Analysis by season :

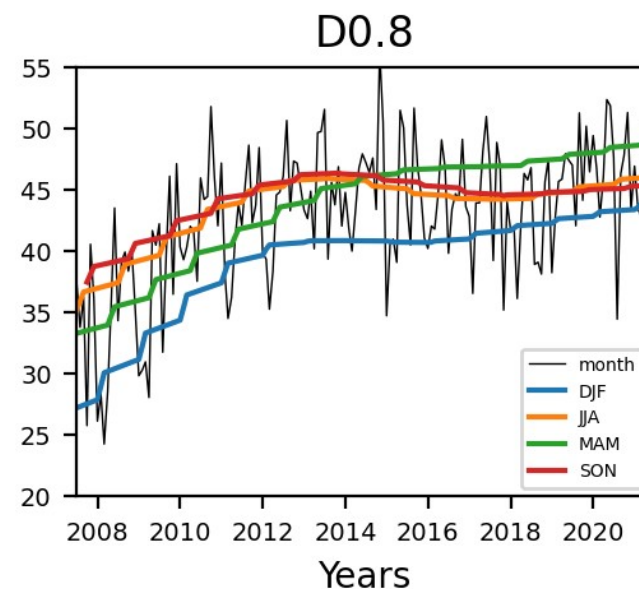
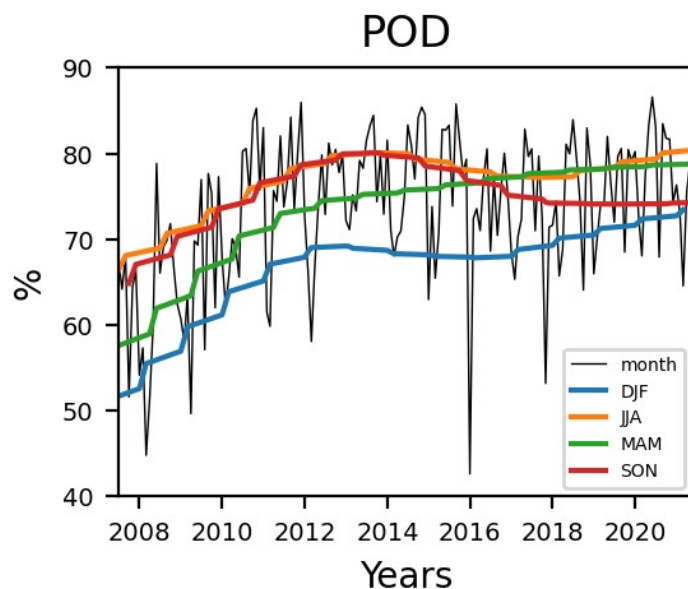
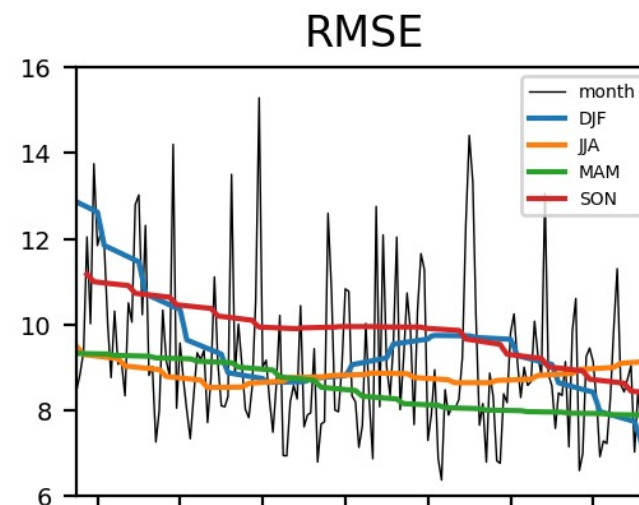
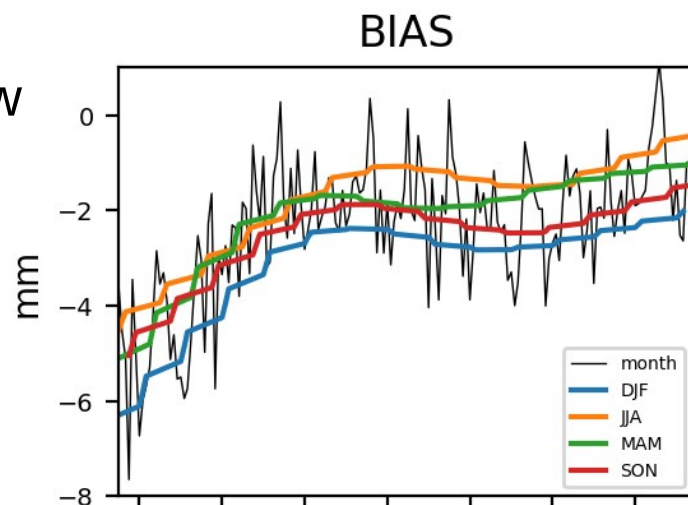
Centred running window of one year with seasonal weighting.

Large differences in performance between seasons

No more year on year variability.

Historically best scores are found in Summer (JJA)

Largest improvement is Spring (MAM) with now best scores.



## Conclusions - outlook

- The scores show that adding more radars and upgrading to dual-pol processing was overall very beneficial to QPE products.
- The analysis per radar reveals that improvements are not equivalent at S, C and X band.
- In our configuration: C band radars do better than S band and S band better than X band.
- New X band radars improved the QPE only in areas where the QPE was poor.
- Deployment of new radars had temporally a negative impact on the overall score because problems on some C band radars were de-prioritised.
- To some extent the monitoring the scores should allow to target better maintenance and development efforts.
- A new tool PIEUVRE will be available soon to help managing the network and planning future developments.
  - see poster by Sanchez et al.