



# Impact des hétérogénéités de surface sur le brouillard

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# Présentation

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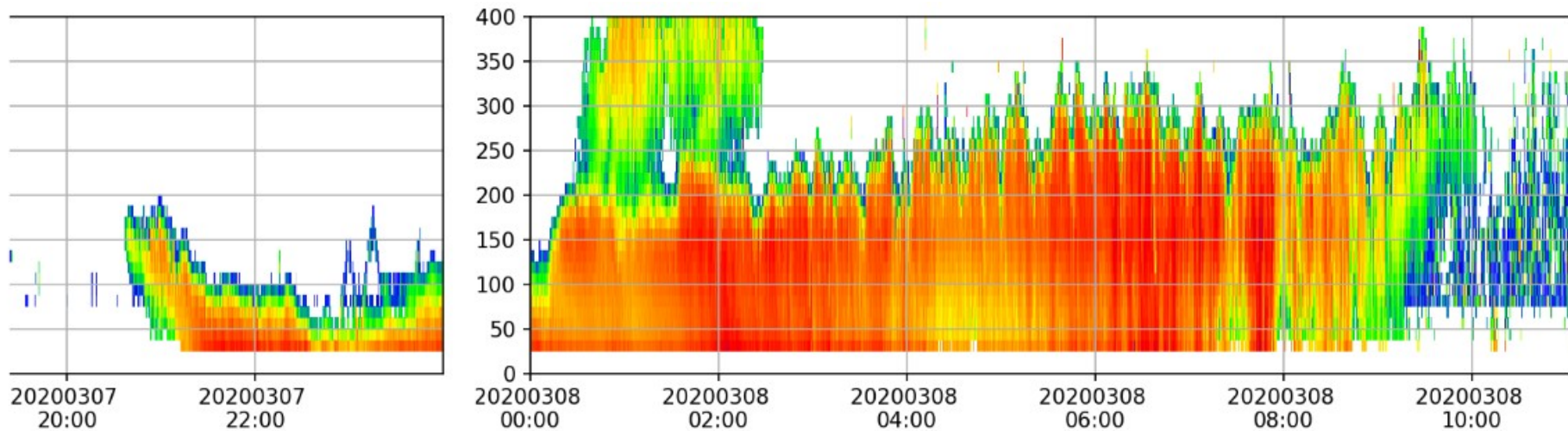
- Post-doc 18 mois au CNRM/PHYNH
- Objectifs :

## Étude de l'impact des hétérogénéités de surface sur le brouillard

- Outils :
  - Campagne de mesures SOFOG3D (base de données)
  - Sélection des meilleures POI (basé sur le stage de M-A Magnaldo)
  - Simulations LES par Méso-NH (impact de la physique, du couplage, de la résolution...)

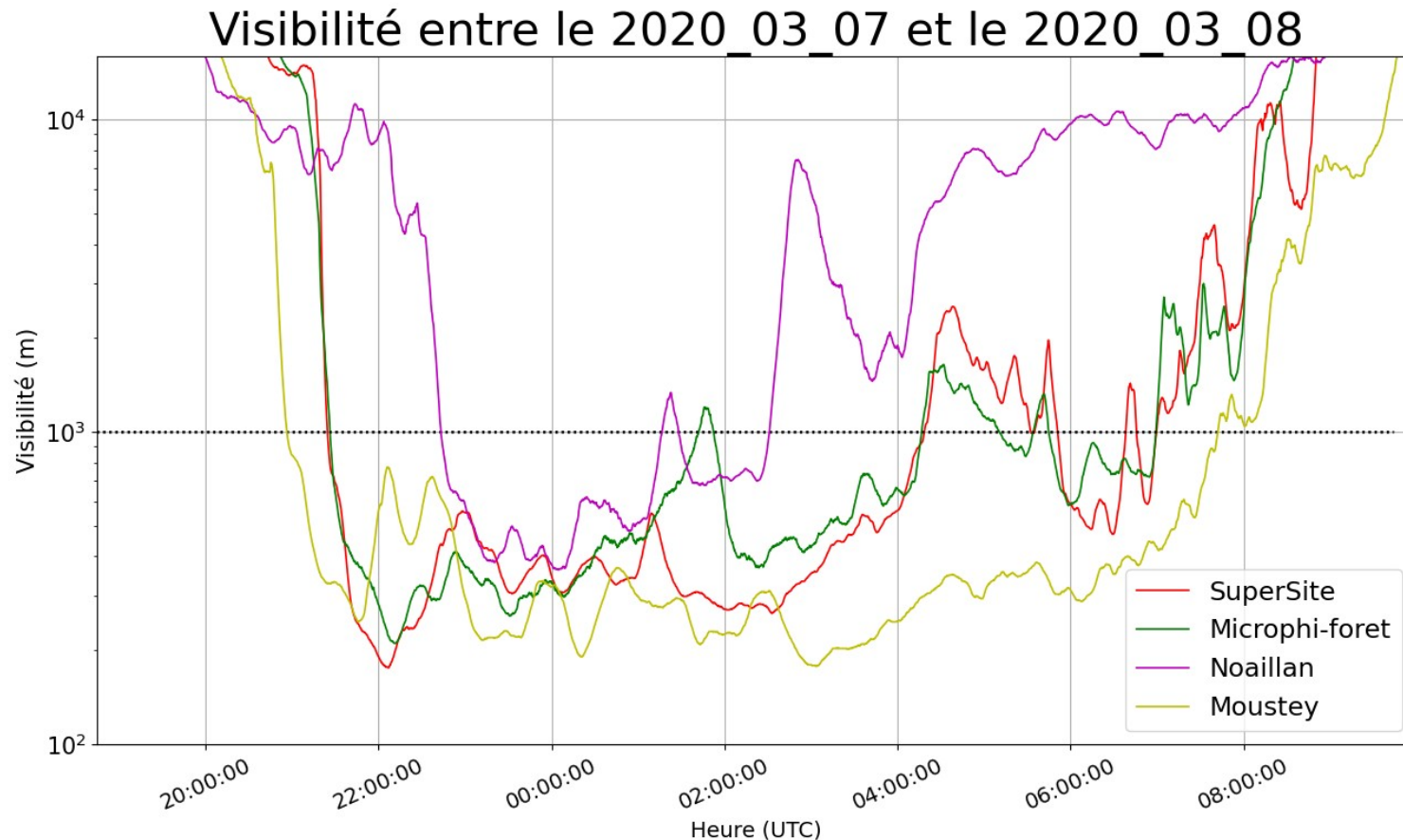
# POI 14 (nuit du 7 au 8 mars)

BASTA SuperSite entre le 2020\_03\_07 et 2020\_03\_08



- Brouillard de 21h30 à 8h au SuperSite
- Nuage entre 0h et 2h le 8 mars 2020

# POI 14 (nuit du 7 au 8 mars)



- Brouillard de 21h30 à 8h au SuperSite
- Visibilité mini de 180m
- Hétérogénéité entre les sites

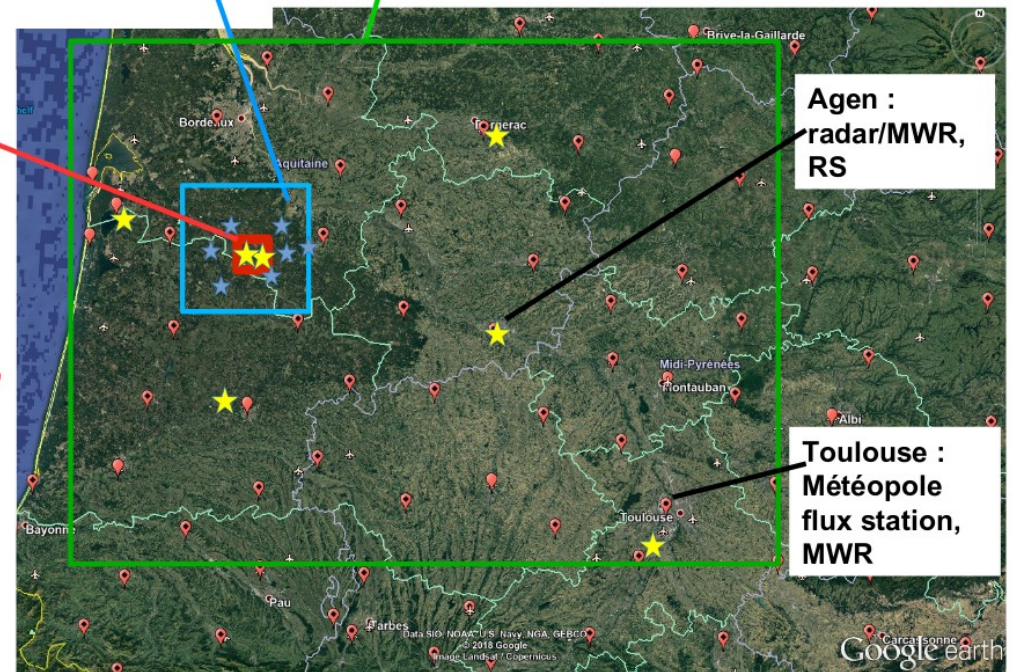
# Simulations MNH à 500m de résolution

- Simulation 24h (du 07/03 12h au 08/03 12h)
- Initialisation analyse AROME à 1,3 km de résolution
- 138 niveaux verticaux (de 2,3m à 12km)
- Ecoclimap II : base de données pour les couverts à 1km de résolution

Surrounding domain 50 x 50 km with increased density in-situ sensors network (8+12=20 surface met. stations, visibility, ceilometers, turbulence)

Larger domain 300 x 200 km (AROME-500m model) with in-situ sensors (~ 50 surface met. stations) and MWR (8 units ★) networks

**Super-site 10 x 10 km:**  
- radar/MWR/lidars  
- tethered balloon, RS  
- UAVs fleet  
- 12 met. stations + visi  
- 50 m mast (2) profiles  
- 4 areas with : heat and turbulent fluxes (ground & 10m), radiation budget, aerosol and fog microphysics, water deposition  
- 6 ceilometers



# Simulations MNH à 500m de résolution

- Schéma de surface : Surfex (Masson et al., 2013)
- Schéma microphysique : ICE3
- Schéma de turbulence : Cuxart e al. (2000)
- Schéma de rayonnement : ECMWF

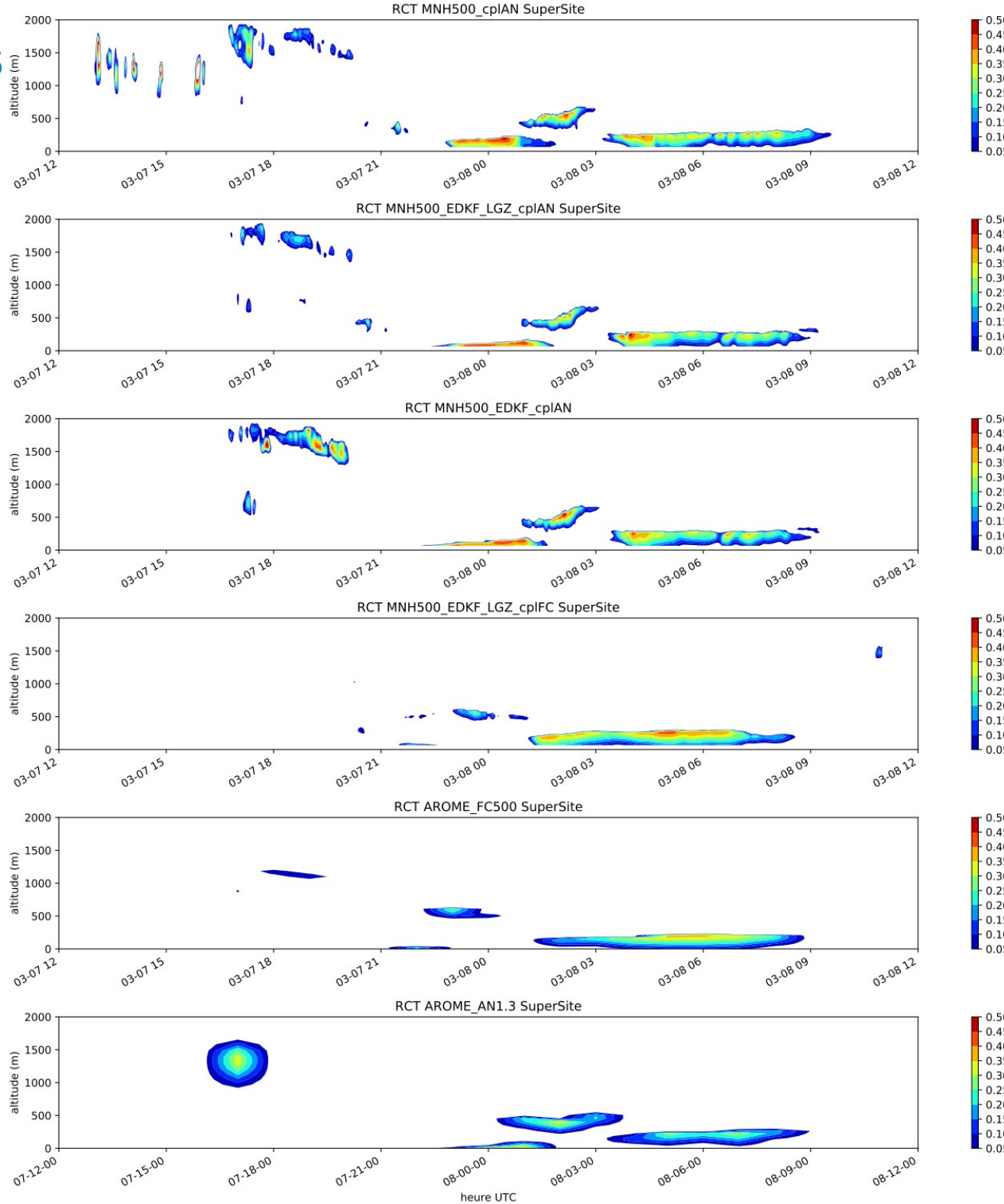
Simulations	Couplage	Schéma de convection	LGZ (reduction of the mass-flux surface closure with the resolution)
MNH500_cplAN	Analyses AROME1.3	None	—
MNH500_EDKF_cplAN	Analyses AROME1.3	EDKF	False
MNH500_EDKF_LGZ_cplAN	Analyses AROME1.3	EDKF	True
MNH500_EDKF_LGZ_cplFC	Forecast AROME500	EDKF	True

Impact paramétrisation physique

Impact couplage

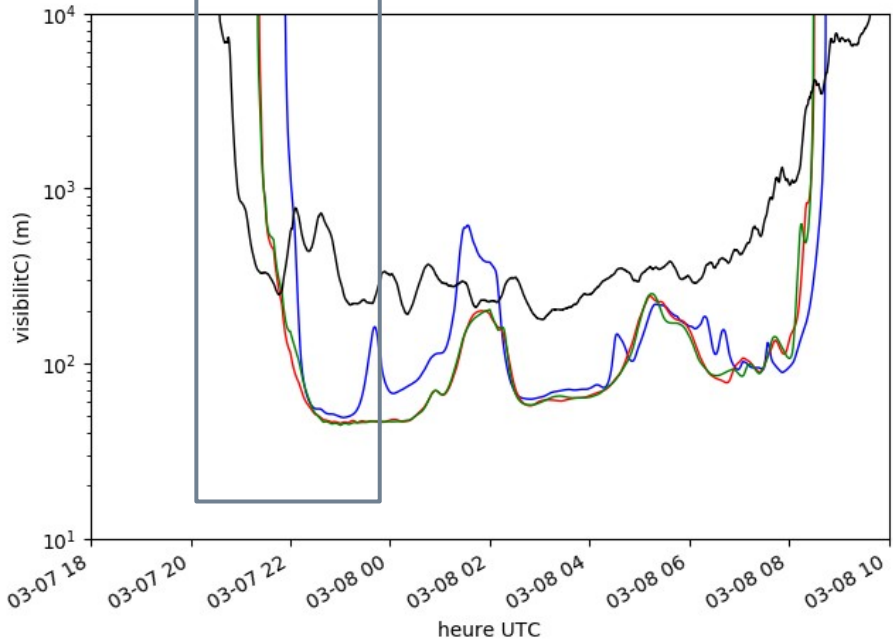
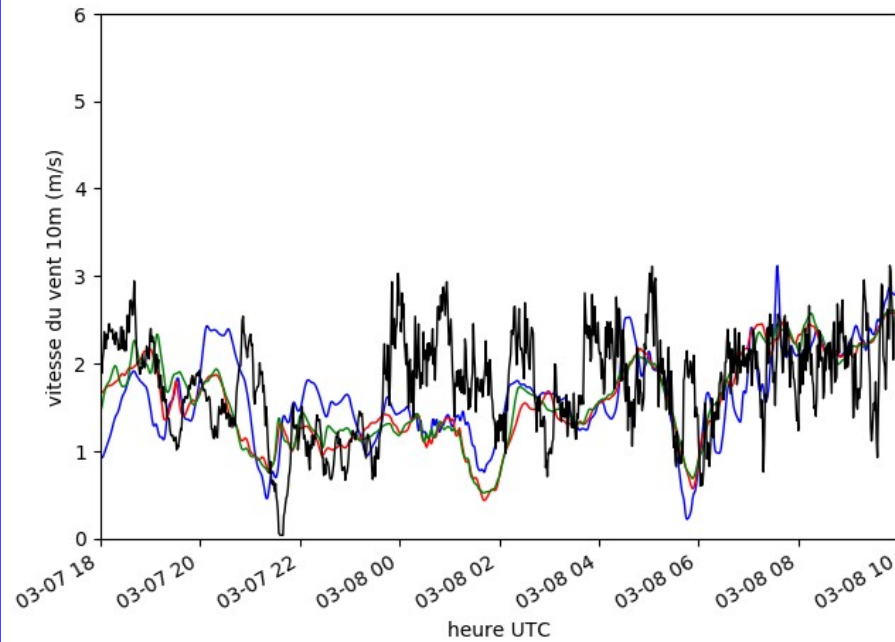
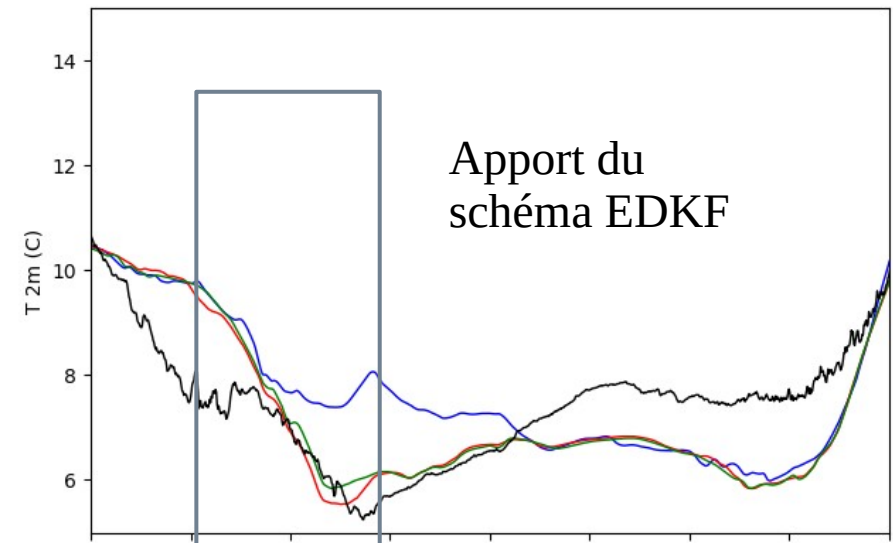
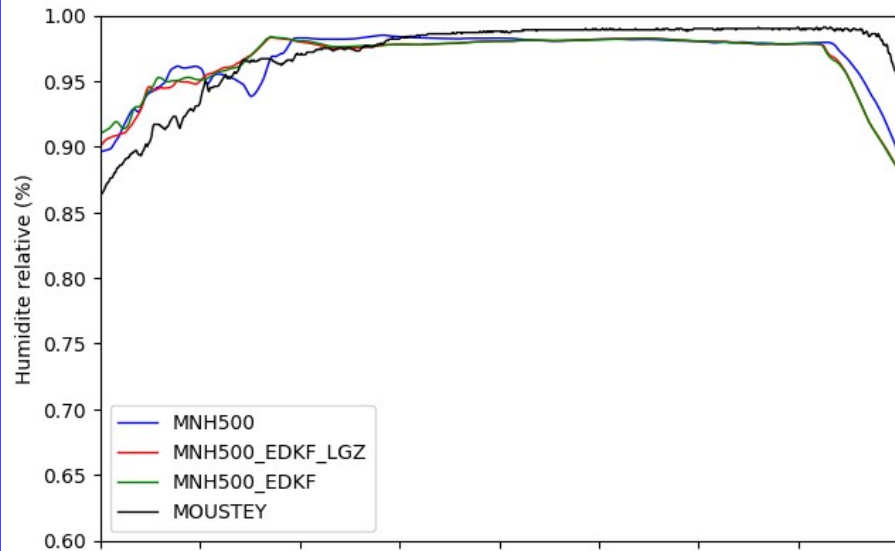
# Profils verticaux des contenu en gouttelettes (kg/kg) SuperSite

- AROME\_AN1.3 mauvaise représentation du brouillard dans les premiers niveaux
- MNH500\_EDKF\_LGZ\_cplFC représentation plus réaliste du passage nuageux de 0h à 2h



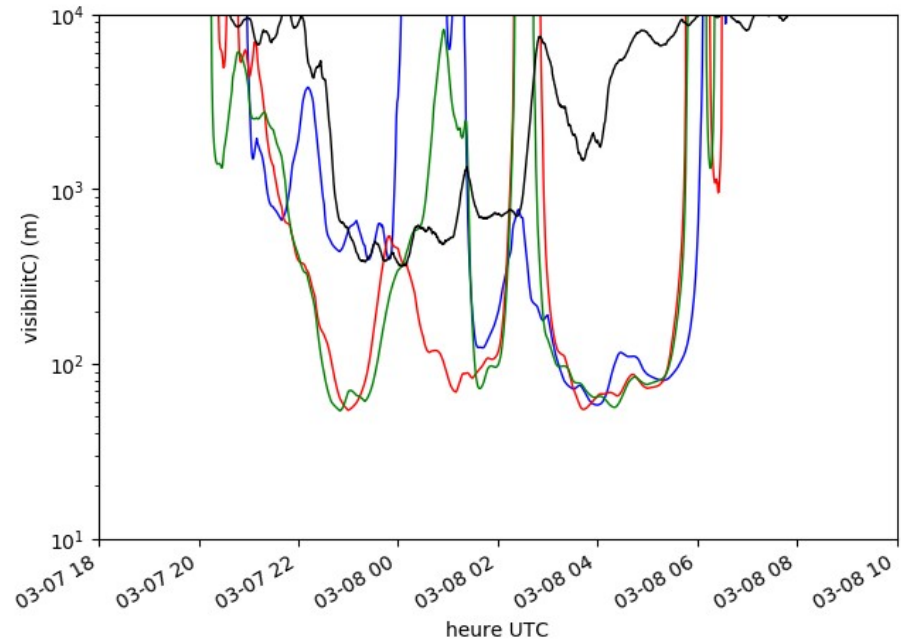
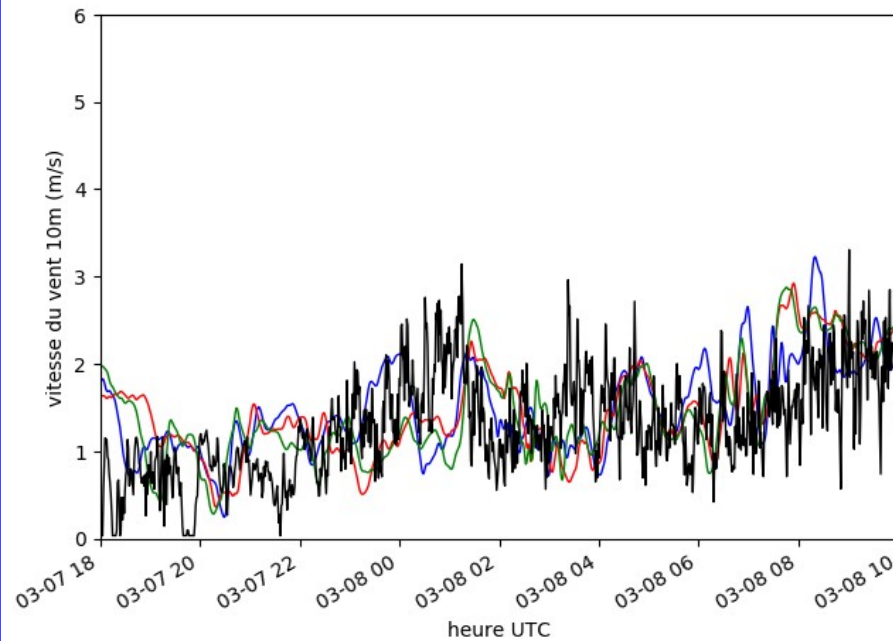
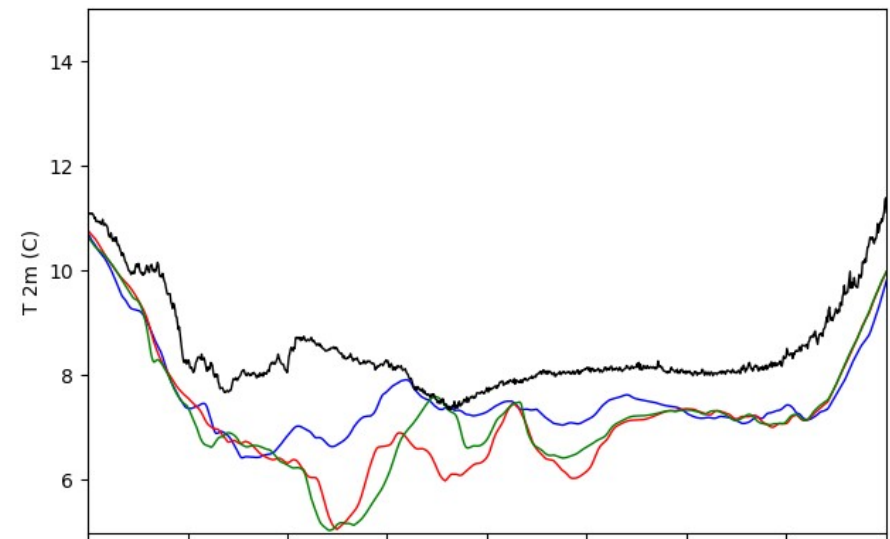
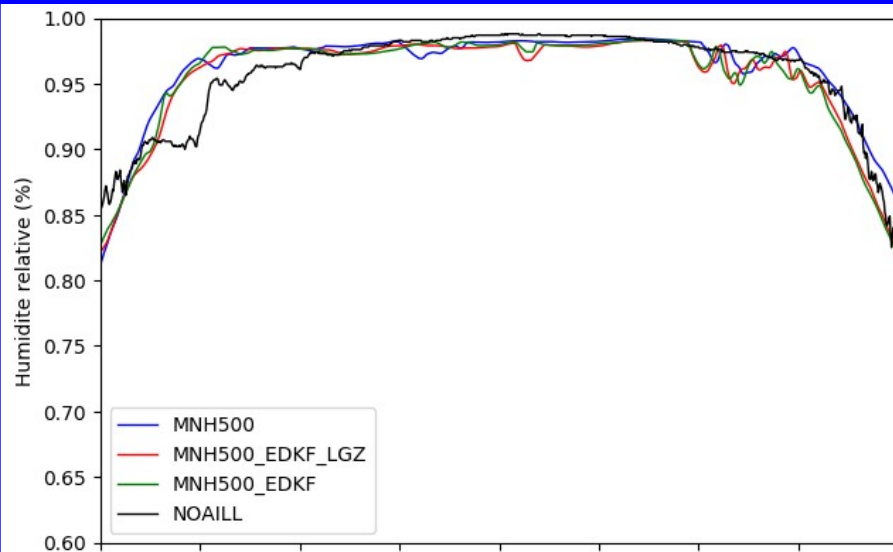
# Comparaisons observations MTO/VISI

## Moustey

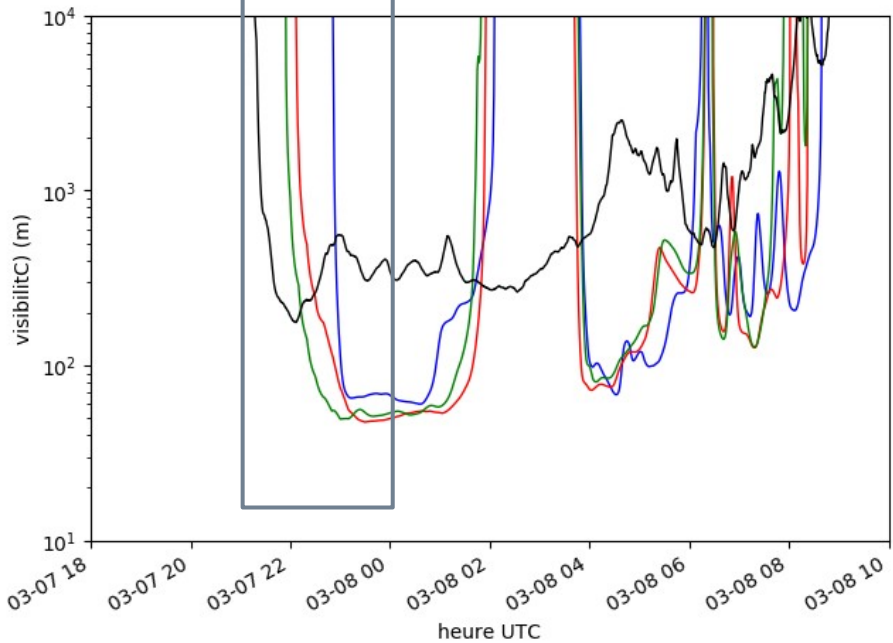
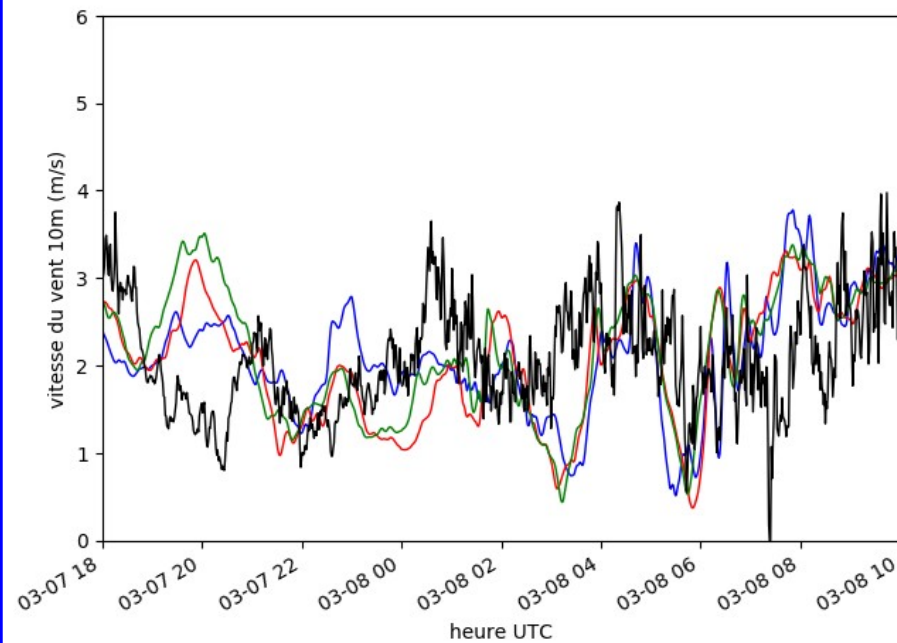
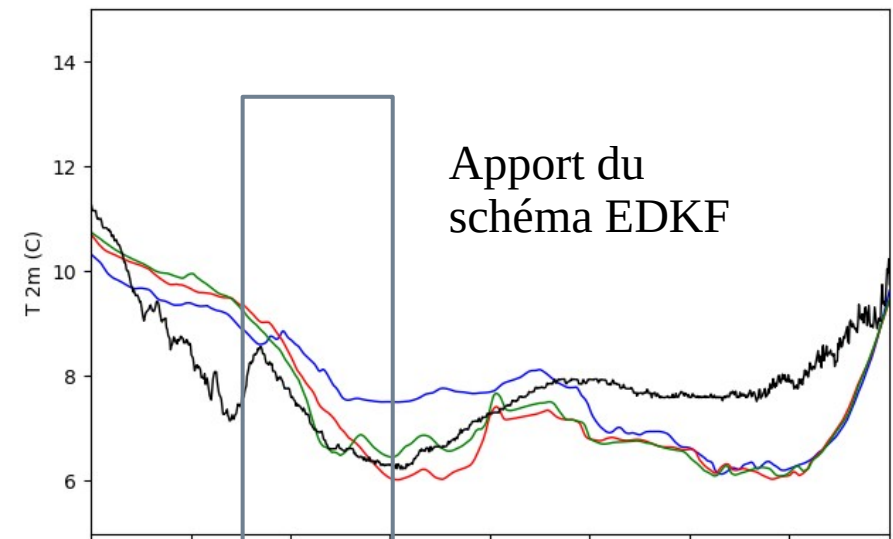
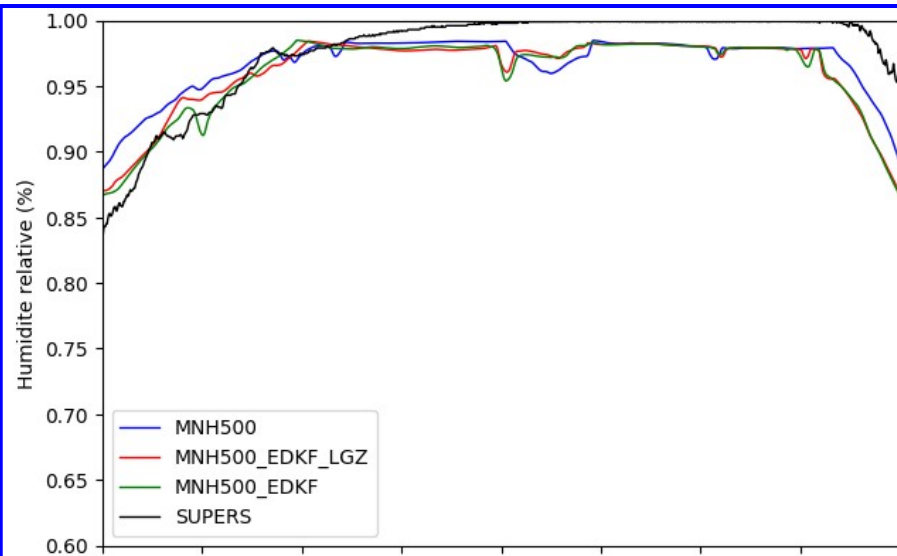




# Comparaisons observations MTO/VISI Noaillan

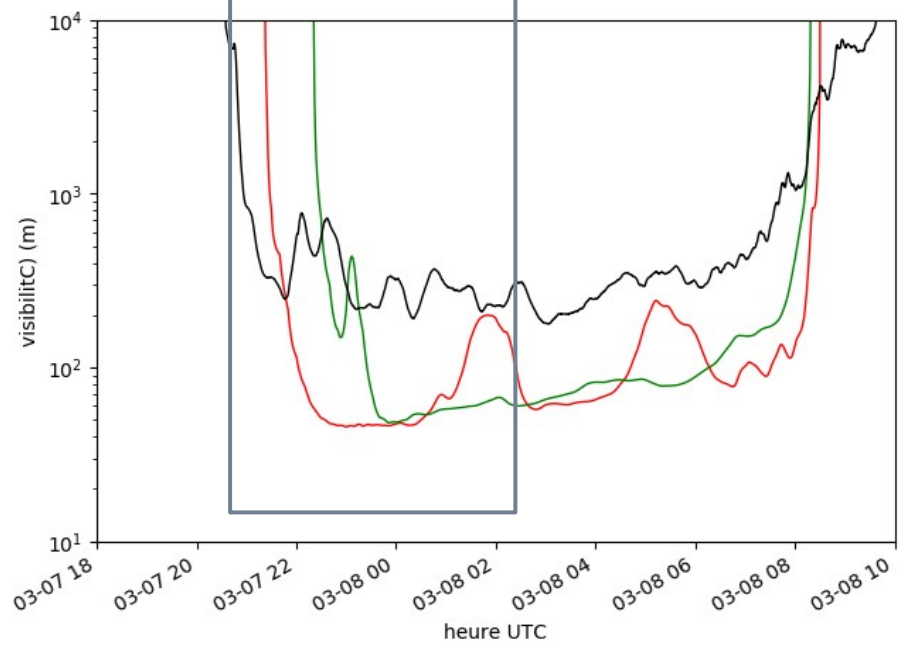
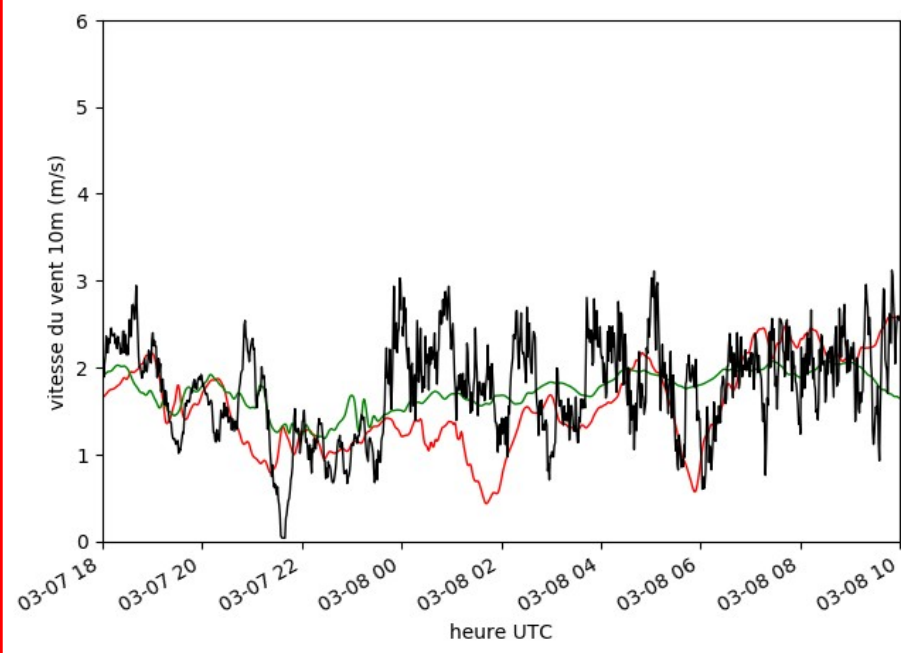
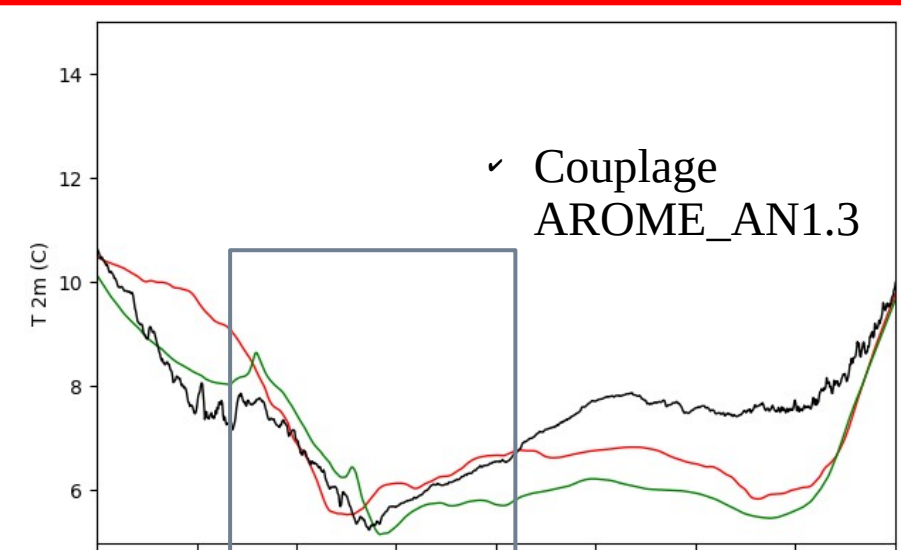
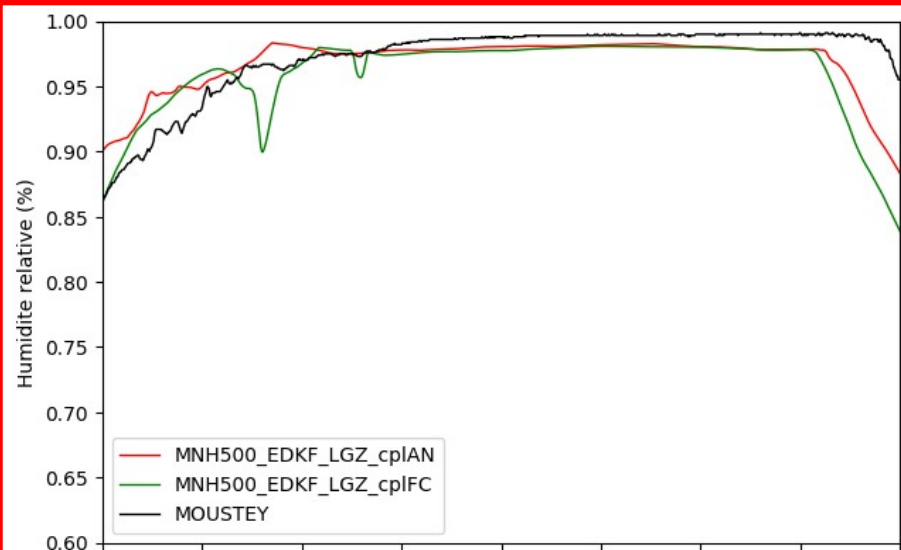


# Comparaisons observations MTO/VISI SuperSite

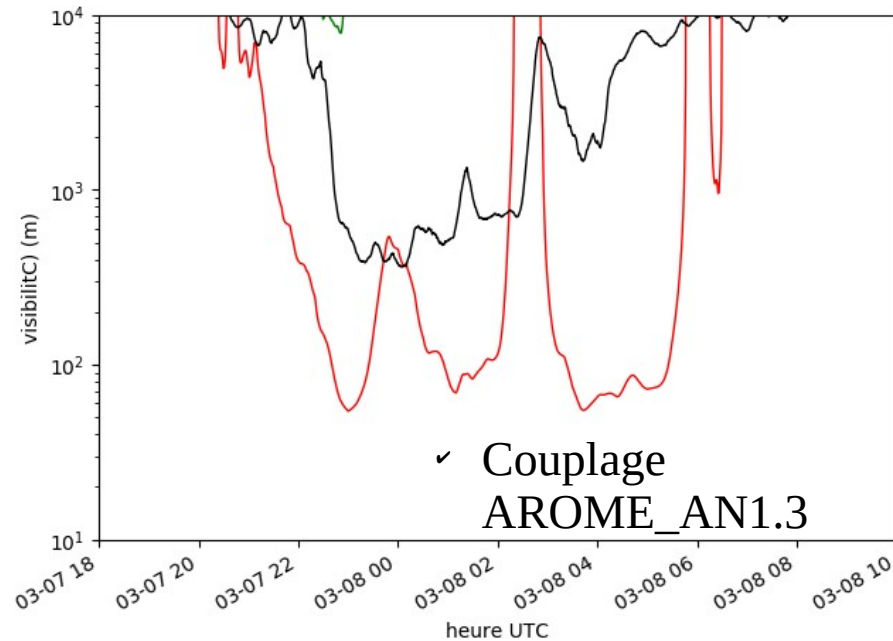
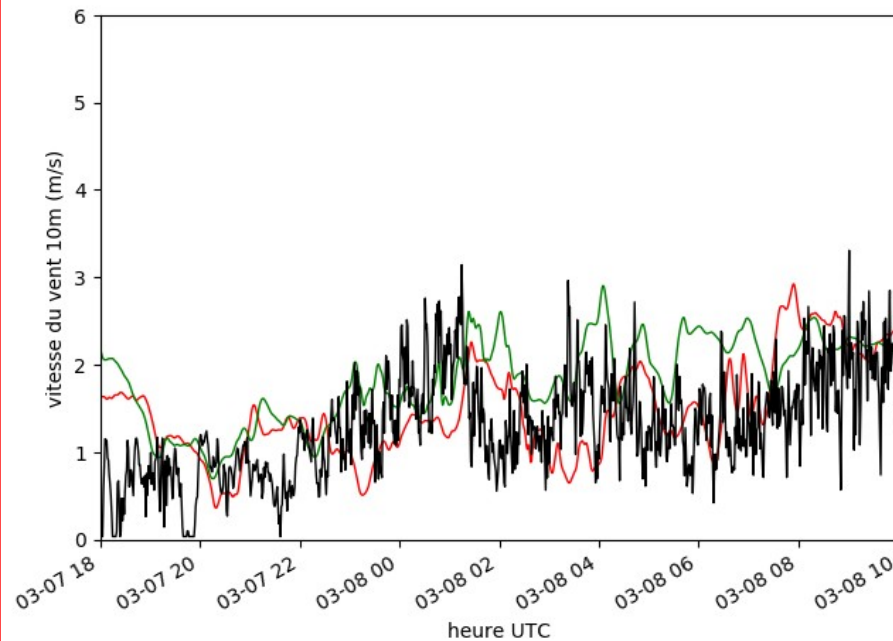
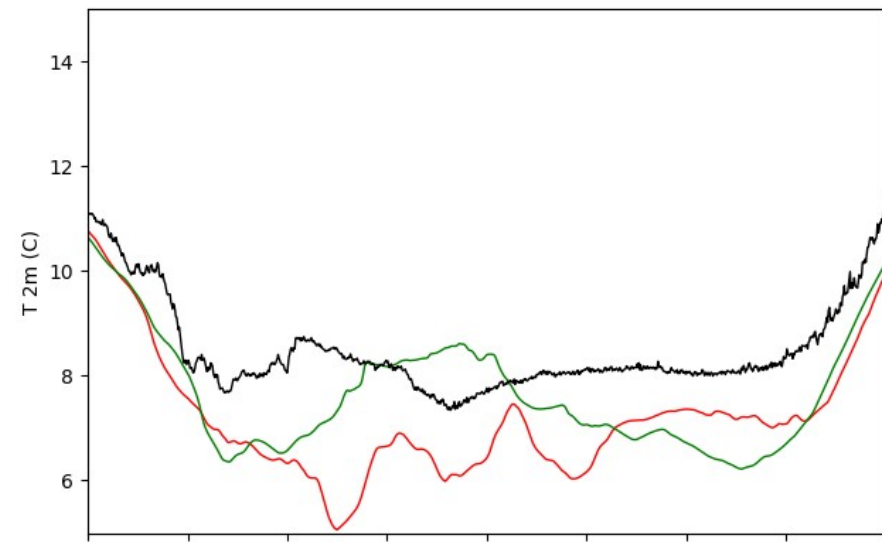
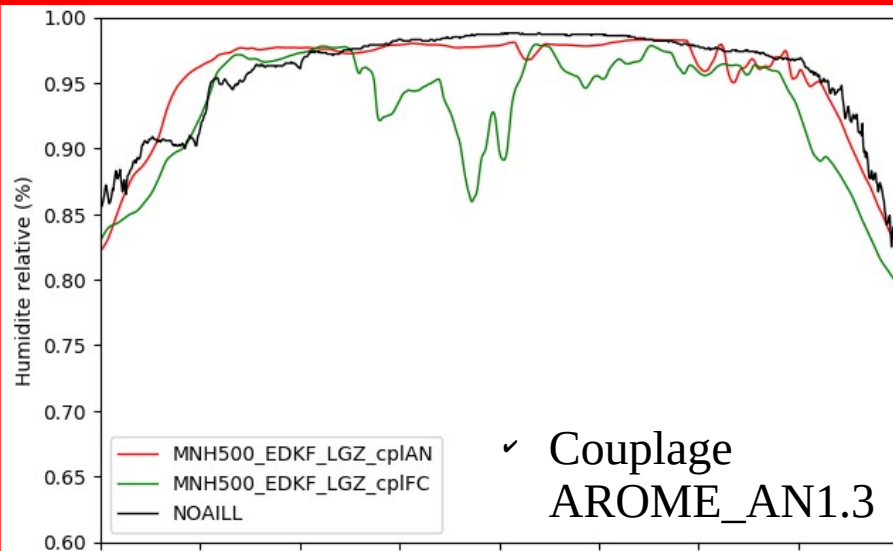


# Comparaisons observations MTO/VISI

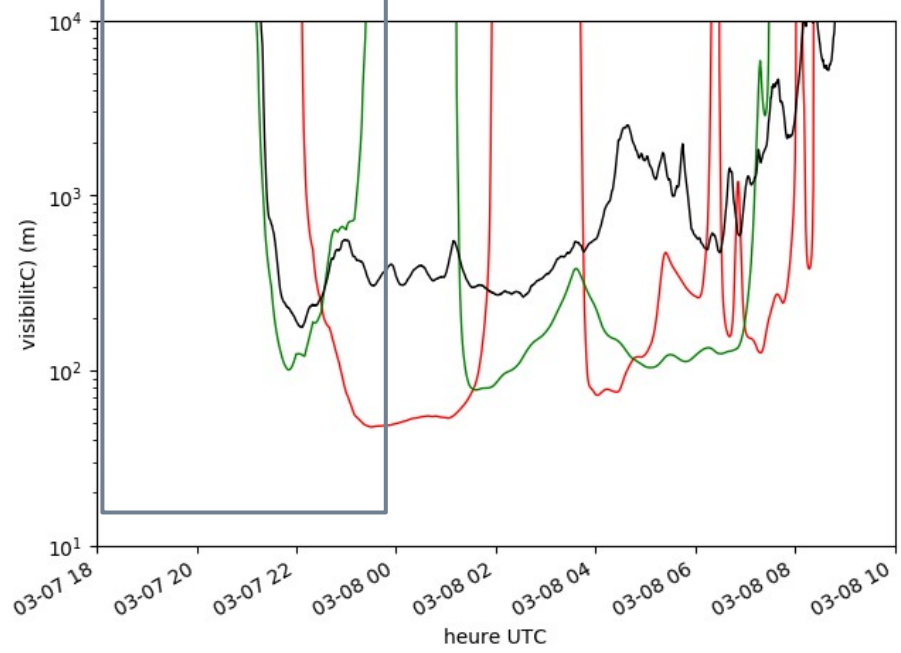
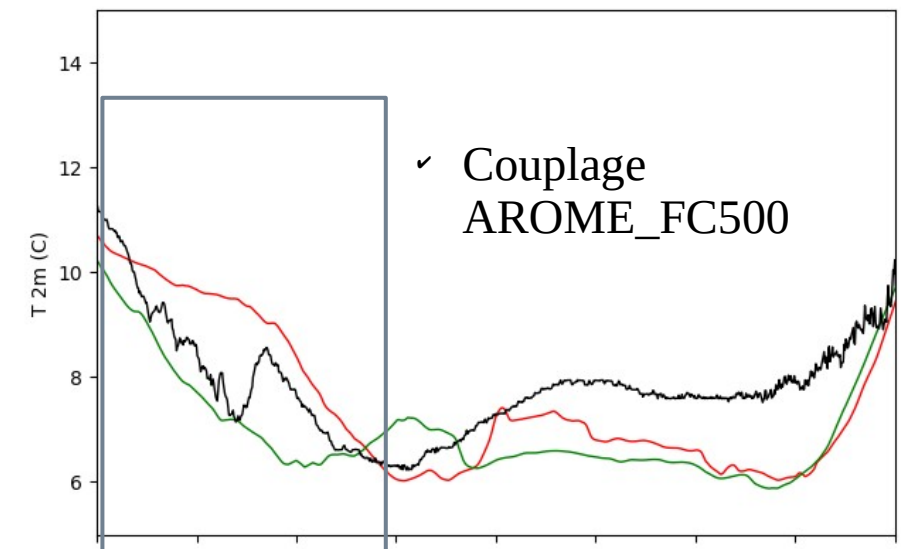
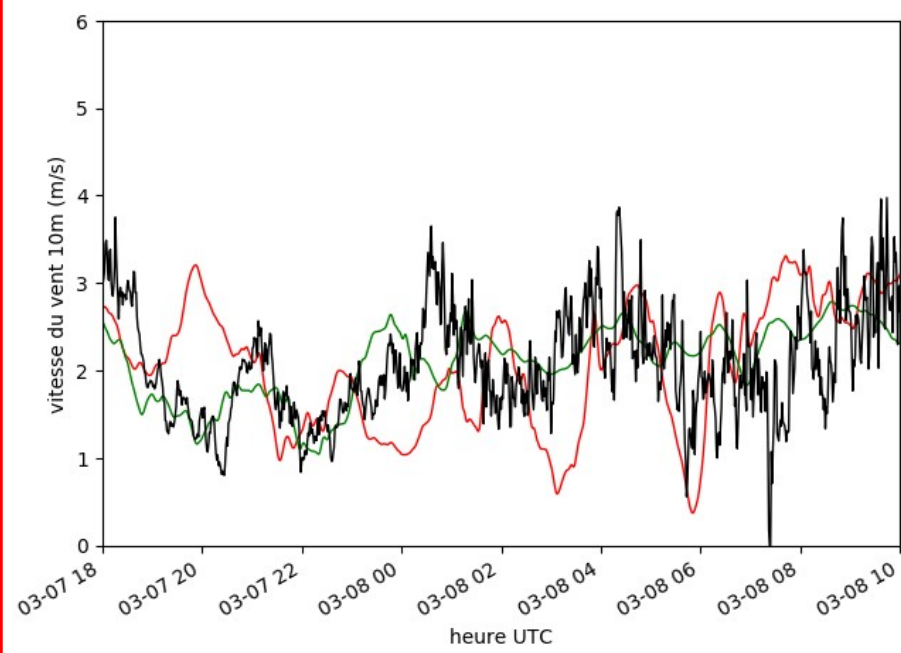
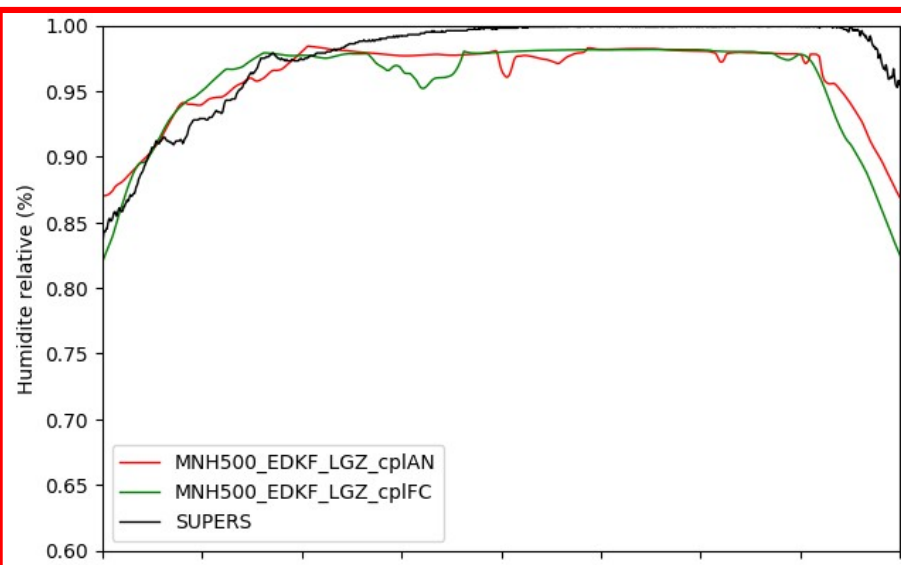
## Moustey



# Comparaisons observations MTO/VISI Noaillan



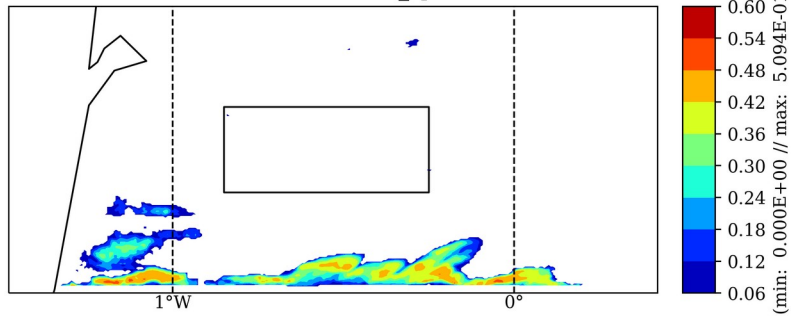
# Comparaisons observations MTO/VISI SuperSite



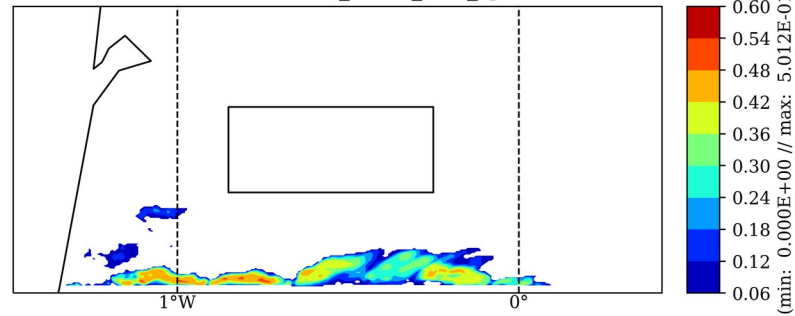
# Gouttelettes d'eau nuageuse au premier niveau modèle

07/03/2020 : 21 HH

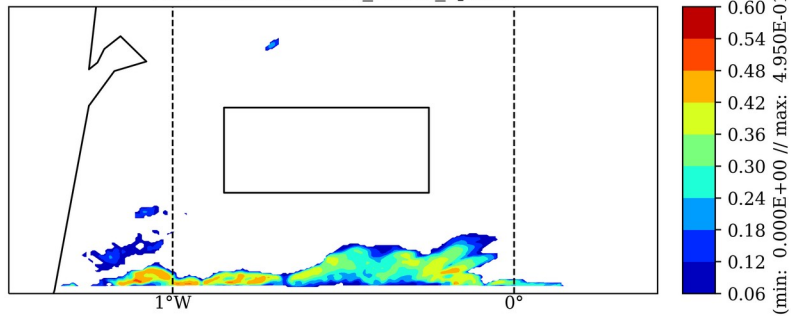
RCT from MNH500\_cplAN



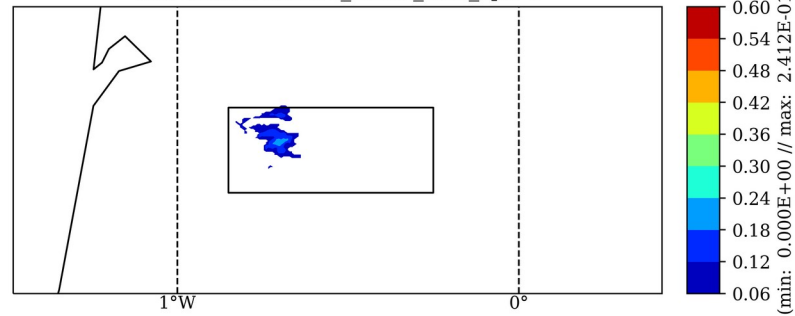
RCT from MNH500\_EDKF\_LGZ\_cplAN



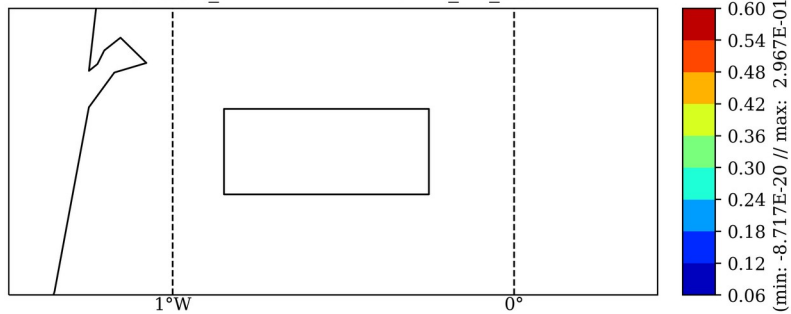
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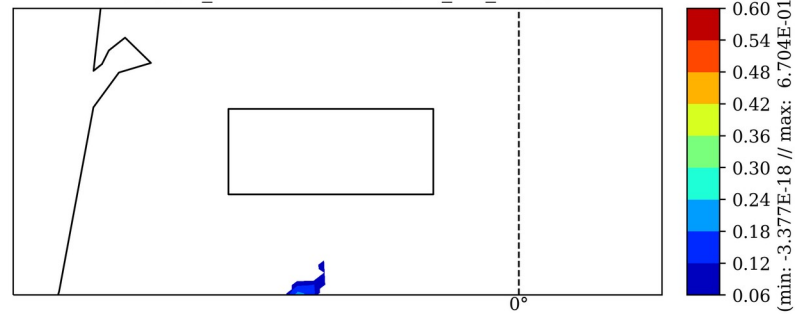
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500



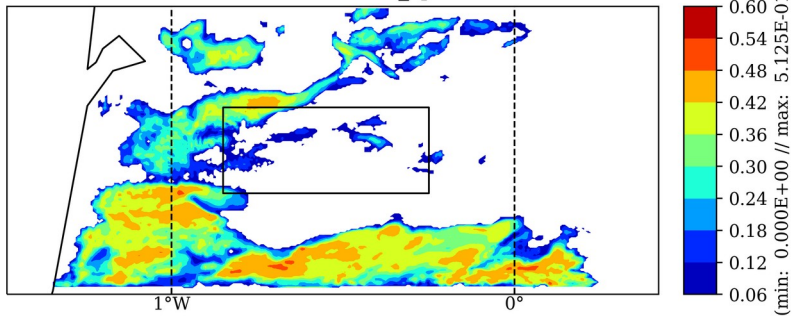
CLOUD\_WATER from AROME\_AN\_1km3



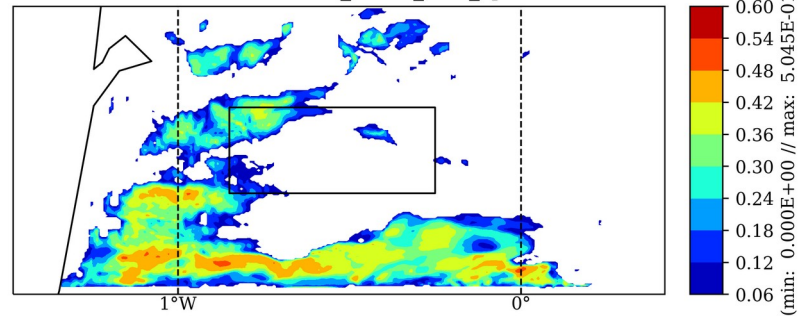
# Gouttelettes d'eau nuageuse au premier niveau modèle

07/03/2020 : 22 HH

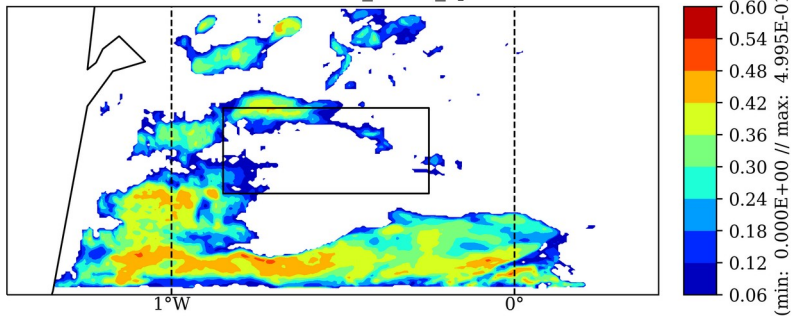
RCT from MNH500\_cplAN



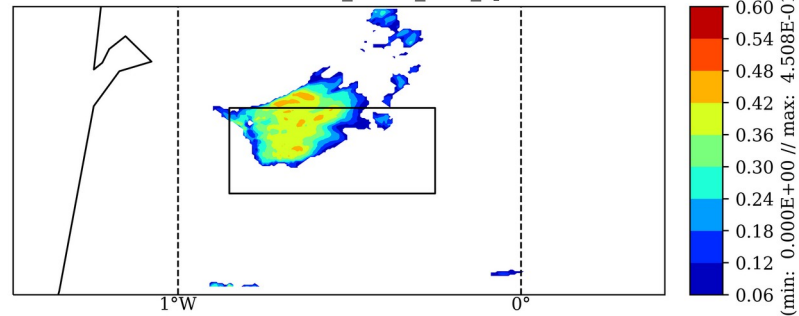
RCT from MNH500\_EDKF\_LGZ\_cplAN



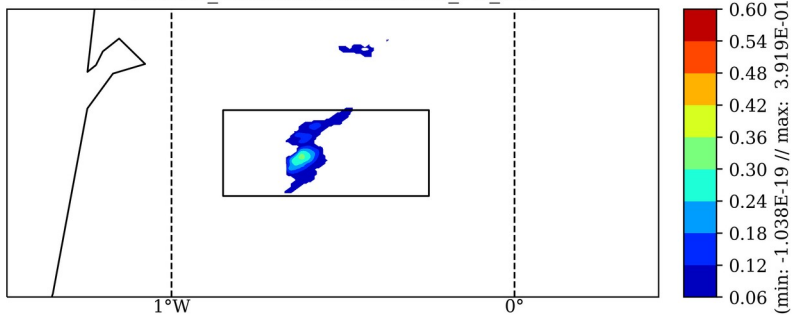
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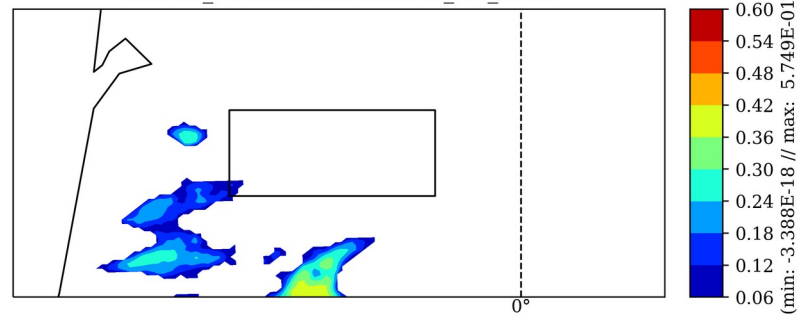
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500

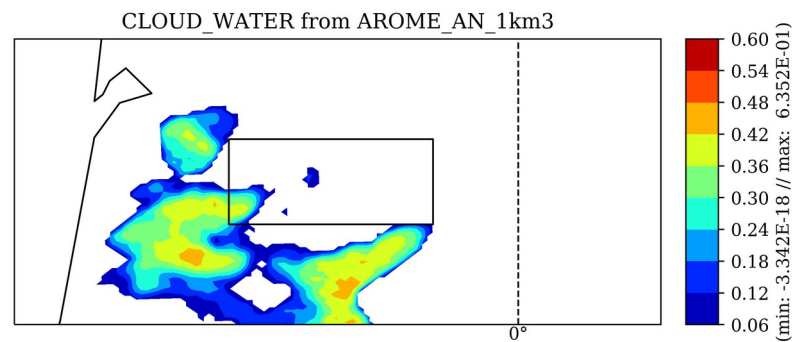
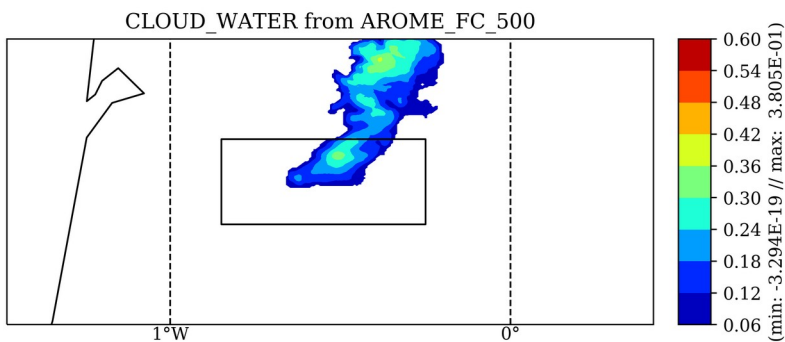
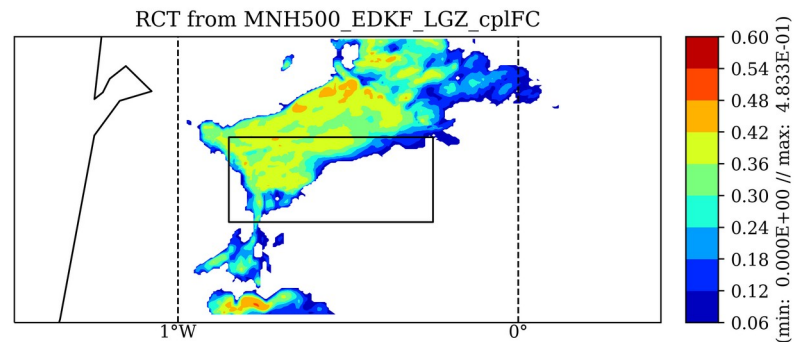
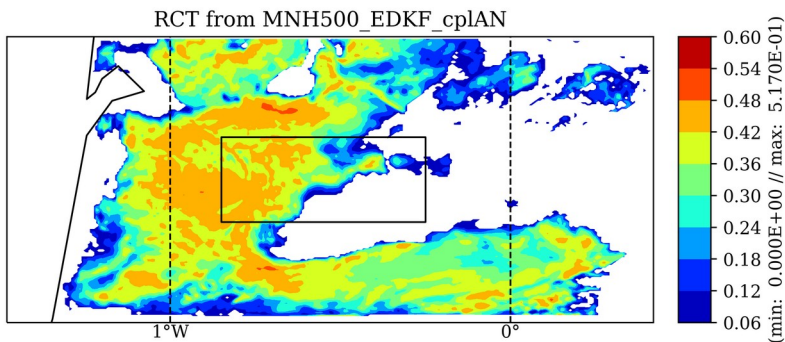
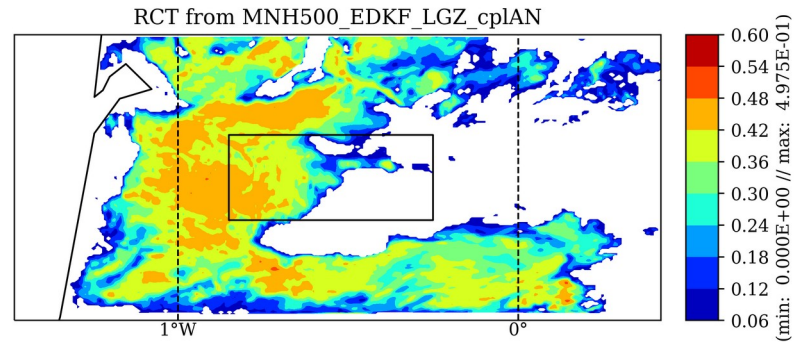
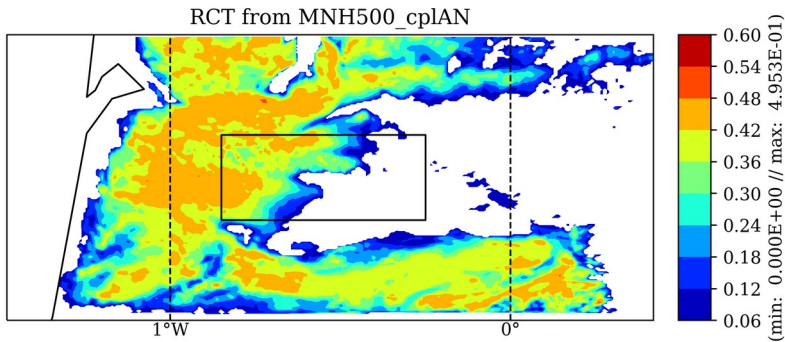


CLOUD\_WATER from AROME\_AN\_1km3



# Gouttelettes d'eau nuageuse au premier niveau modèle

07/03/2020 : 23 HH

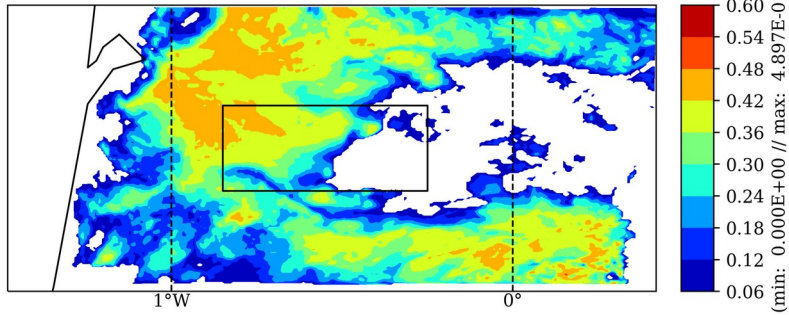




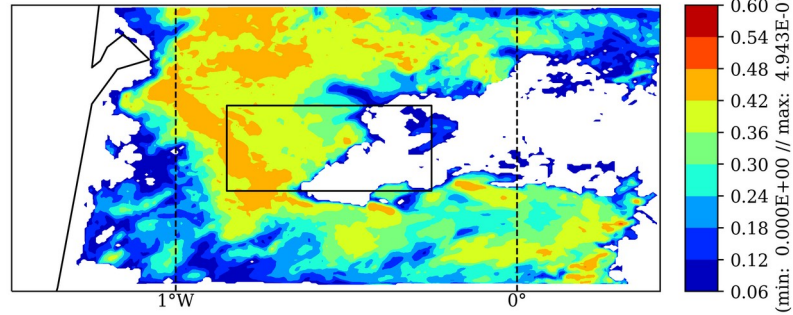
# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 0 HH

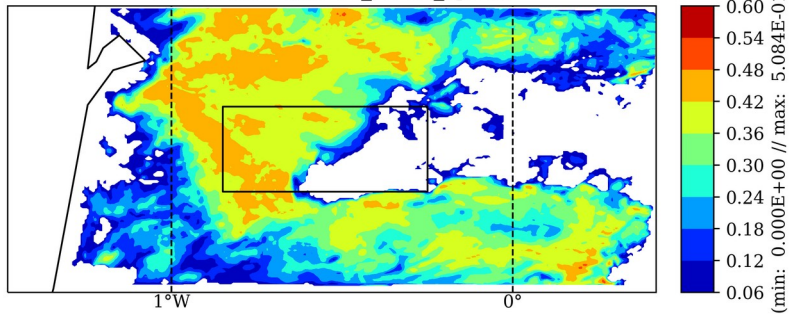
RCT from MNH500\_cplAN



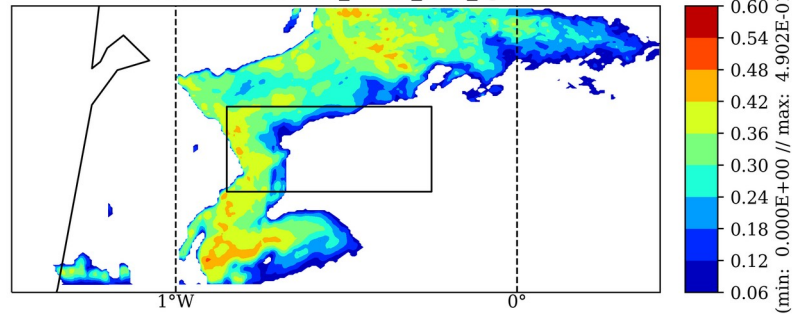
RCT from MNH500\_EDKF\_LGZ\_cplAN



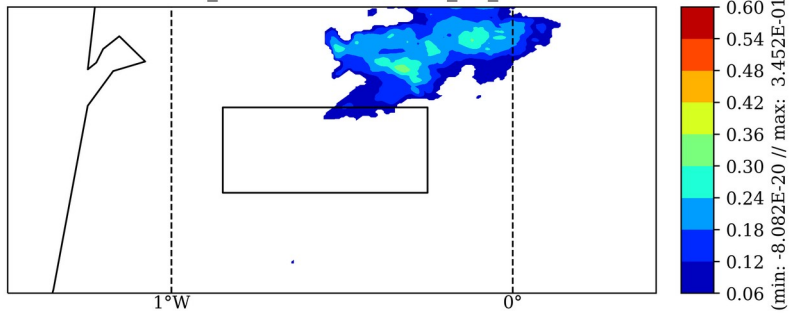
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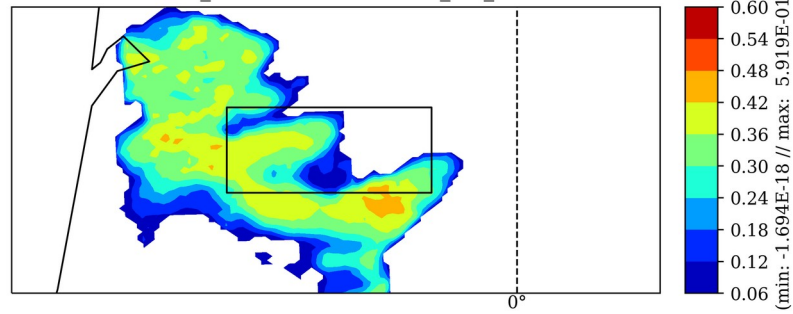
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500



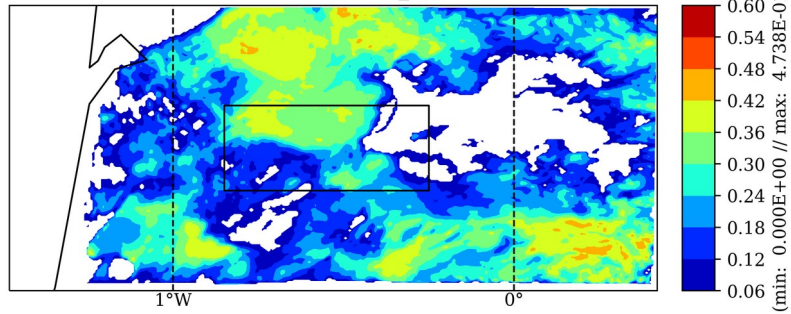
CLOUD\_WATER from AROME\_AN\_1km3



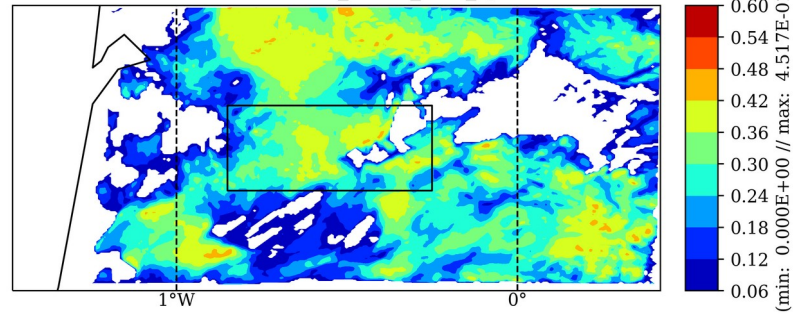
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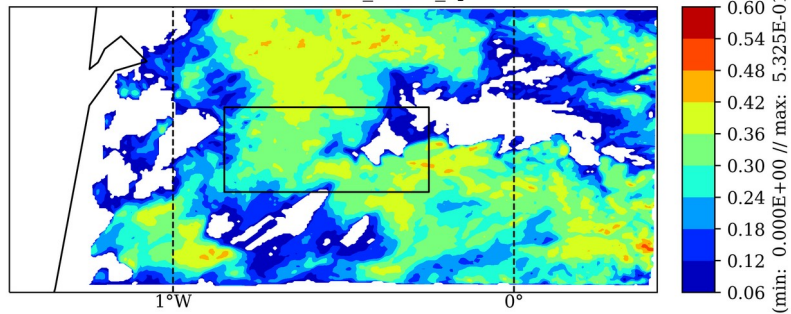
RCT from MNH500\_cplAN



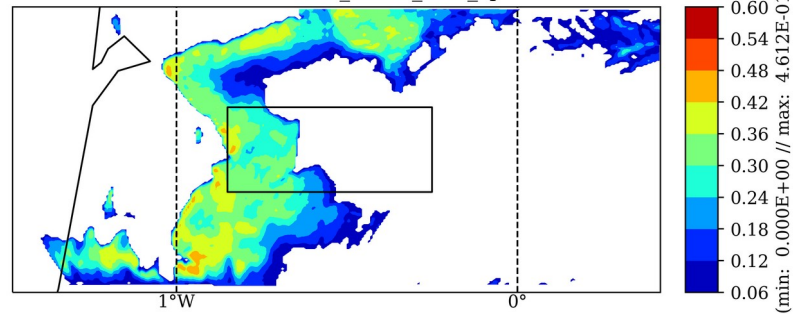
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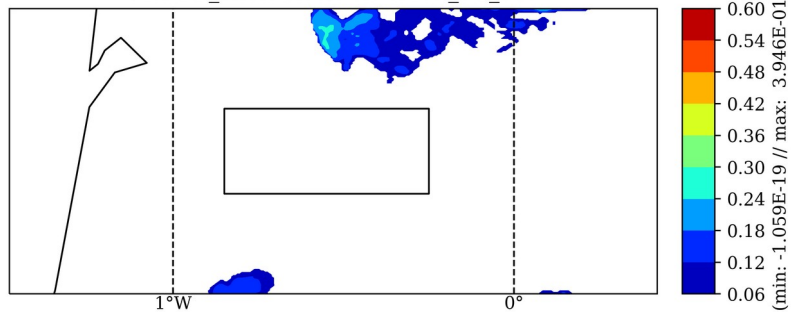
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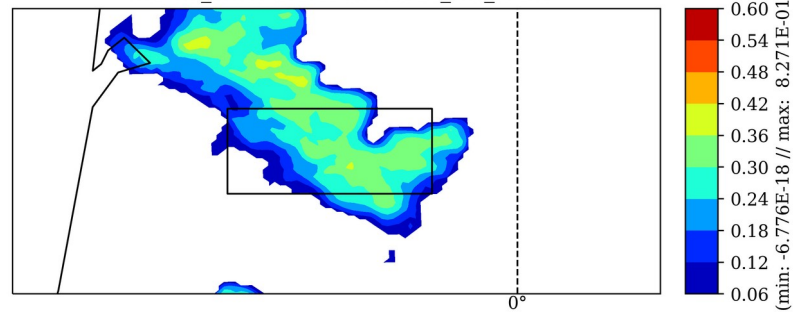
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500



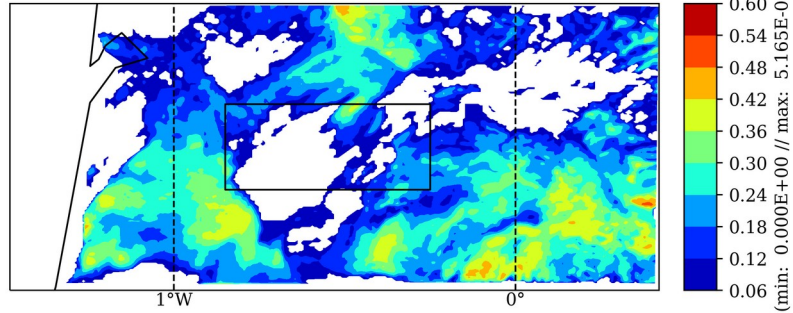
CLOUD\_WATER from AROME\_AN\_1km3



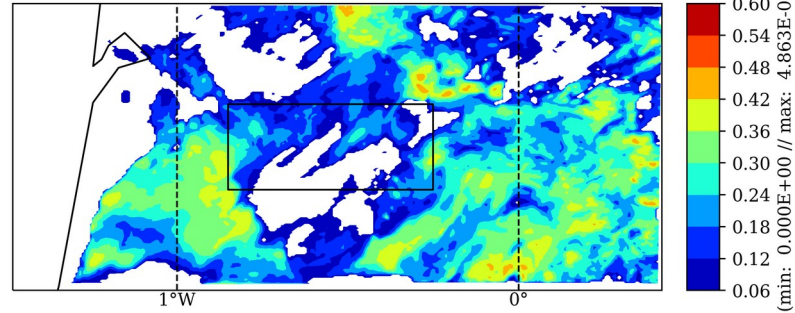
# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 2 HH

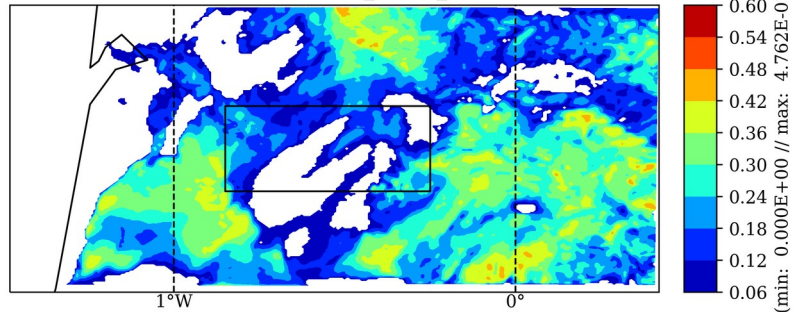
RCT from MNH500\_cplAN



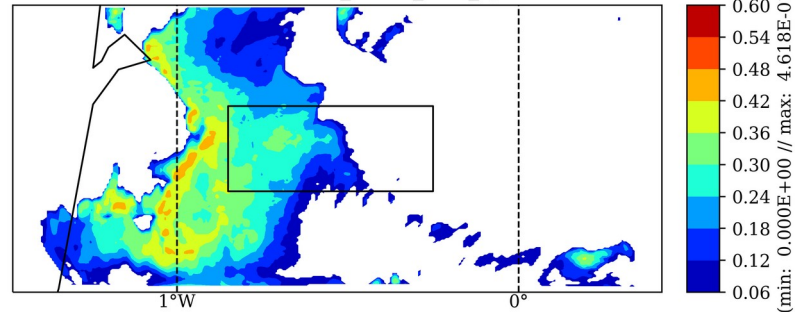
RCT from MNH500\_EDKF\_LGZ\_cplAN



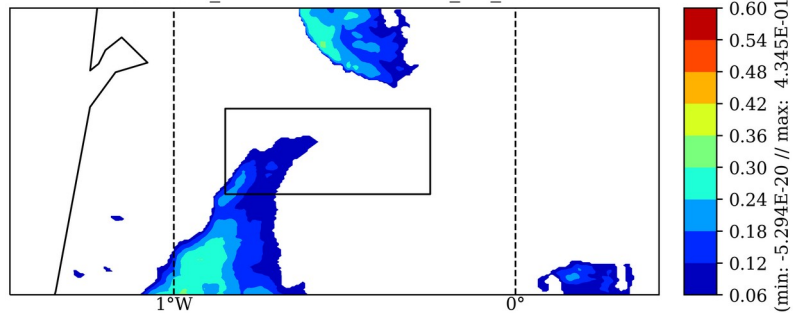
RCT from MNH500\_EDKF\_cplAN



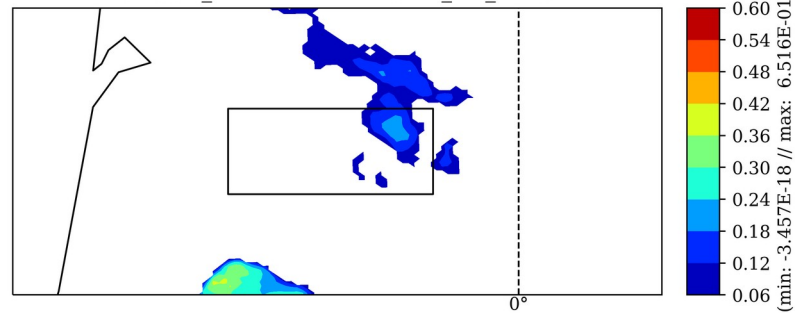
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CLOUD\_WATER from AROME\_FC\_500



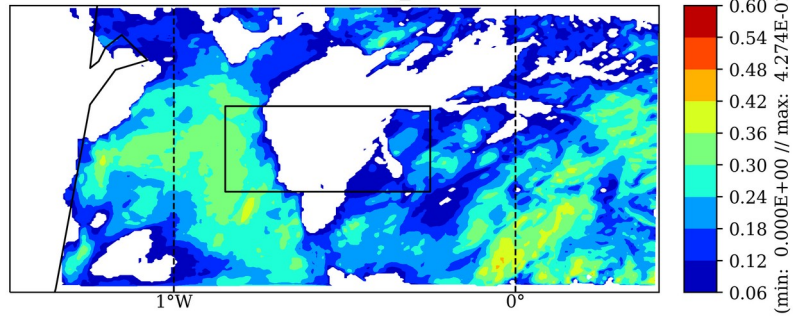
CLOUD\_WATER from AROME\_AN\_1km3



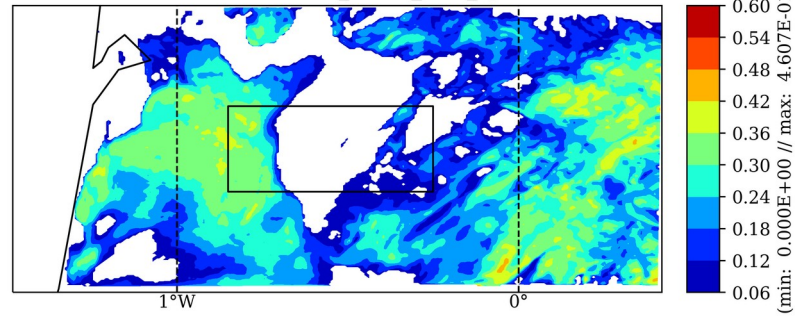
# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 3 HH

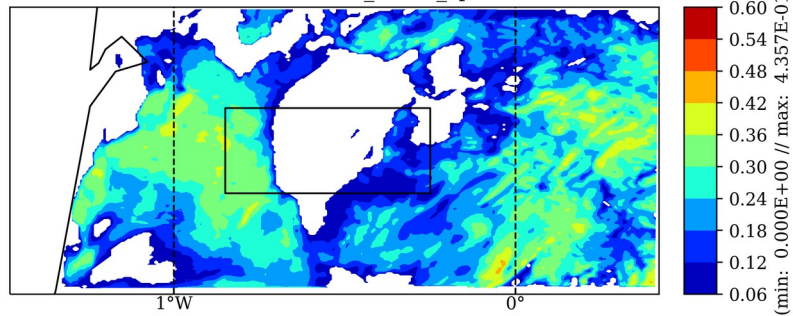
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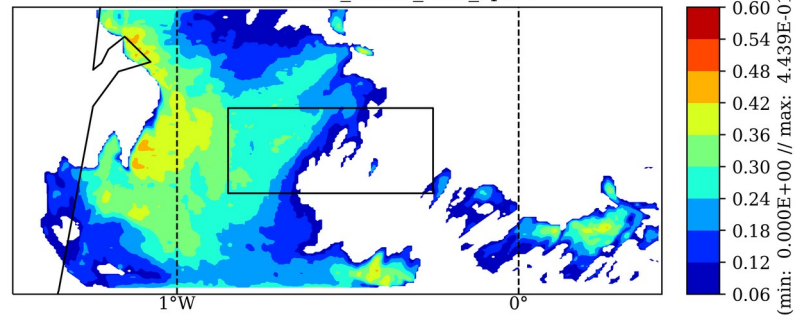
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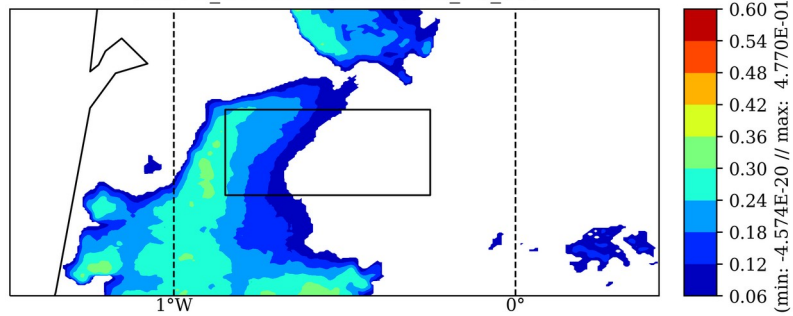
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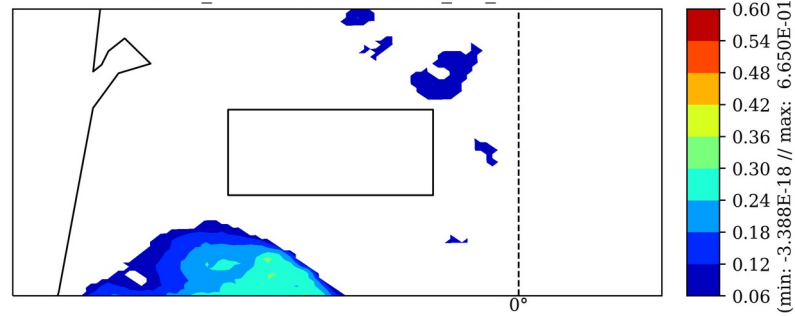
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500



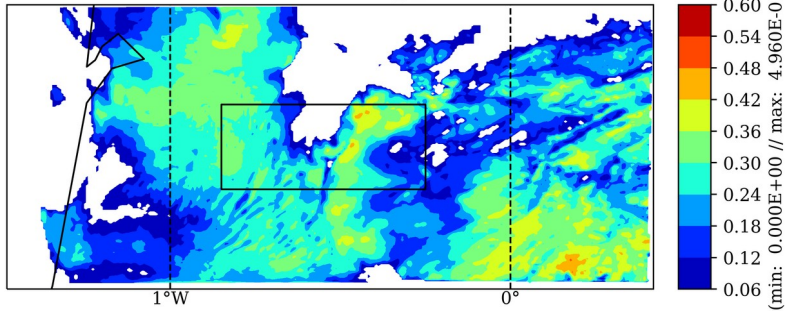
CLOUD\_WATER from AROME\_AN\_1km3



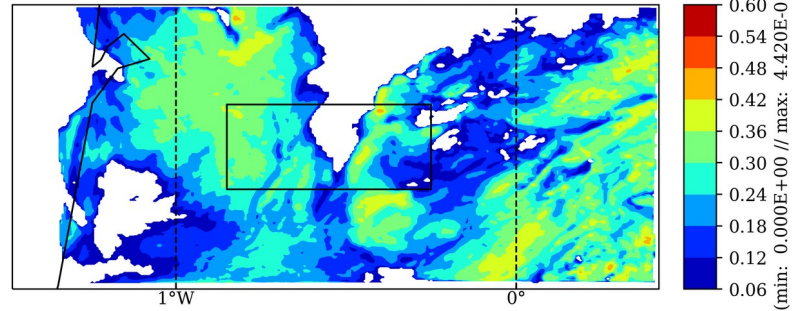
# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 4 HH

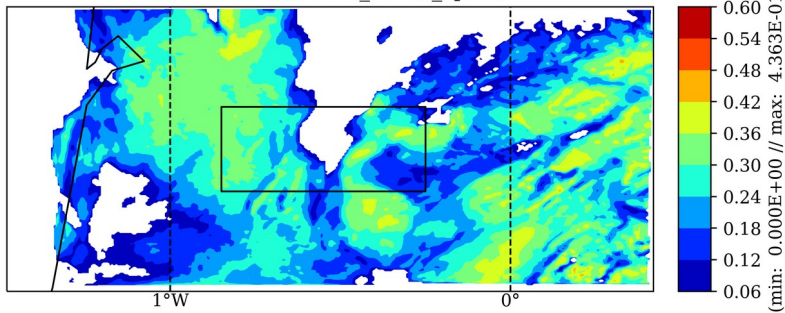
RCT from MNH500\_cplAN



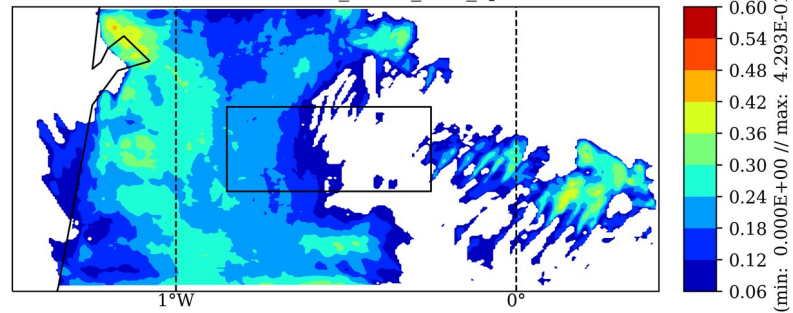
RCT from MNH500\_EDKF\_LGZ\_cplAN



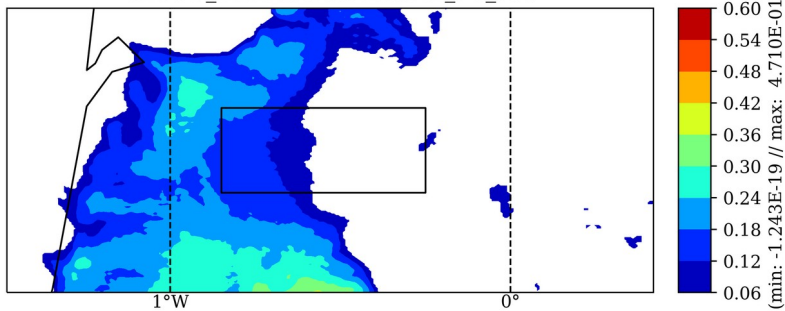
RCT from MNH500\_EDKF\_cplAN



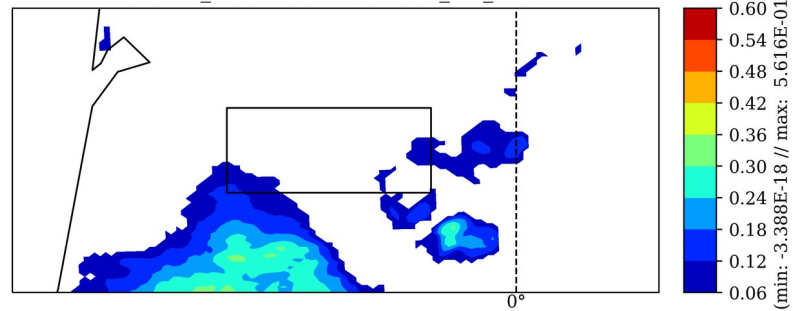
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500



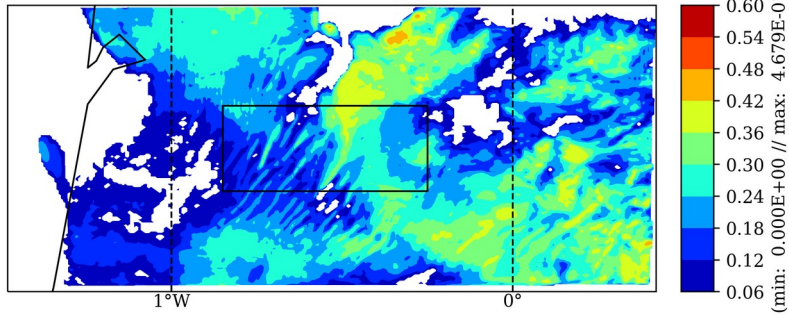
CLOUD\_WATER from AROME\_AN\_1km3



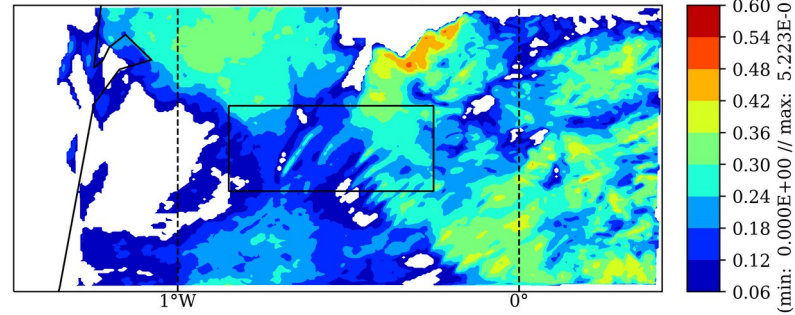
# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 5 HH

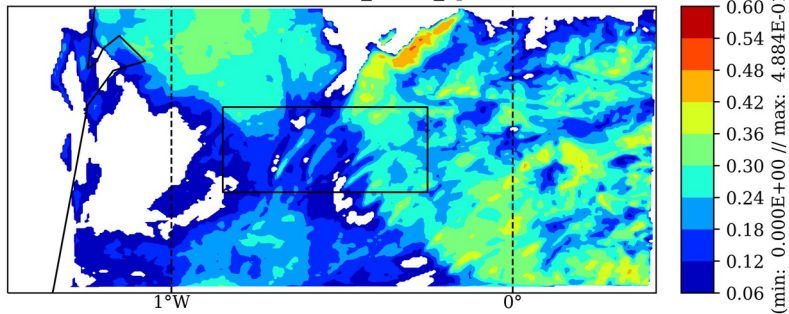
RCT from MNH500\_cplAN



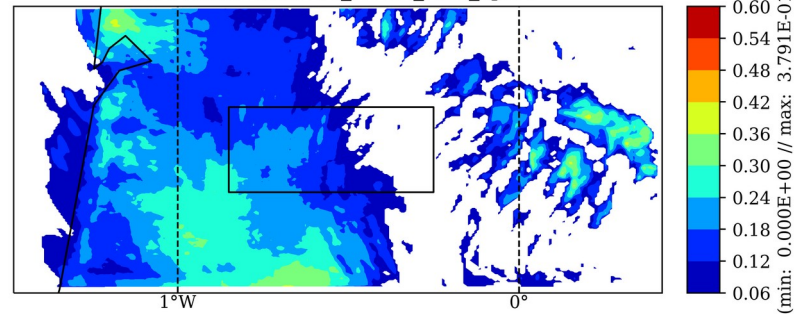
RCT from MNH500\_EDKF\_LGZ\_cplAN



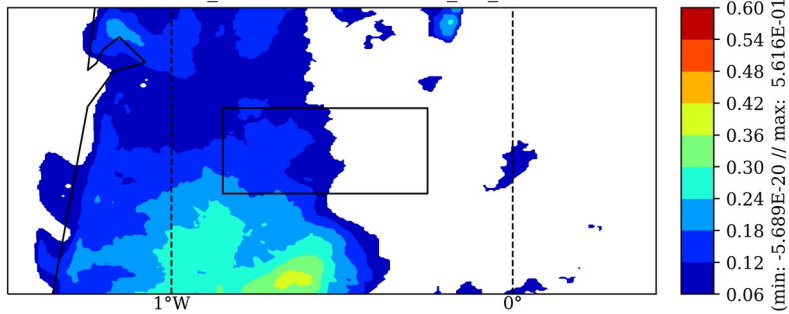
RCT from MNH500\_EDKF\_cplAN



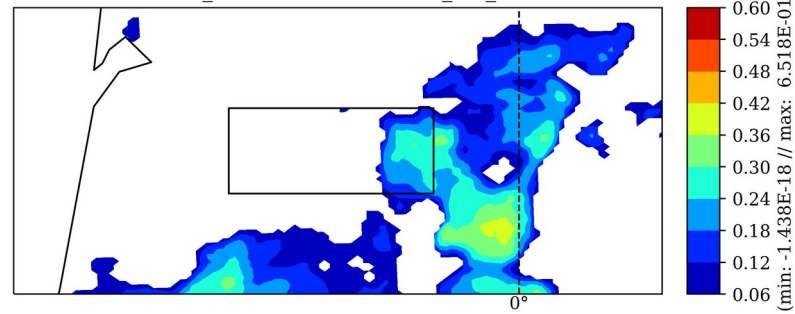
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500



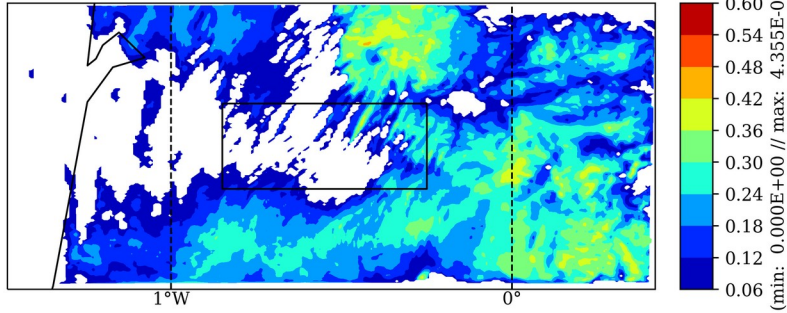
CLOUD\_WATER from AROME\_AN\_1km3



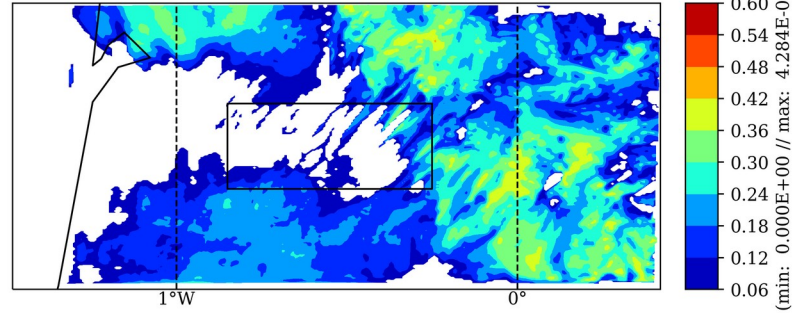
# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 6 HH

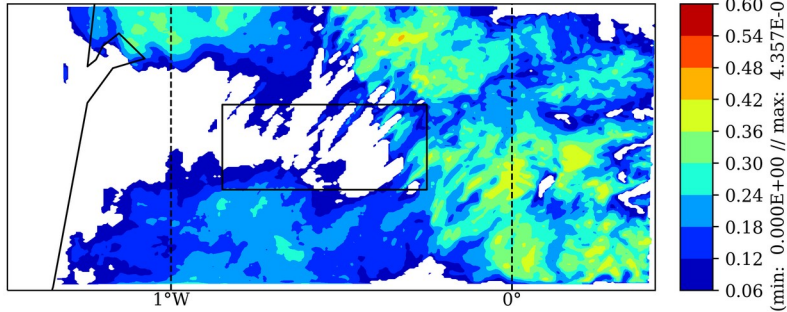
RCT from MNH500\_cplAN



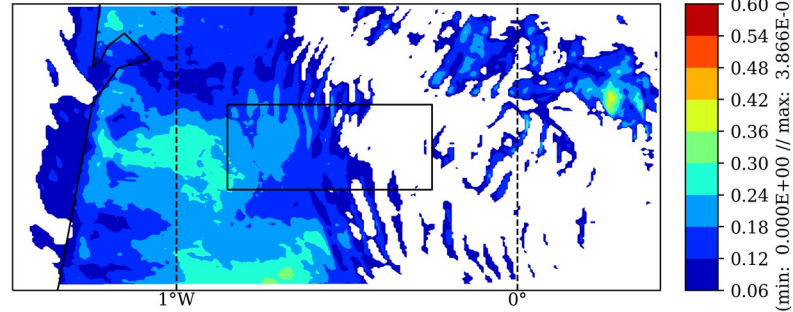
RCT from MNH500\_EDKF\_LGZ\_cplAN



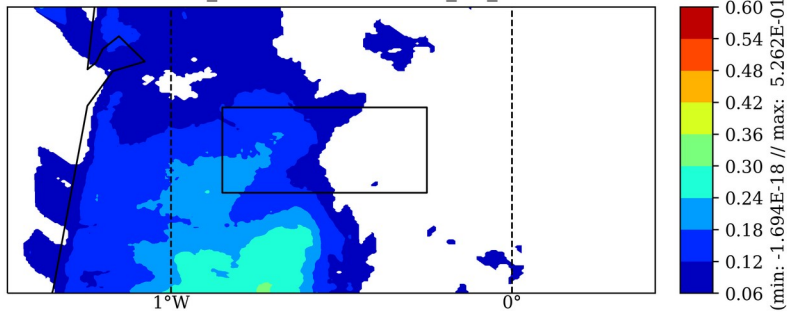
RCT from MNH500\_EDKF\_cplAN



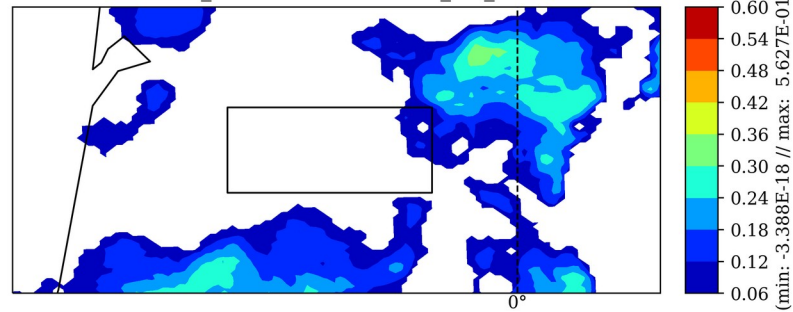
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500

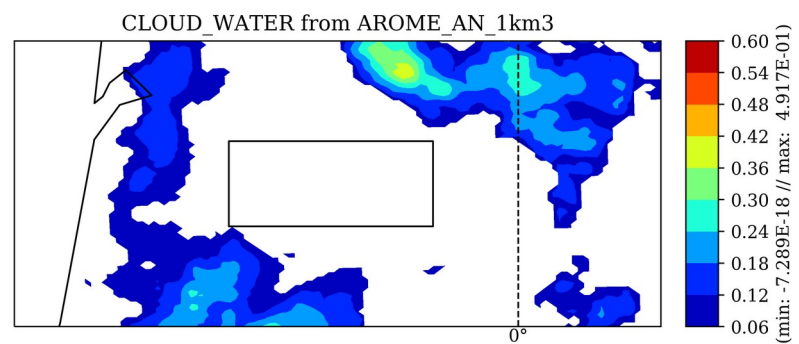
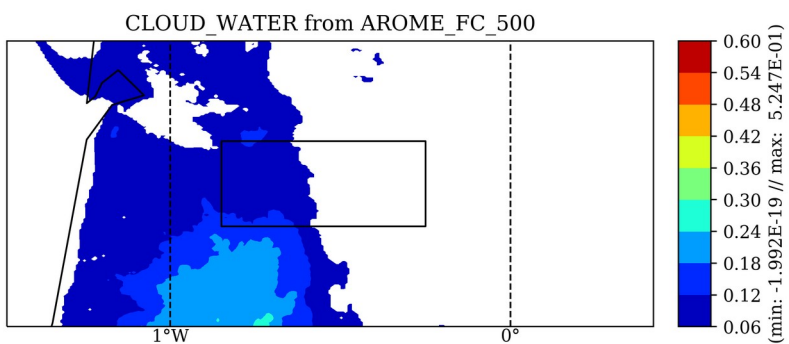
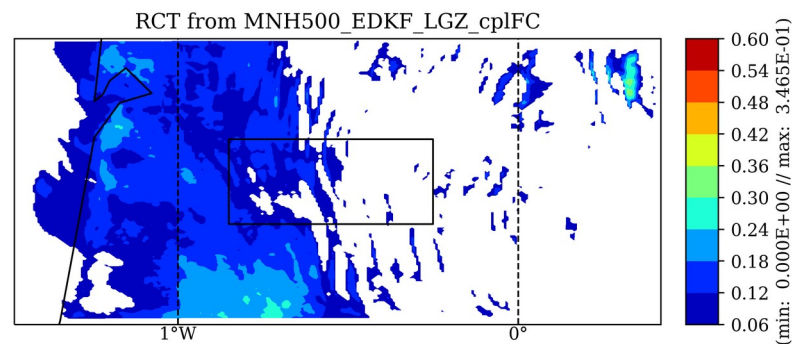
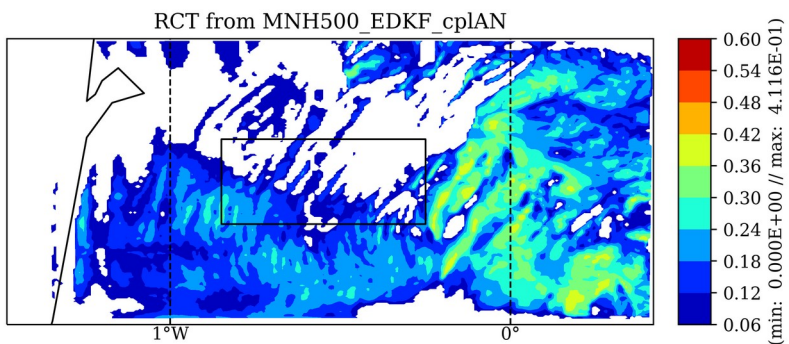
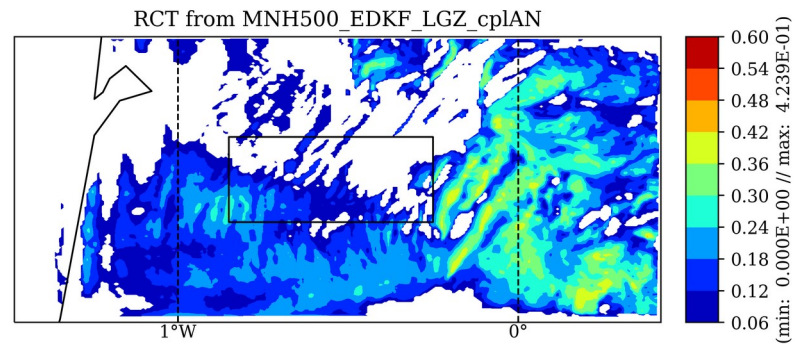
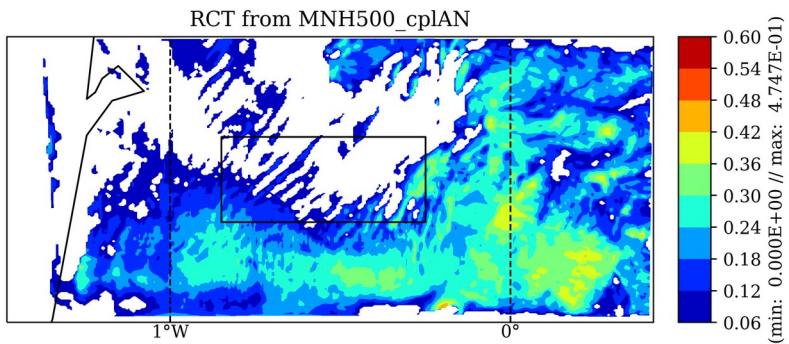


CLOUD\_WATER from AROME\_AN\_1km3



# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 7 HH

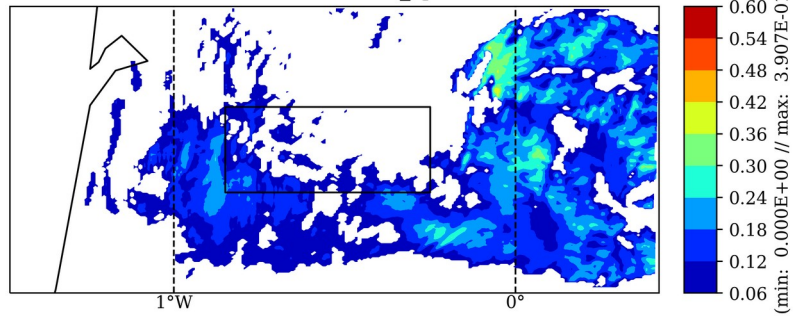




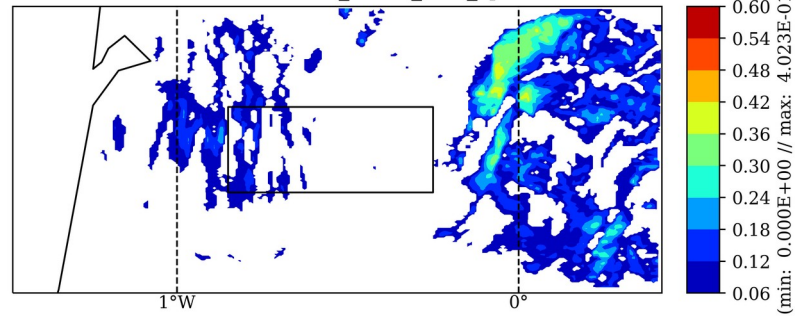
# Gouttelettes d'eau nuageuse au premier niveau modèle

08/03/2020 : 8 HH

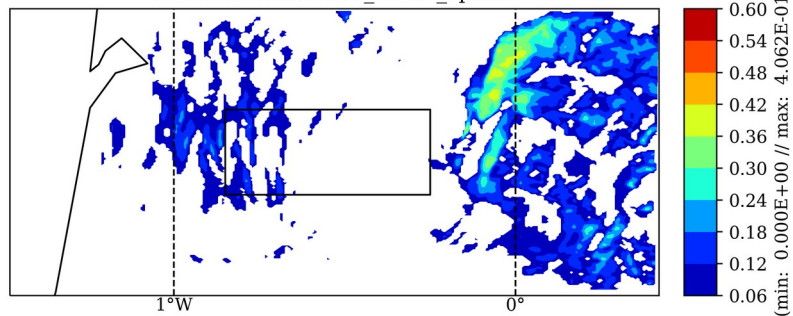
RCT from MNH500\_cplAN



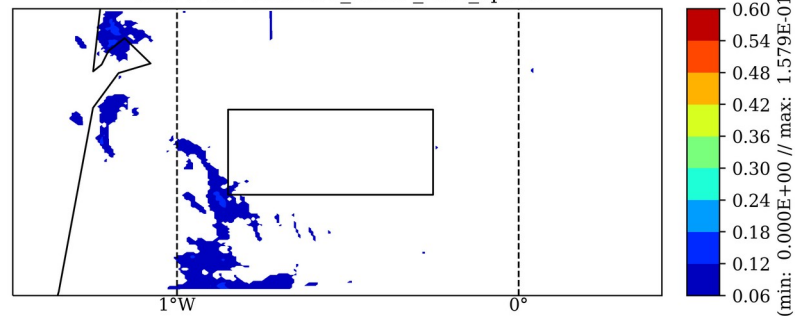
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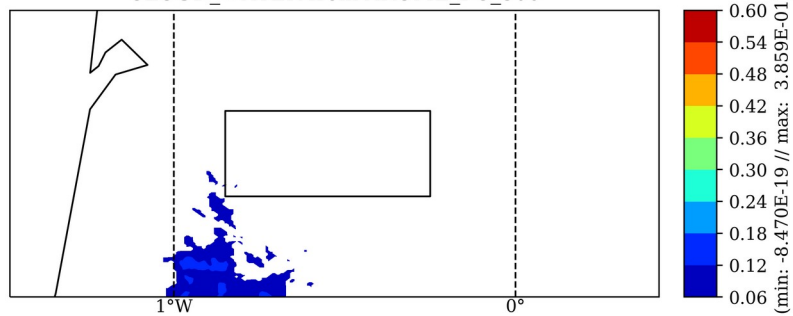
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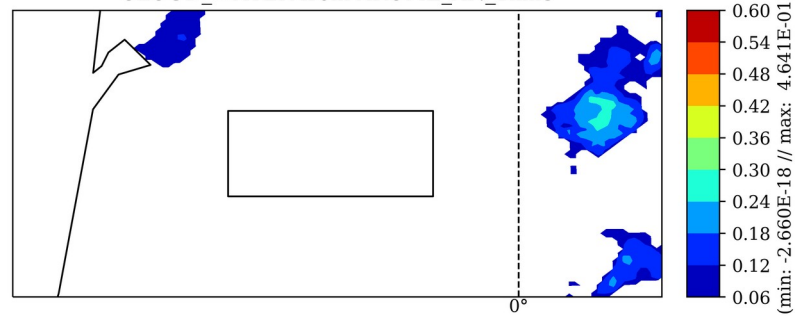
RCT from MNH500\_EDKF\_LGZ\_cplFC



CLOUD\_WATER from AROME\_FC\_500



CLOUD\_WATER from AROME\_AN\_1km3



# Conclusions et perspectives

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- Choix de la meilleure paramétrisation MNH500 pour initier la simulation MNH100 à 100m de résolution
- Tests surface :
  - ECO-SG
  - Analyses SIM v2 pour l'humidité du sol
  - ISBA DIFF vs ISBA 3L
  - Topographie à 30m de résolution
- Tests atmosphère (au retour du congés maternité Octobre2021) :
  - Microphysique LIMA
  - EcRAD



Basée sur les validations  
de Théophile