Status for surface modelisation in AROME/ARPEGE

Eric Bazile with materials from ..

CNRM, Université de Toulouse, Météo-France, CNRS, Toulouse, France

Eric.bazile@meteo.fr

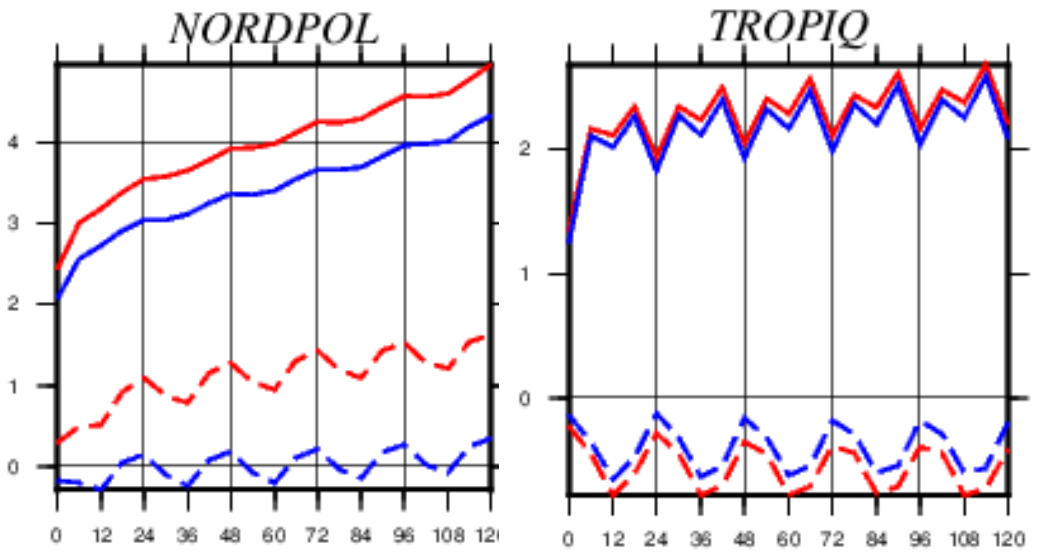
ACCORD All Staff Workshop 4-8 April, 2022, Ljubljana

Outline:

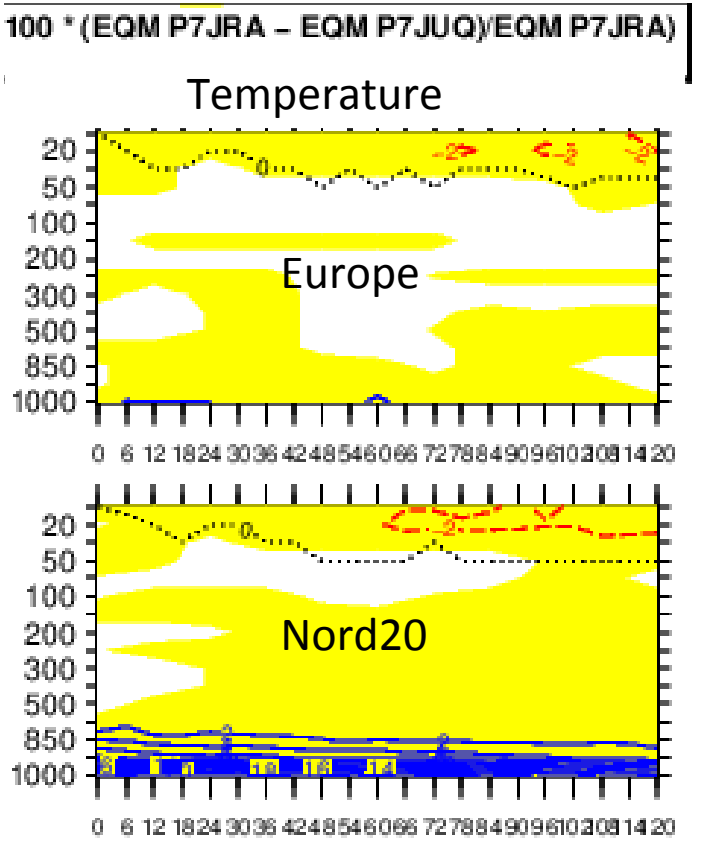
- GELATO-1D : N. Azouz, E. Bazile, A. Napoly, C. Loo
- DIF + ES , DIF +ES + EcoSG : A. Napoly, Y. Seity, C. Birman
- Sensitivity tests around Blagnac: M. Rémy, A. Lemonsu, A. Napoly
- Flake in ARPEGE/AROME: A. Napoly (not shown)

GELATO-1D in the ARPEGE E-Suite

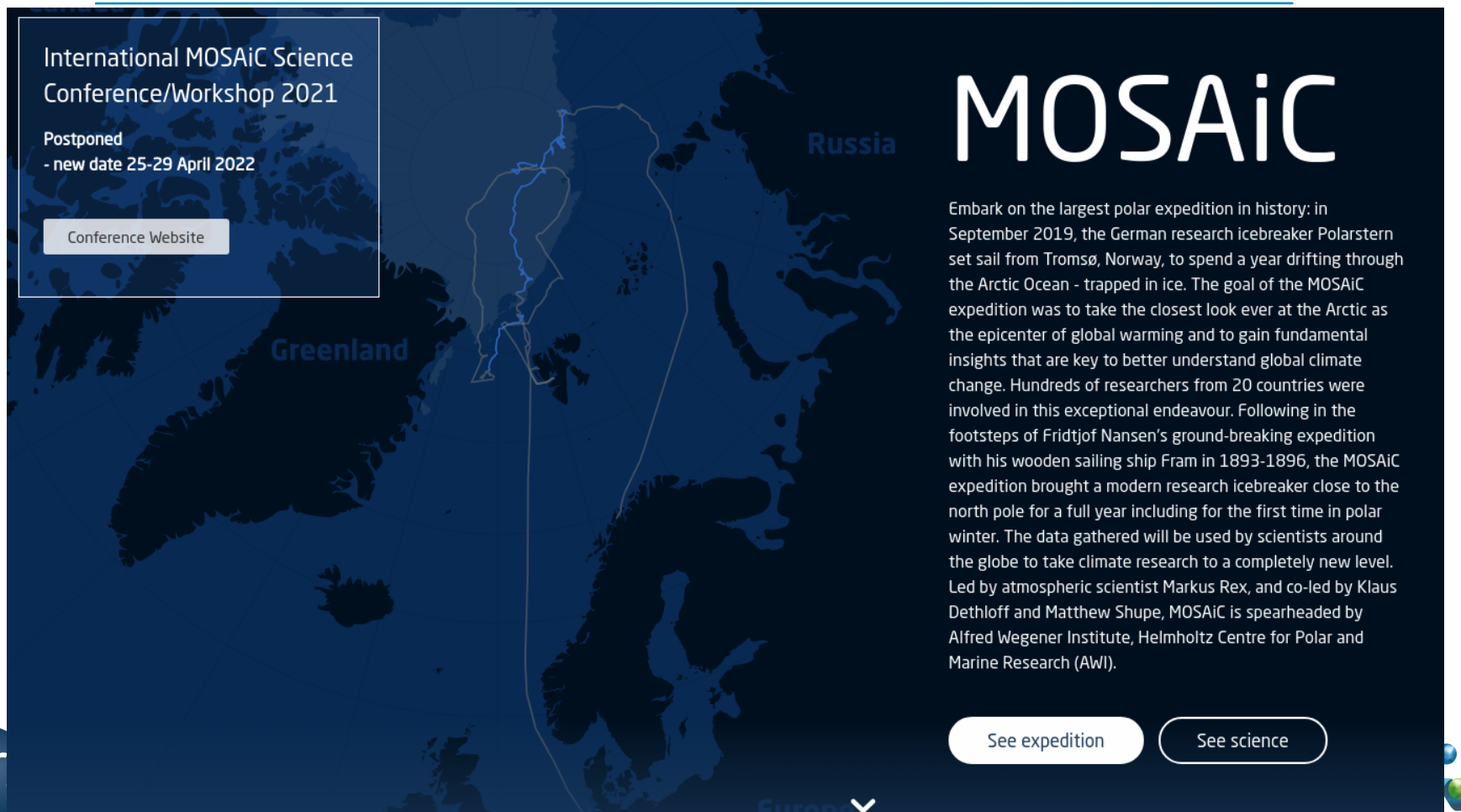
Impact of GELATO-1D in ARPEGE T1200 for 1 year (1/3/2018-→ 22/2/2019)



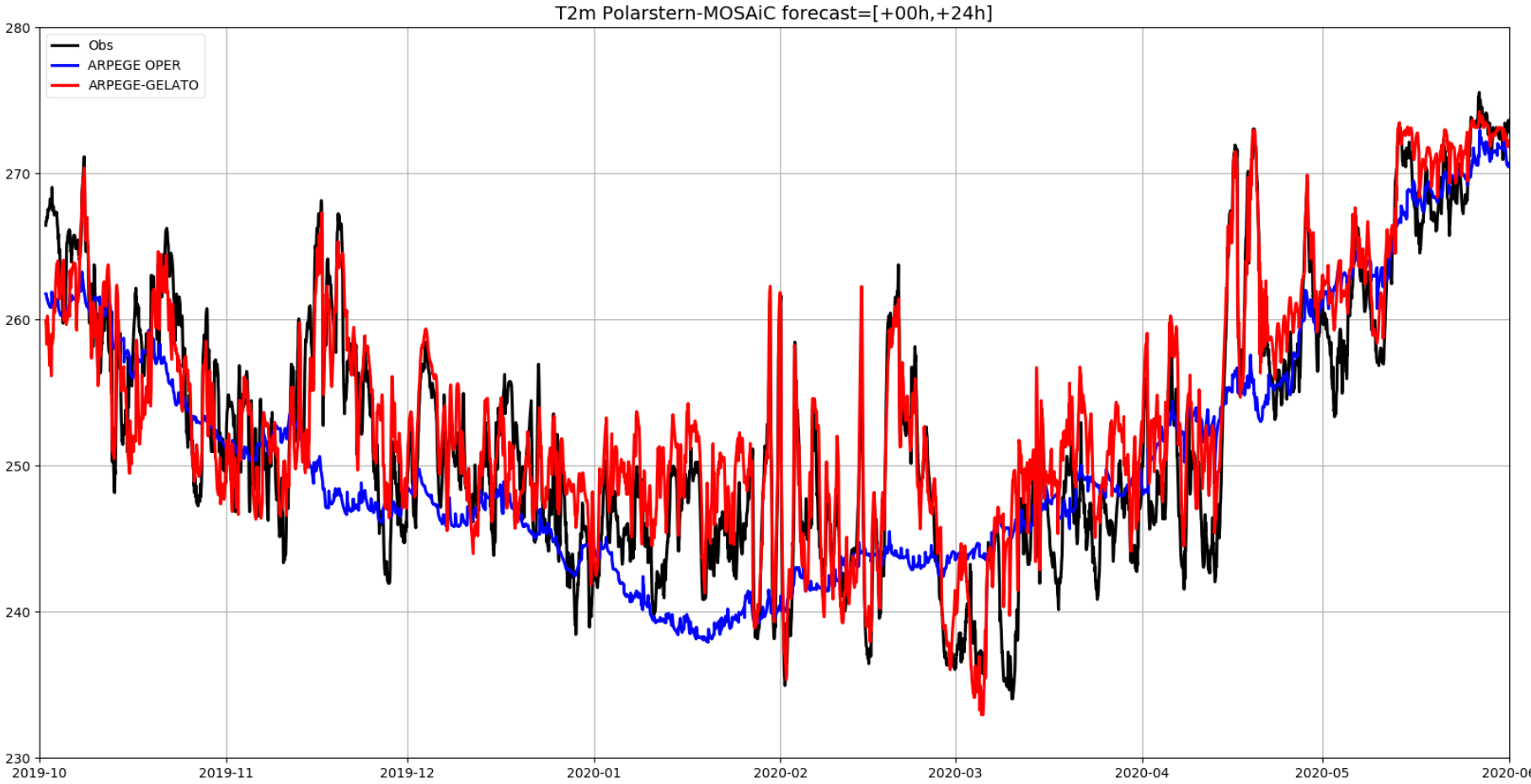
T2m ARPEGE / ARPEGE-GELATO



ARPEGE-GELATO-1D in the ARPEGE E-Suite

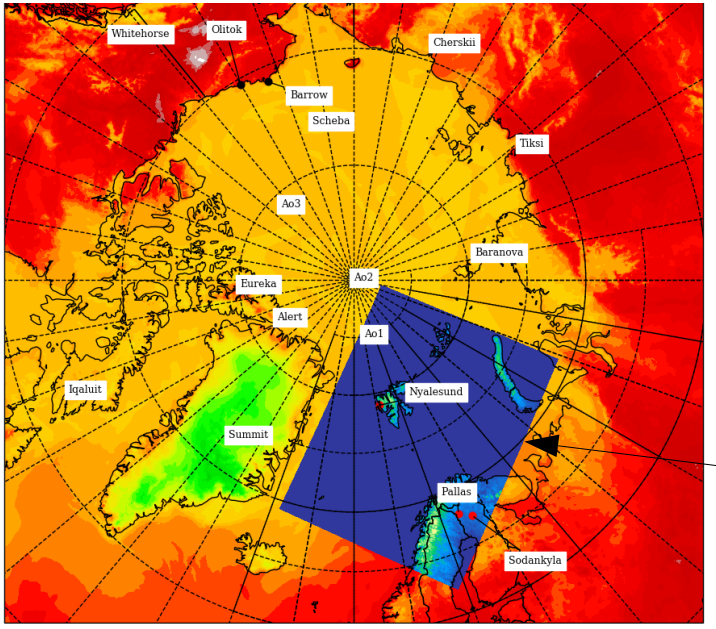


T2m along the Polarstern track



GELATO-1D in the ARPEGE E-Suite and used in AROME within the APPLICATE project

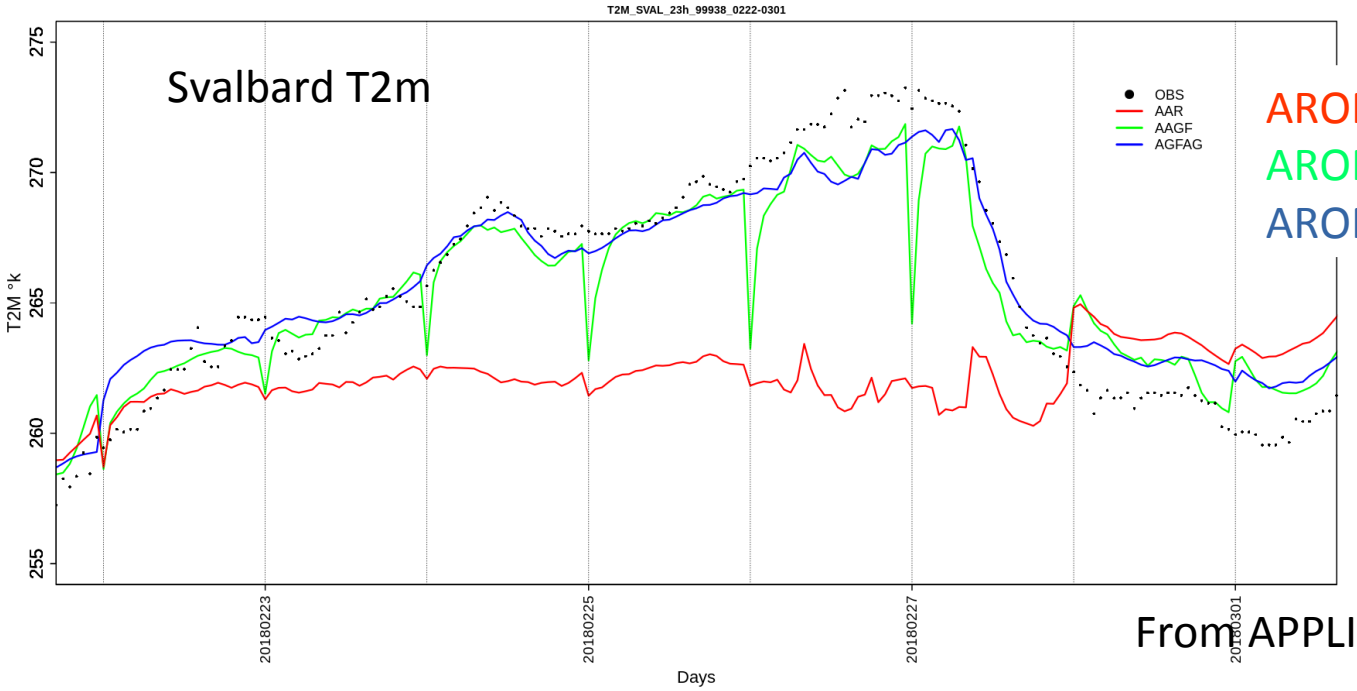
GELATO-1D in AROME-MF over Svalbard during the YOPP-SOP1 (Feb-march 2018)



AROME-MF-Arctic (2.5km L65 and 1.3km L90)

GELATO-1D in the ARPEGE E-Suite and used in AROME within the APPLICATE project

GELATO-1D in AROME-MF over Svalbard during the YOPP-SOP1 (Feb-march 2018)



AROME

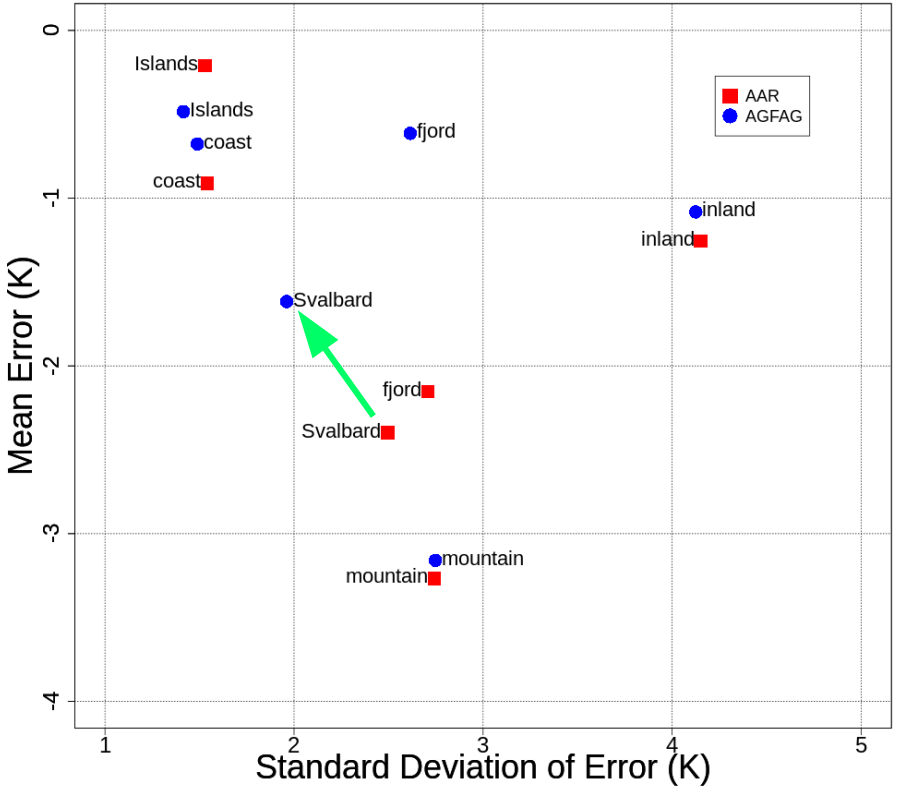
AROME-G1D-LBC-ARP

AROME-G1D-LBC-ARP-G1D

From APPLICATE Delivrable 5.3

GELATO-1D in the ARPEGE E-Suite and used in AROME within the APPLICATE project

GELATO-1D in AROME-MF over Svalbard during the YOPP-SOP1 (Feb-march 2018)



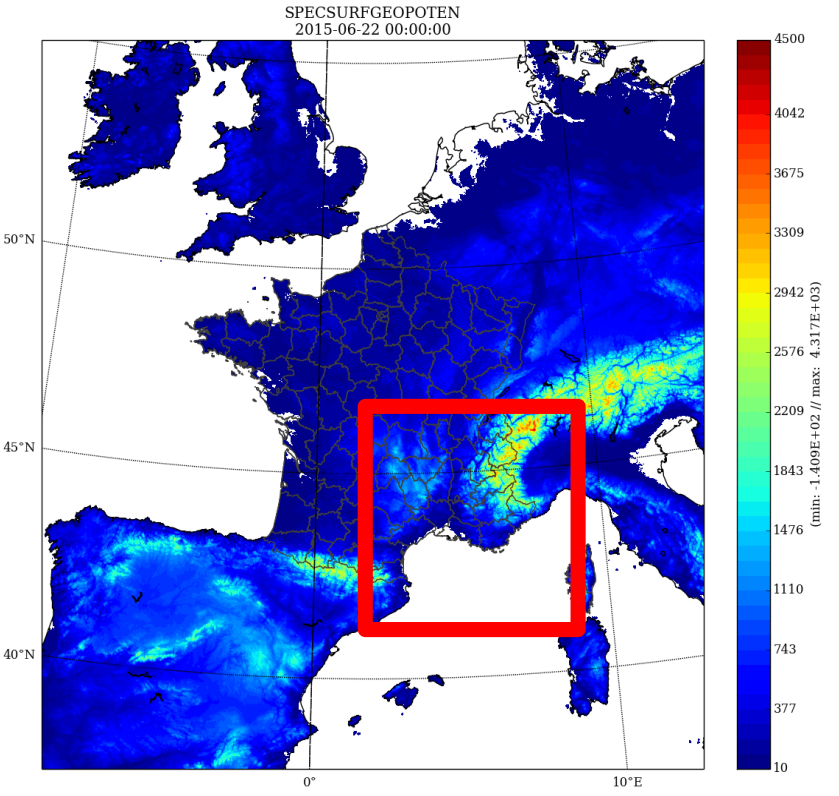
AROME

AROME-G1D-LBC-ARP-G1D

From APPLICATE Delivrable 5.3

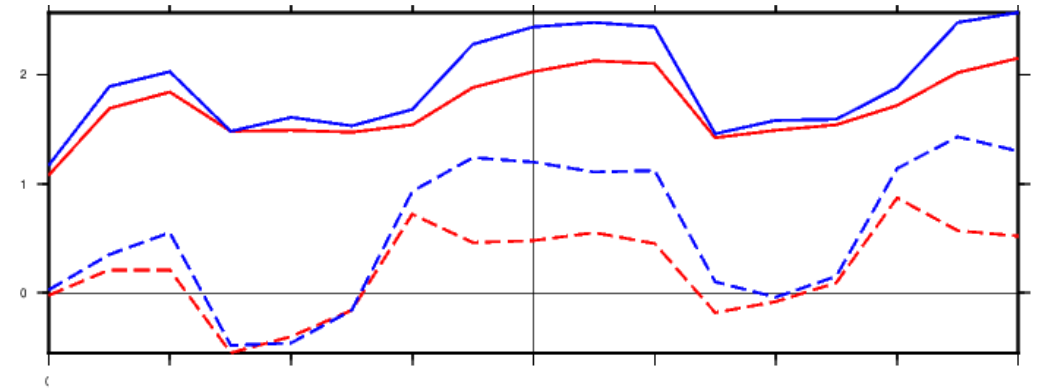
DIF+ES in AROME cy46 + surfex V8.1+

- 3dvar configuration on a small domain with sea/montains/towns.
- July 2019 → September 2020
- Start from 6 months Offline Surfex
- In surface analysis, report T2m/Hu2m increments in soil layers in a simple way.
  - Tg increments: uses T2m increments in the first 8 layers, decreasing increments with soil depth
  - Wg increments: uses T2m and Hu2m increments, adds/removes the same amount of water as in ISBA-3L scheme, divided into the first 6 layers of the ground

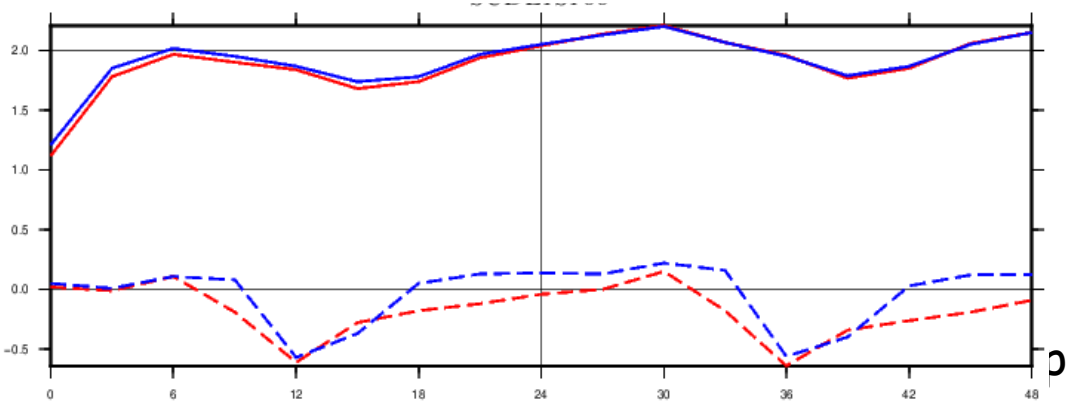


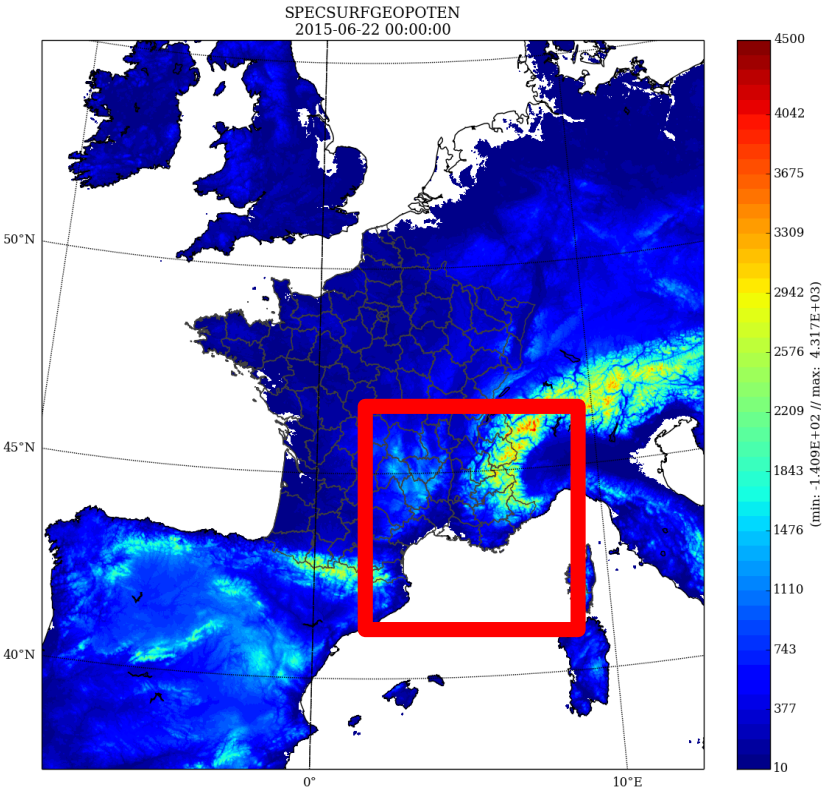
DIF+ES in AROME cy46 + surfex V8.1+

1-30 Sept 2019 T2m Ref, DIFF+ES



1-31 Dec 2019 T2m Ref, DIFF+ES



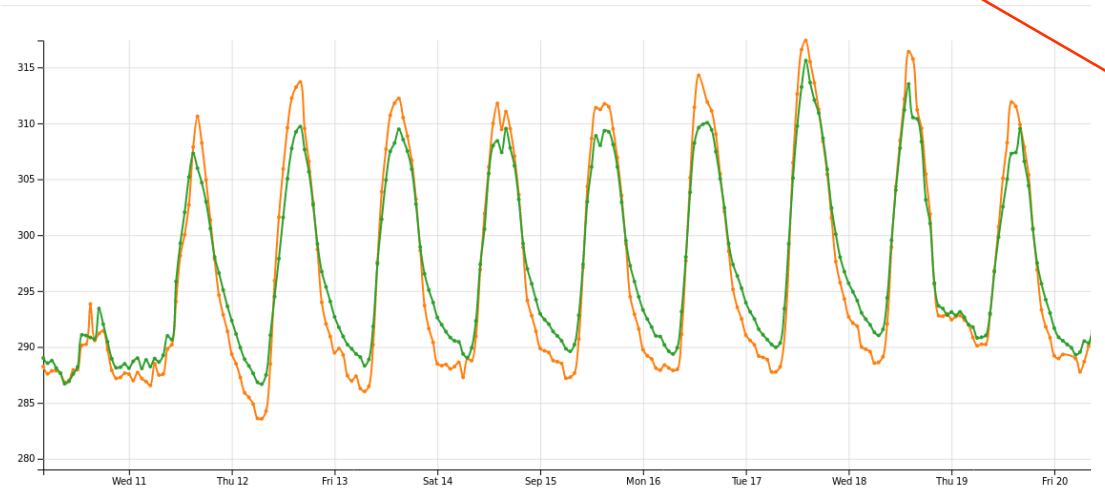


p 4-8 April, 2022, Ljubljana

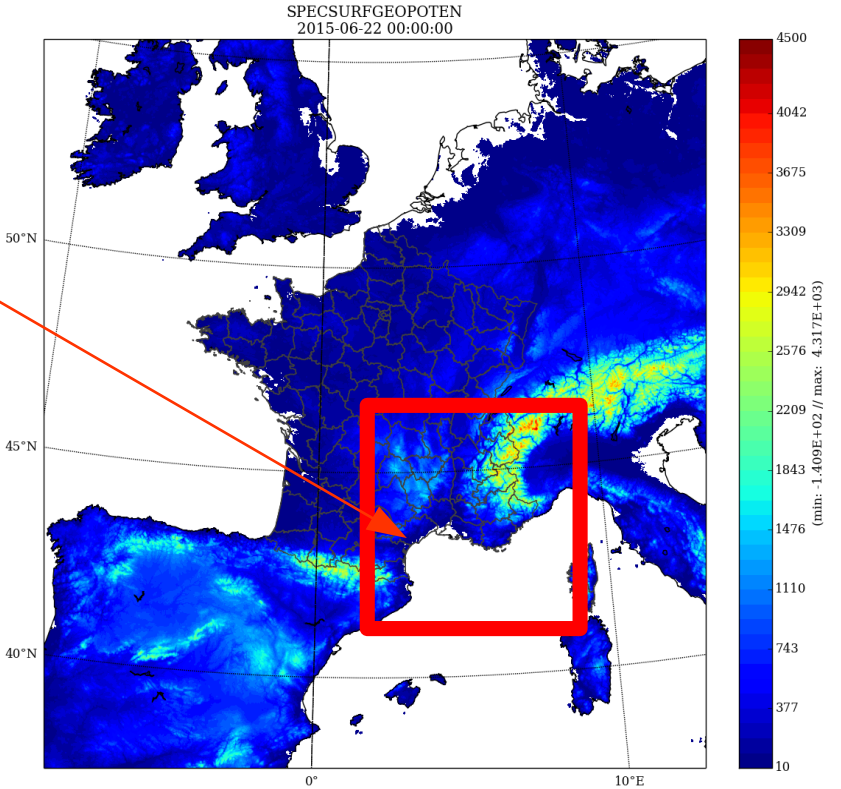
DIF+ES in AROME cy46 + surfex V8.1+

Tsurf (TG1) @ Montpellier

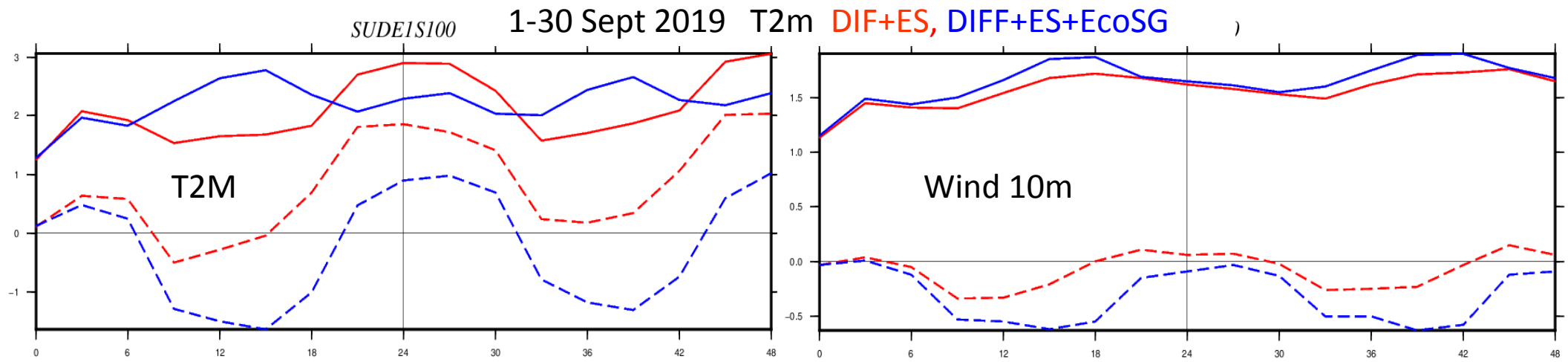
10-20 september 2019. REF and DIF-ES



Minimum Tsurf warmer about 2 or 3 deg with DIF-ES



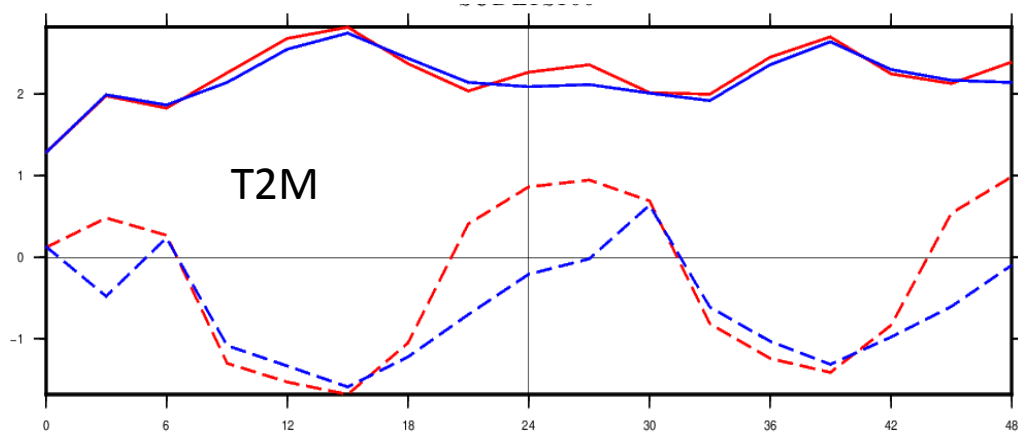
DIF+ES+EcoSG in AROME cy46 + surfex V8.1+

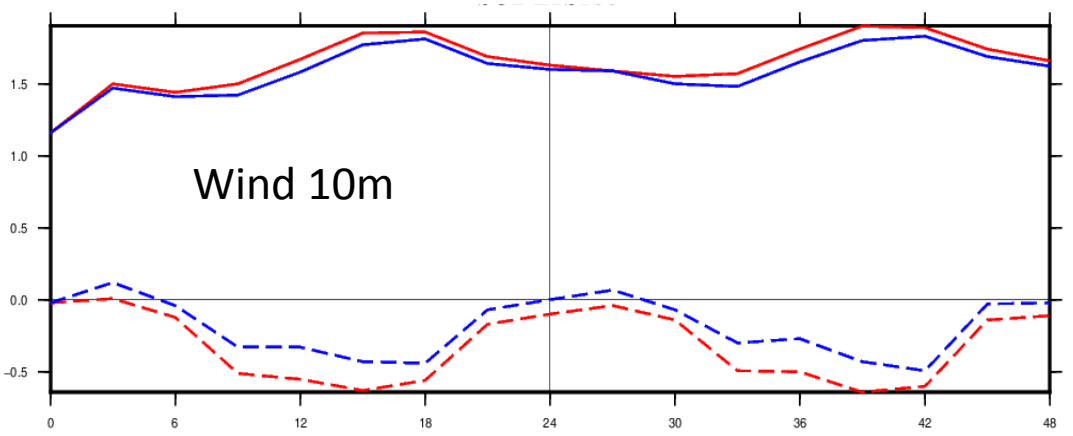


Negative bias for the 10m wind and a colder T2m

DIF+ES+EcoSG in AROME cy46 + surfex V8.1+

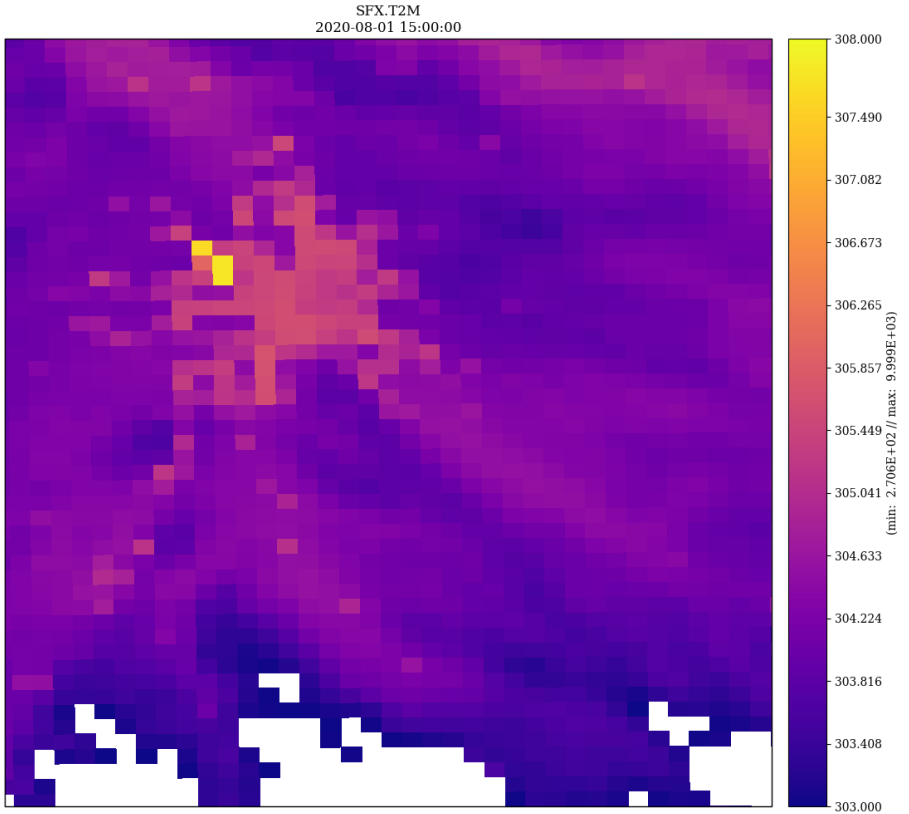
- With DIF option, Cv is modified → cv=cv*0.2 (see soildif.F90, CVHEATF coeff)
- Test using the MLCH option. It only reduces thermal conductivity of layers till 4 cm. Simple but probably efficient
- Limit vegetation Z0 to a max of 1.3m (our max value with ECO1)?





1-30 Sept 2019 T2m DIF+ES+EcoSG, DIFF+ES+EcoSG+MLCH+z0

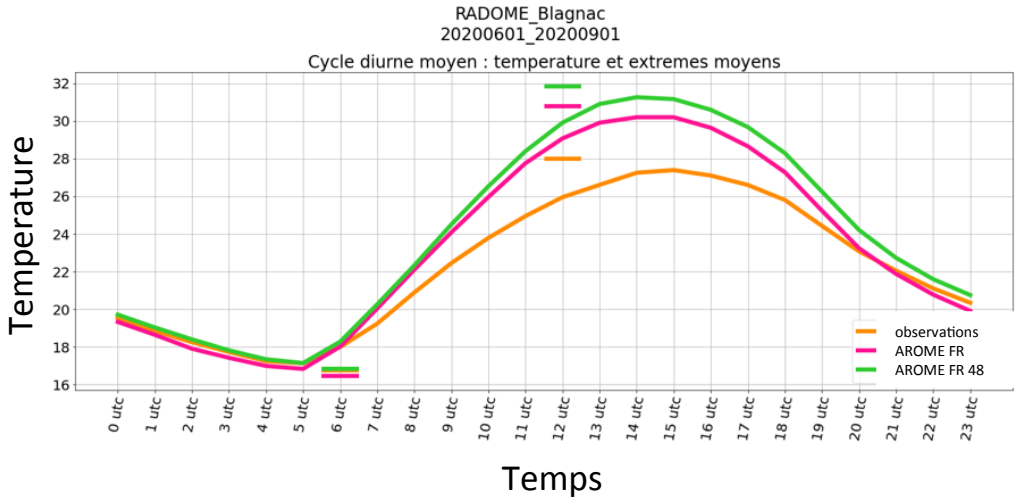
Blagnac Airport in AROME oper

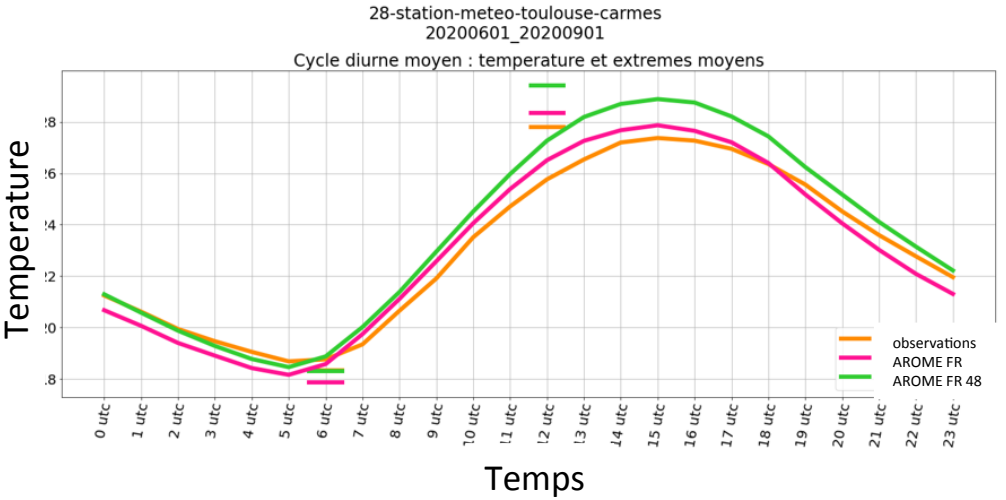


- Average T2m at 15 UTC over august 2020 from operational forecasts
- Suspicious behaviour at Blagnac airport pixels

Blagnac Airport in AROME oper

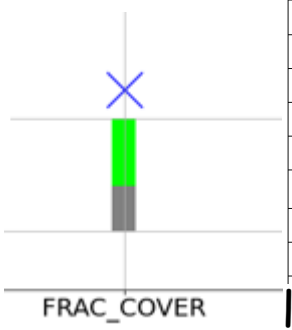
August 2020



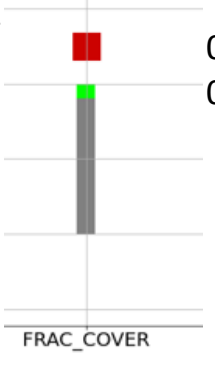


0.3 : FRAC_TOWN
0.7 : FRAC_NATURE

COVER FRANCE:
1.0 cover 158 (aéroport)



	Carmes	Blagnac
Lon	1.44544	1.37861
Lat	43.5976	43.6208
Frac_Town	90 %	30 %
Frac_Nature	10 %	70 %
T2M	38.4	41.4
TG1 (ISBA)	42.5	47.3
TROAD1	54.2	65.3
TROOF1	65.0	63.3

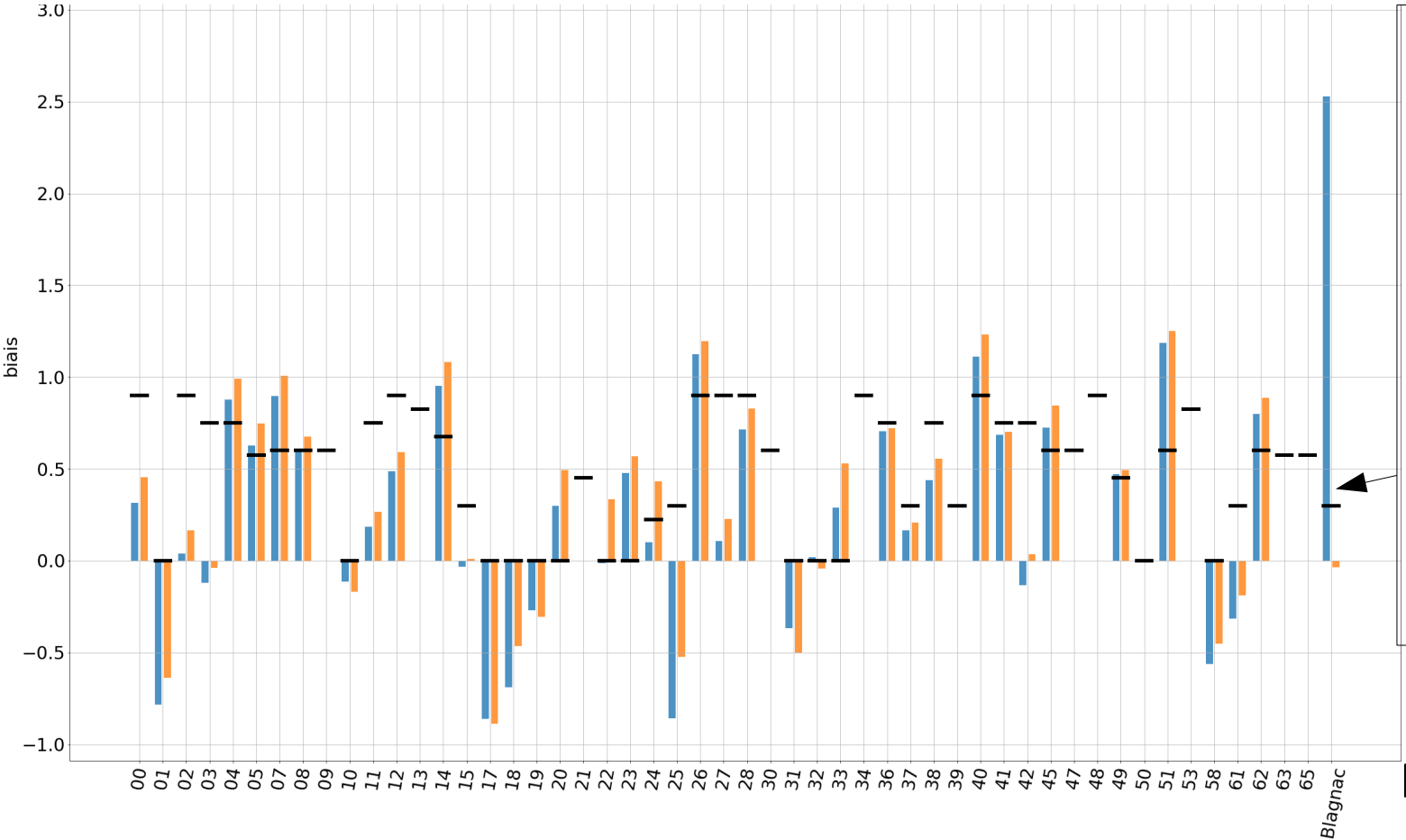


0.9 : FRAC_TOWN
0.1 : FRAC_NATURE

COVER FRANCE:
1.0 cover 151

Blagnac Airport in AROME oper

August 2020



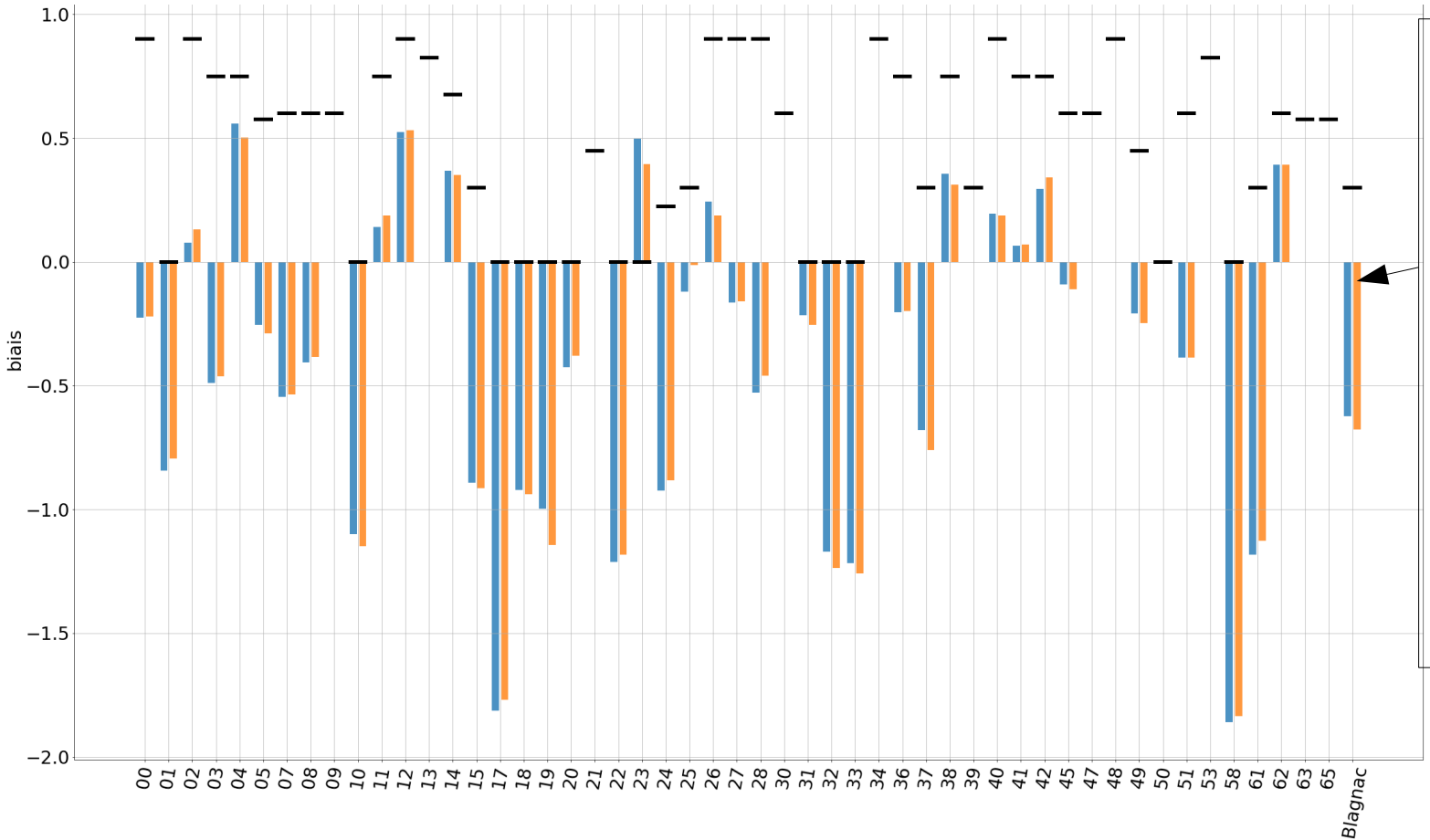
Strong Impact on Tmax for the airport pixel

- Modification of cover 158 in ECOCLIMAP (airport)
- Roughness from 1 cm to 1 m
- Albedo of road is modified from 8% to 15%

bljana

Blagnac Airport in AROME oper

August 2020



Low impact over Tmin for Blagnac and all stations

Conclusion

- looks better
- scores on all synop stations are slightly worse
- **try a 0.1 or 0.5 m roughness and evaluate wind speed**

ljana

Conclusions

- Gelato1D is in the ARPEGE E-suite, is also used in AROME in Polar Region:
  - AROME-DomeC-DDU for the winter YOPP-SH April 2022-July2022
  - AROME-MF-Arctic for the RALI-THINICE field experiment in Svalbard
  - 3 years with N. Azouz (APPLICATE) + % pm of GMAP
- No progress on DIF+ES, EcoSg, Flake since September 2021 due to the preparation of the next e-suite based on cy48 and fix problems with the new Surfex version

- Need more people working on SURFEX options if we want to evaluate correctly DIF+ES, EcoSG , Flake in AROME and in ARPEGE ...