Status and plans in AROME Surface

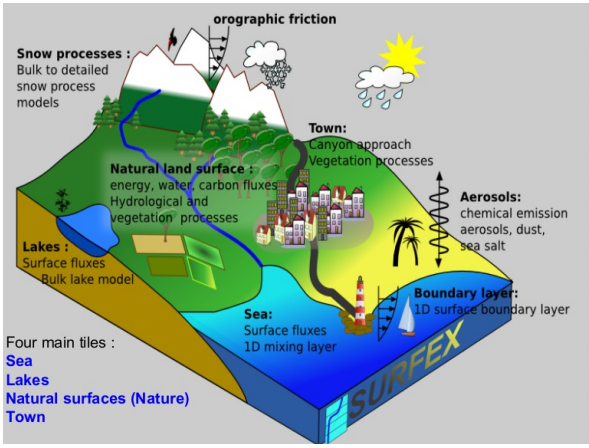
Yann Seity, Adrien Napoly, Camille Birman

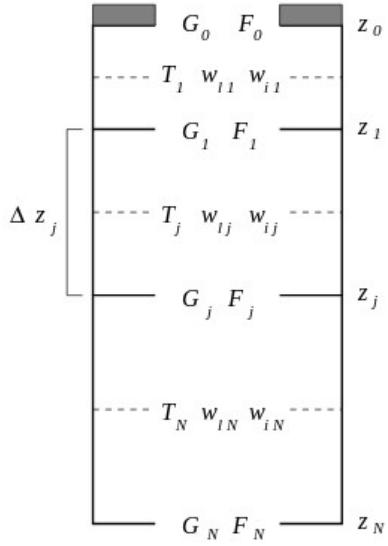
Outline :

- Current tests in AROME v81+
  - **DIF+ES**
  - DIF+ES+EcoSG
  - Sensitivity tests
  - Flake

First tests using DIF/ES in v8.1+
Strategy

- 6 months offline simulations before 3-07-2019
- 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
- First tests on the oper 3DVAR domain 1 month
- Next, on a smaller domain, 1 year





First tests using DIF/ES in v8.1+
Namelistes

PGD

```
&NAM_ISBA
  CPEDO_FUNCTION = 'CH78', #default value
  CISBA = 'DIF',
  NGROUND_LAYER = 14,
  XUNIF_RUNOFFB = 0.2, #default value = 0.5
/
```

PREP

```
&NAM_PREP_ISBA_SNOW
  LSNOW_IDEAL=.TRUE.,
  CSNOW = '3-L',
  NSNOW_LAYER = 12,
/
```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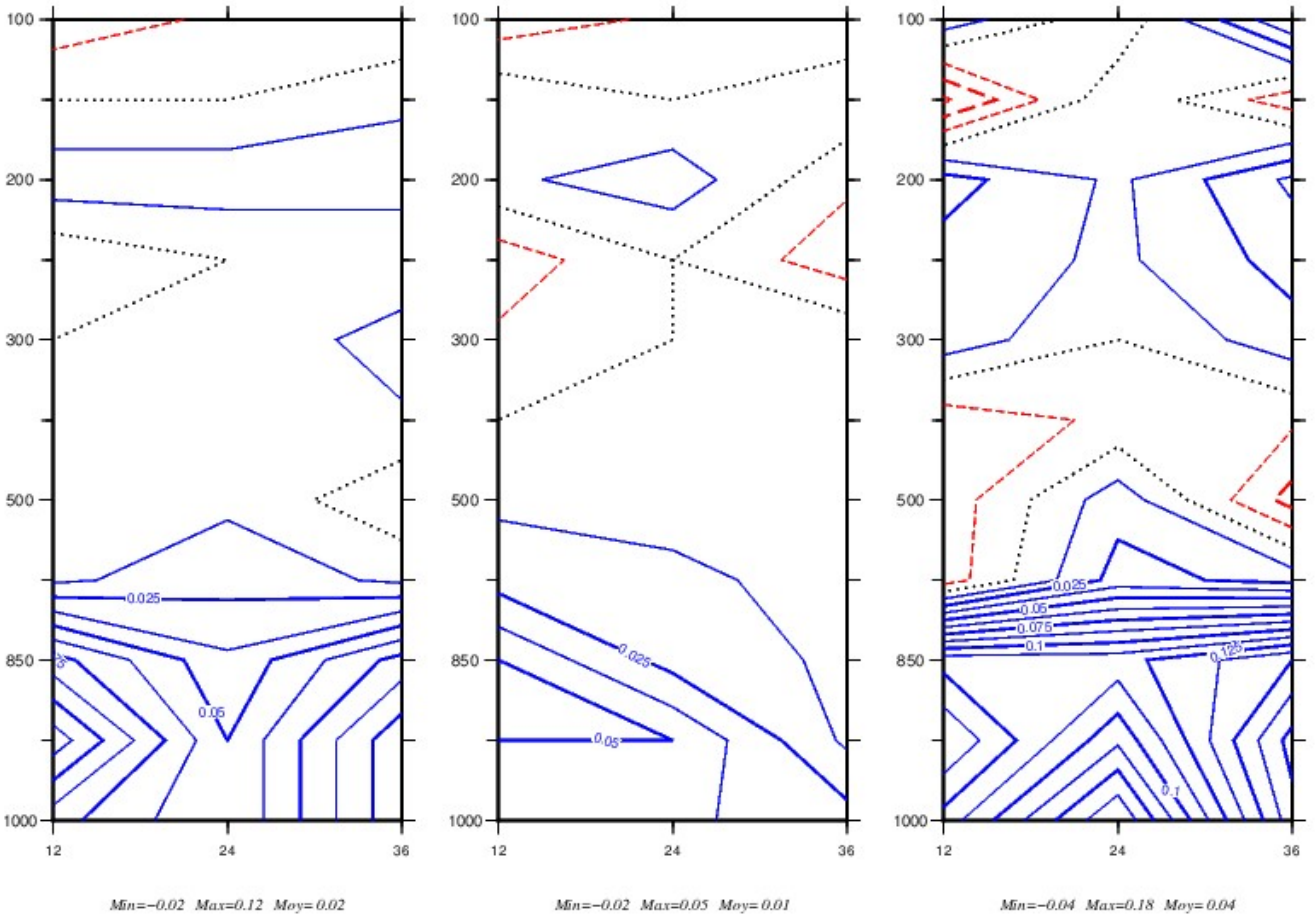
First tests using DIF/ES in v8.1+ on oper domain

Results

- First results promising !

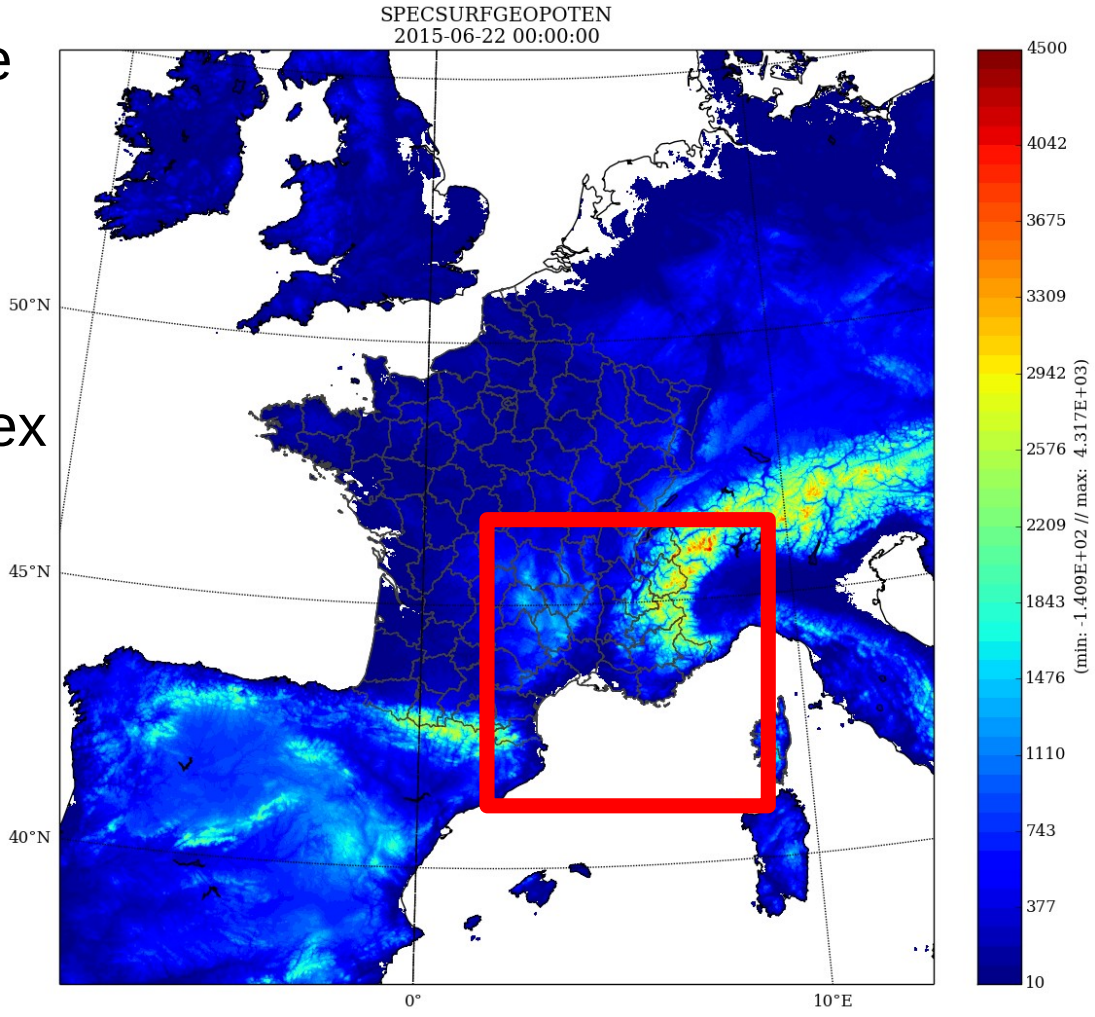
Temperature profiles compared with RS between July 5 – August 6 2019

RMSE STD BIAS



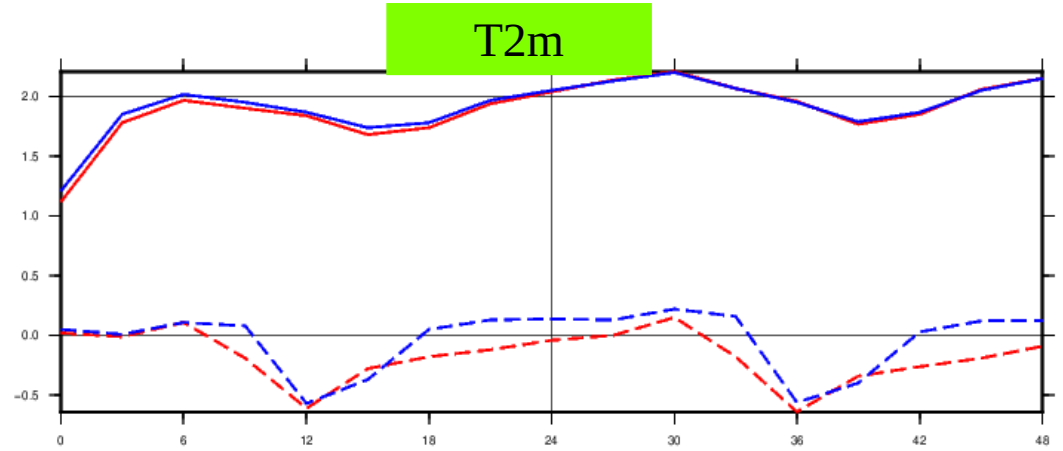
First tests using DIF/ES in v8.1+
Small AROME domain

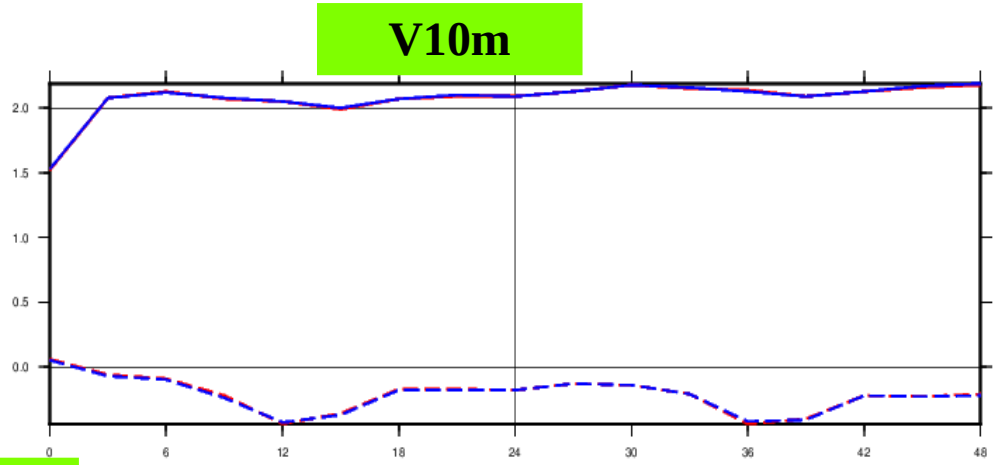
- In order to study long periods (at least one year), we setup a 3dvar configuration on a small domain with sea/montains/towns.
- It can run on only one HPC node
- July 2019 → September 2020
- Start from 6 months Offline Surfex

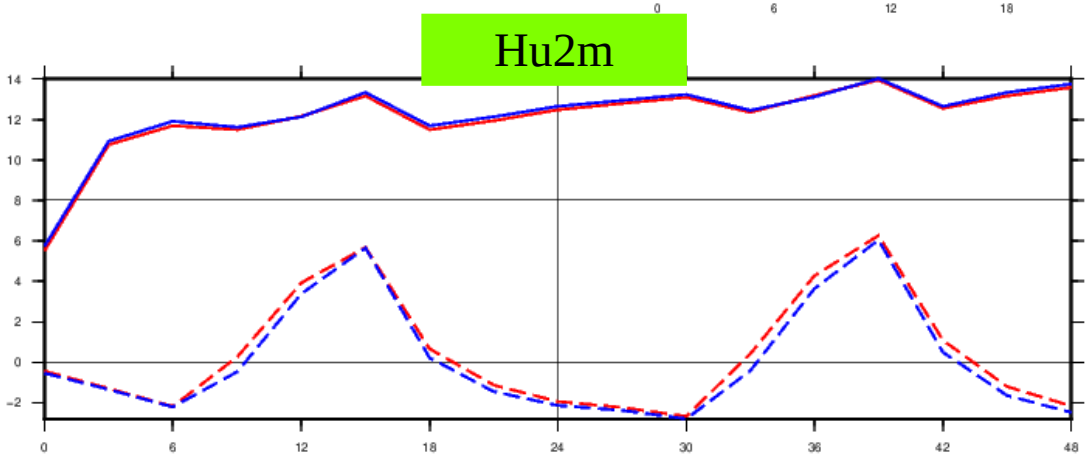


First tests using DIF/ES in v8.1+
Surface scores on december 2019

- Scores more or less neutral during winter



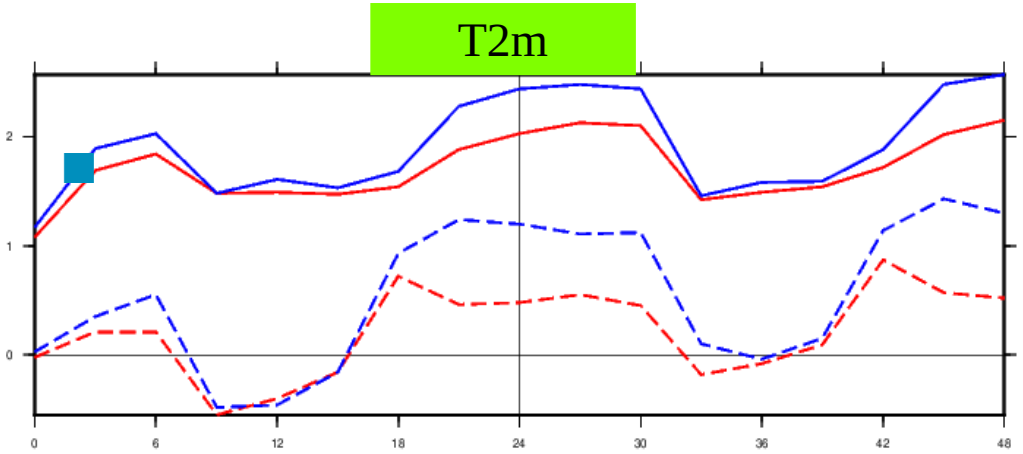


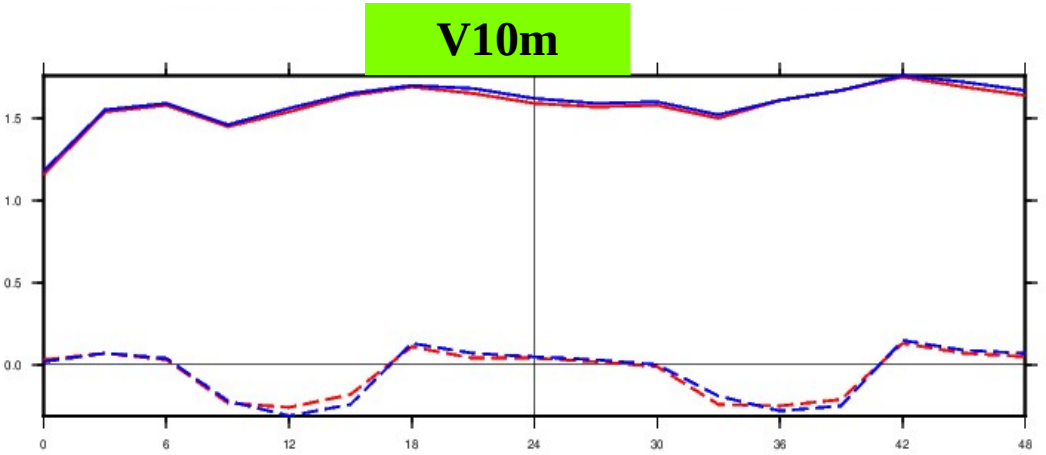


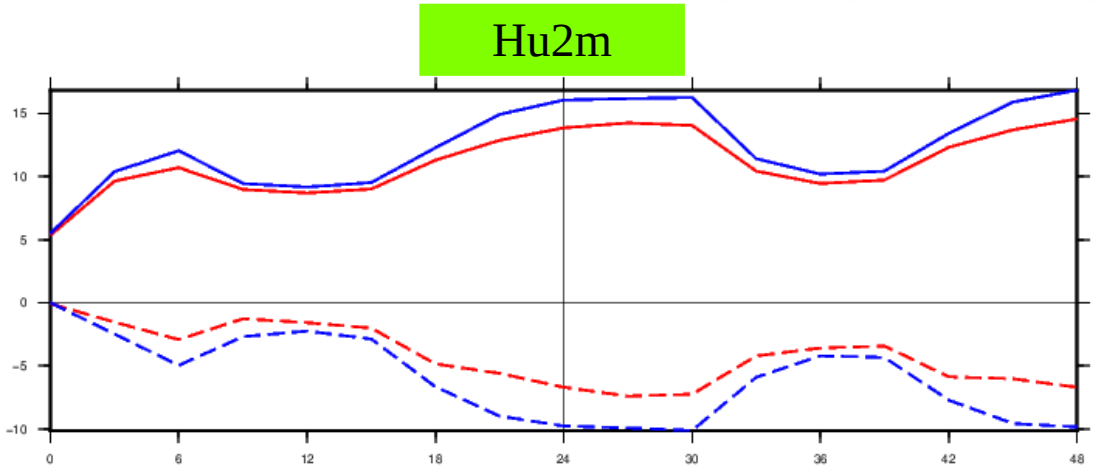
1-31 Dec 2019 surface scores Ref, DIFF+ES

First tests using DIF/ES in v8.1+
Surface scores on september 2019

- In summer : neutral scores on wind, warm and dry bias with DIFF+ES during nightime



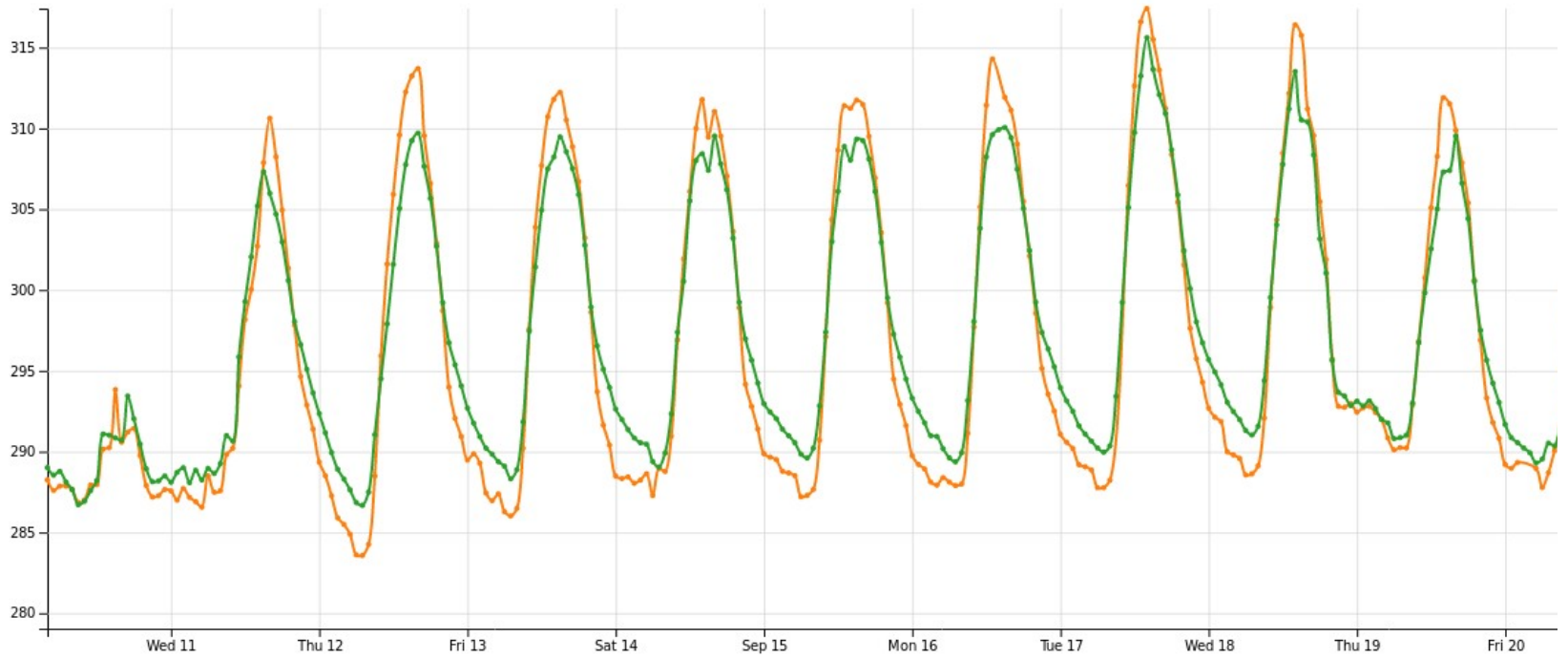




1-30 Sept 2019 surface scores Ref, DIFF+ES

First tests using DIF/ES in v8.1+
Surface scores on september 2019

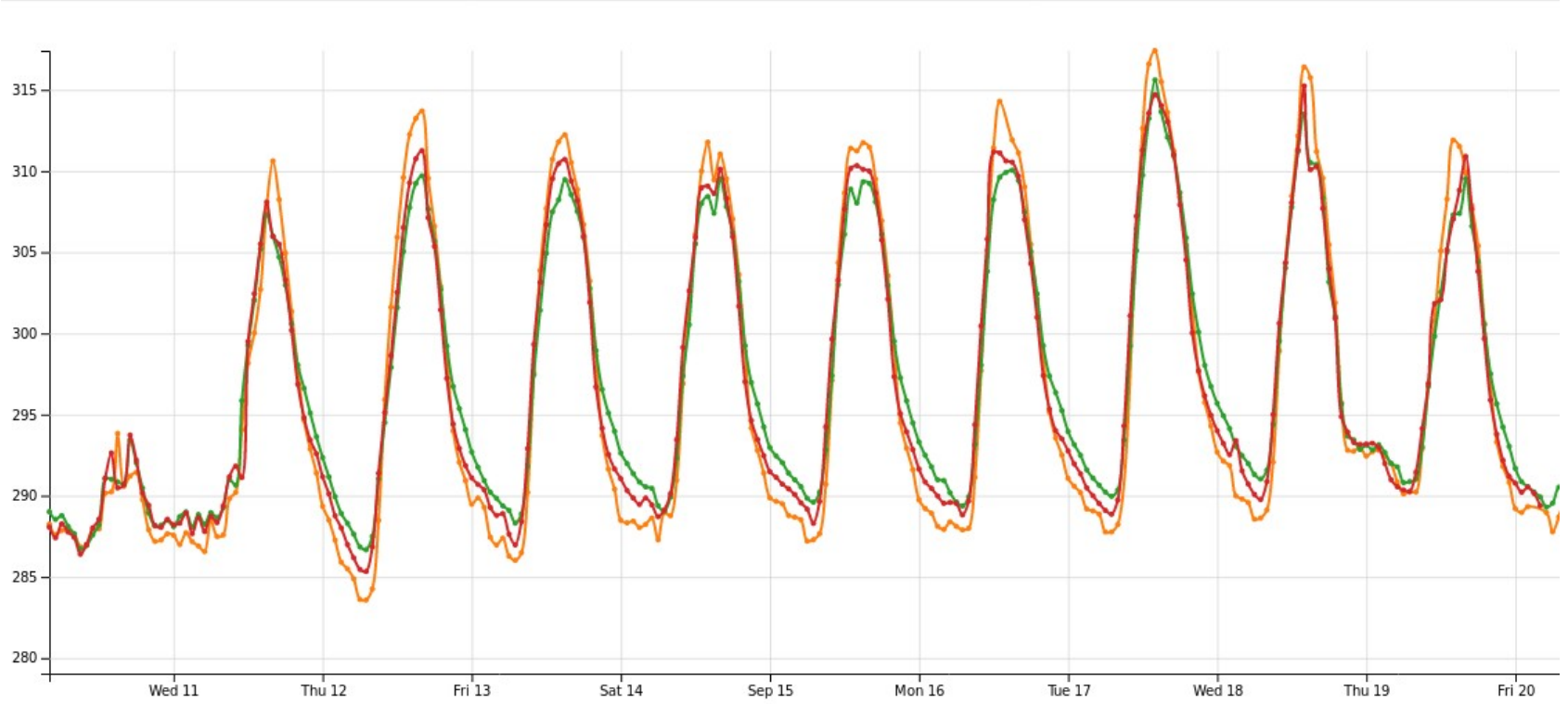
- Differences in TG1 diurnal amplitude seem to explain the biases.



Legend : TG1 at station INRA-Montpellier, 10-20 september 2019. REF and DIF-ES

First tests using DIF/ES in v8.1+
Surface scores on september 2019

- With DIF option, the Cv has been already modified → cv=cv*0.2 (see soildif.F90, CVHEATF coeff)
- Test using the MLCH option. It reduces thermal conductivity of layers till 4 cm.



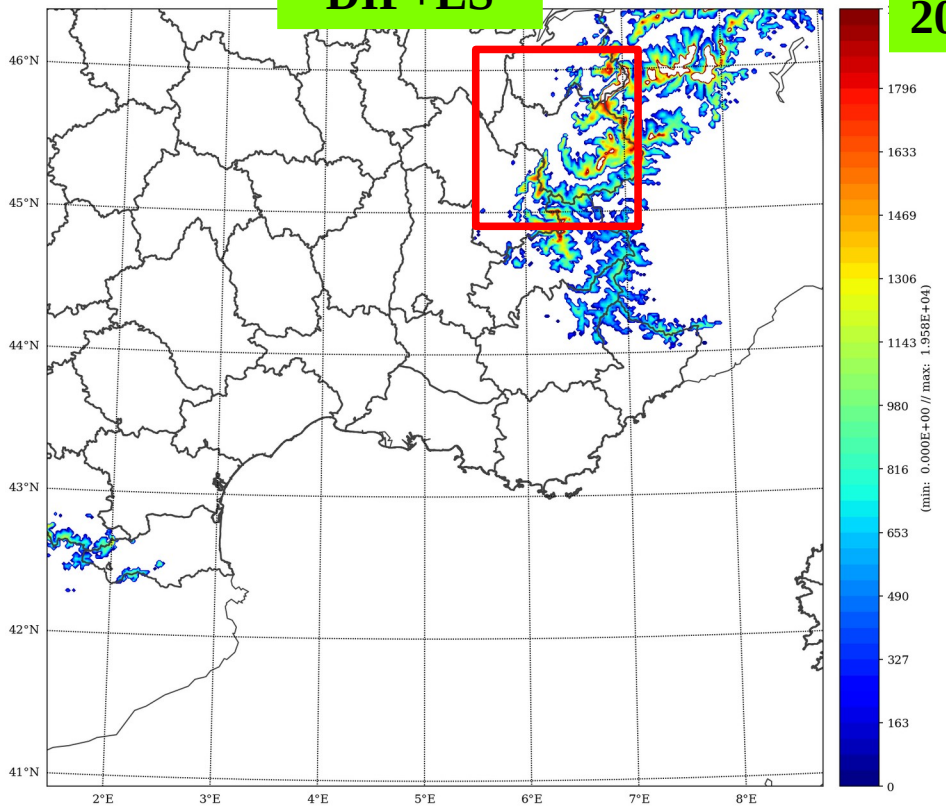
Legend : TG1 at station INRA-Montpellier, 10-20 september 2019. REF and DIF-ES and DIF-ES+Mulch

First tests using DIF/ES in v8.1+: Snow cover

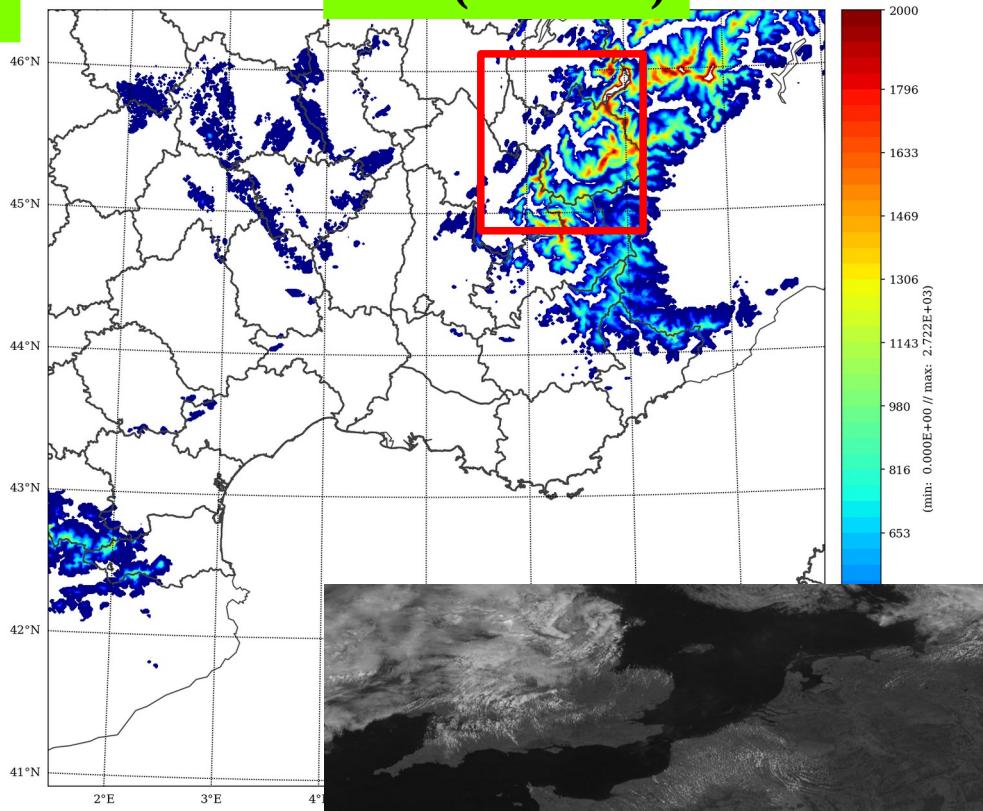
- More realistic snow cover with DIF+ES

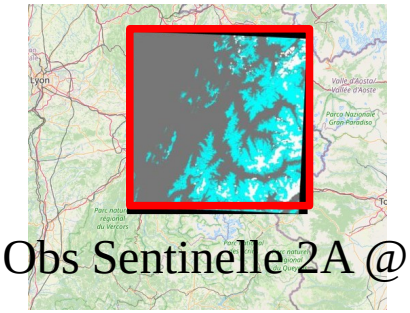
DIF+ES

2020-04-04

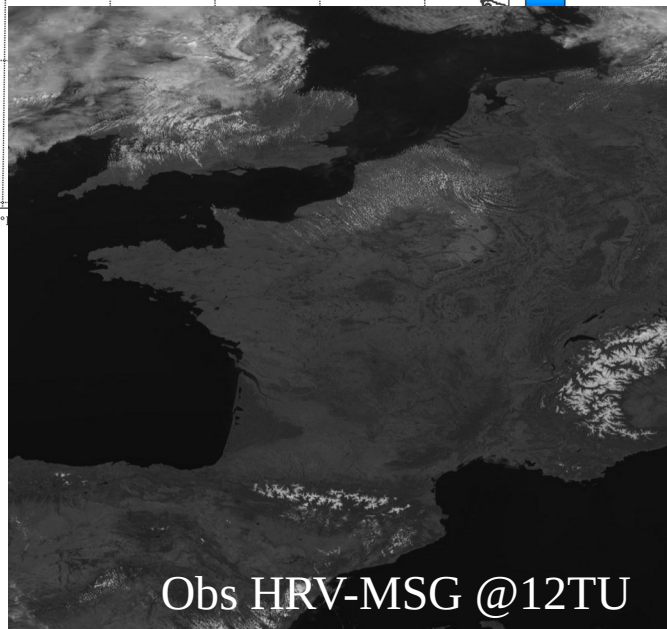


REF (3-L+D95)





Obs Sentinelle 2A @ 20m



Obs HRV-MSG @12TU

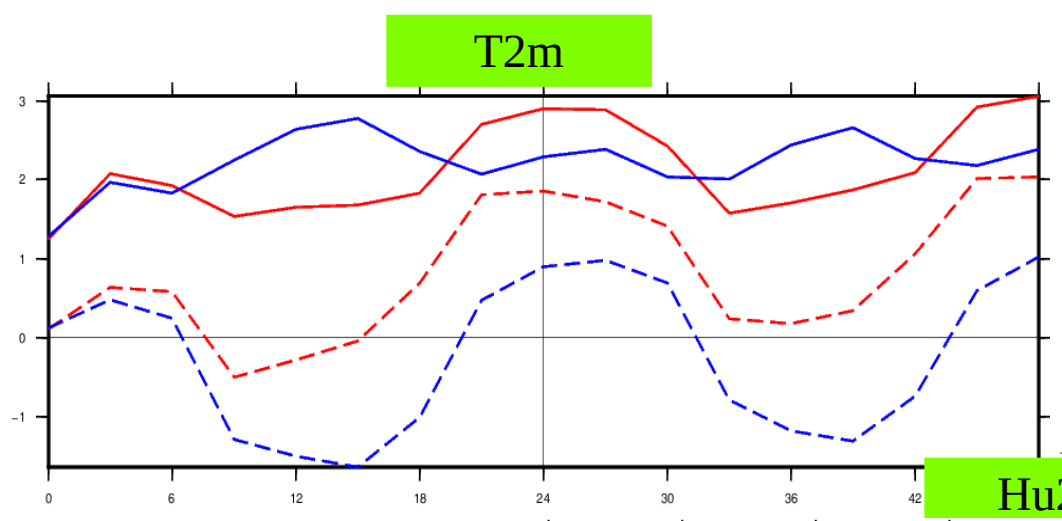
Outline :

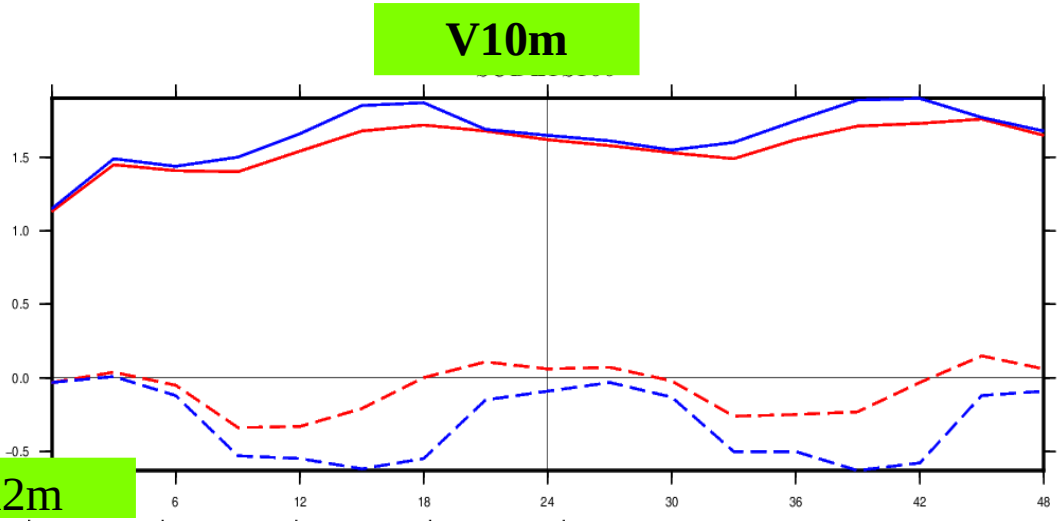
- Current tests in AROME v81+
  - DIF+ES
  - **DIF+ES+EcoSG**
  - Sensitivity tests
  - Flake

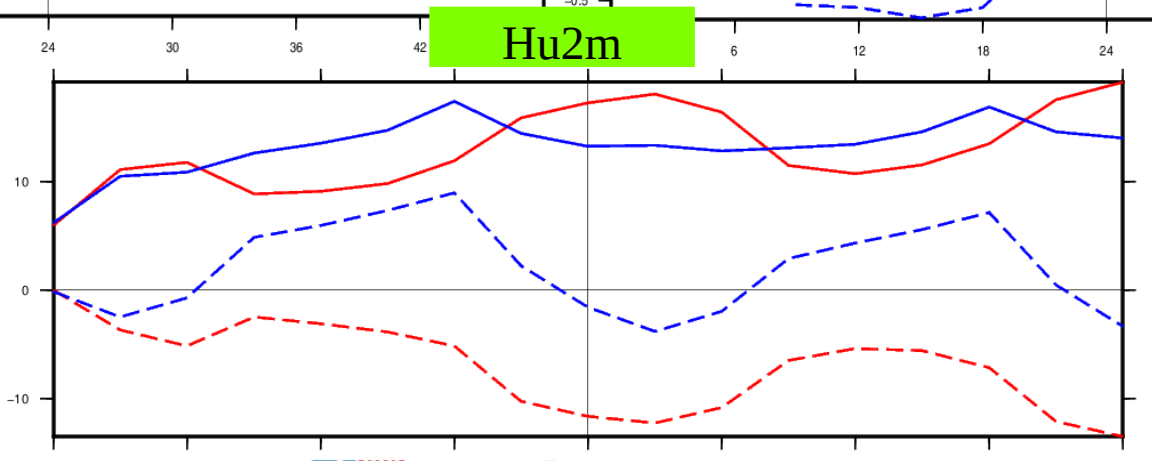
First tests using DIF+ES+EcoSG in v8.1+

Surface scores on september 2019

- Negative V10m bias, and diurnal T2m





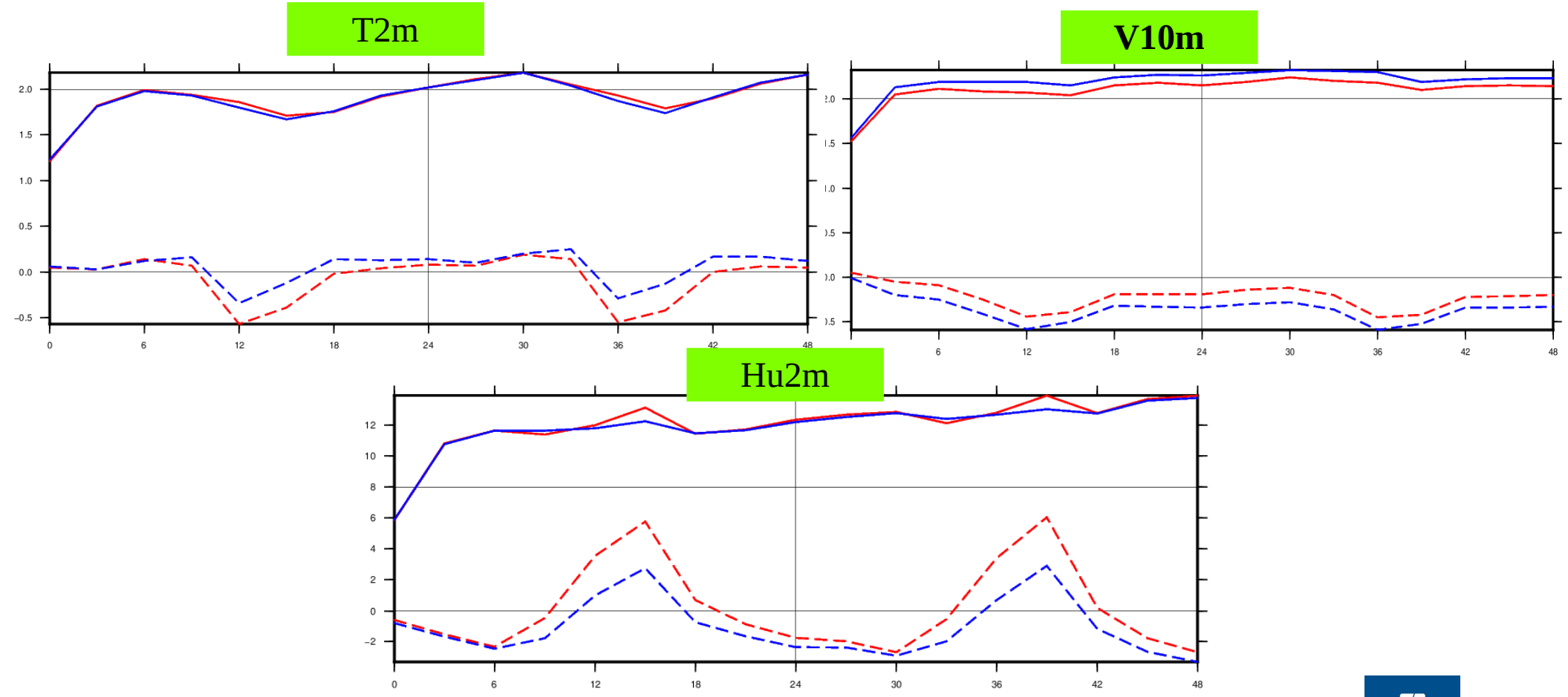


1-30 Sept 2019 surface scores DIF+ES, DIF+ES+EcoSG

First tests using DIF+ES+EcoSG in v8.1+

Surface scores on december 2019

- Less impact than in summer : improvements in T2M/Hu2m, negative V10m bias



1-31 Dec 2019 surface scores DIF+ES, DIFF+ES+EcoSG

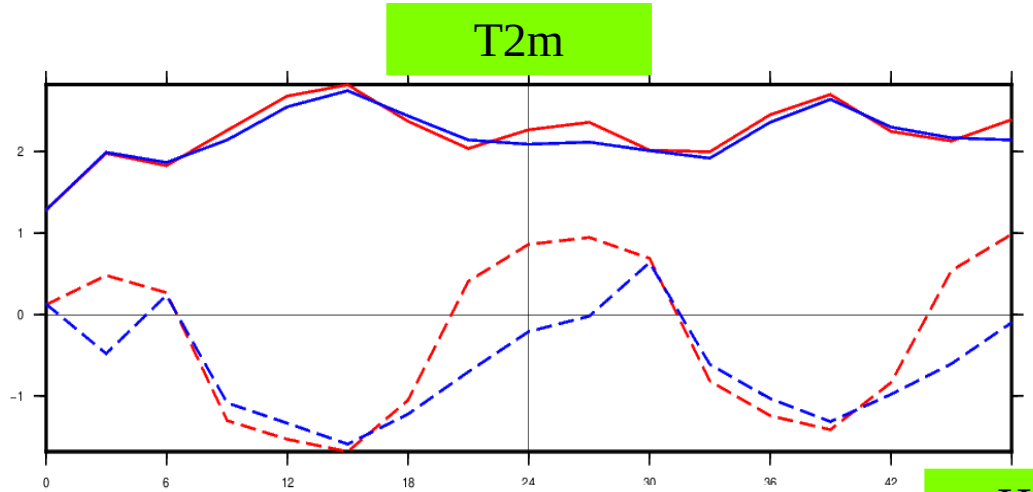
Sensitivity tests : MLCH and Z0 limitation

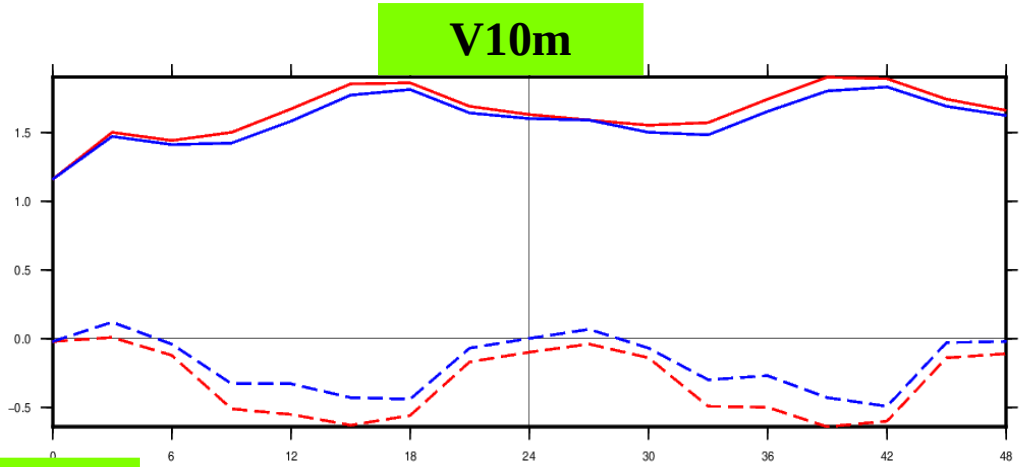
- For wind problems :

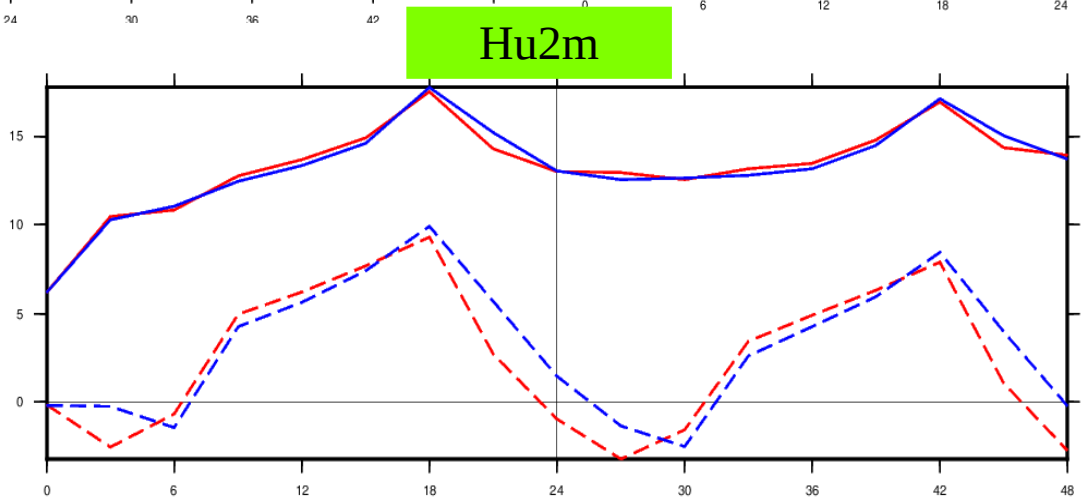
1) Limit vegetation Z0 to a max of 1.3m (our max value with ECO1)? 1.6 (seen in Samuel presentation)?
2) Move to a new parametrisation as z0=0,13*H is too simple. Raupach (1994) ? Does anyone have implemented it in SURFEX ?

Sensitivity tests : MLCH and Z0 limitation
Surface scores on July 2019

- To the right direction...







6-07 to 6-08 2019 surface scores DIF+ES+EcoSG, DIFF+ES+EcoSG+MLCH&Z0

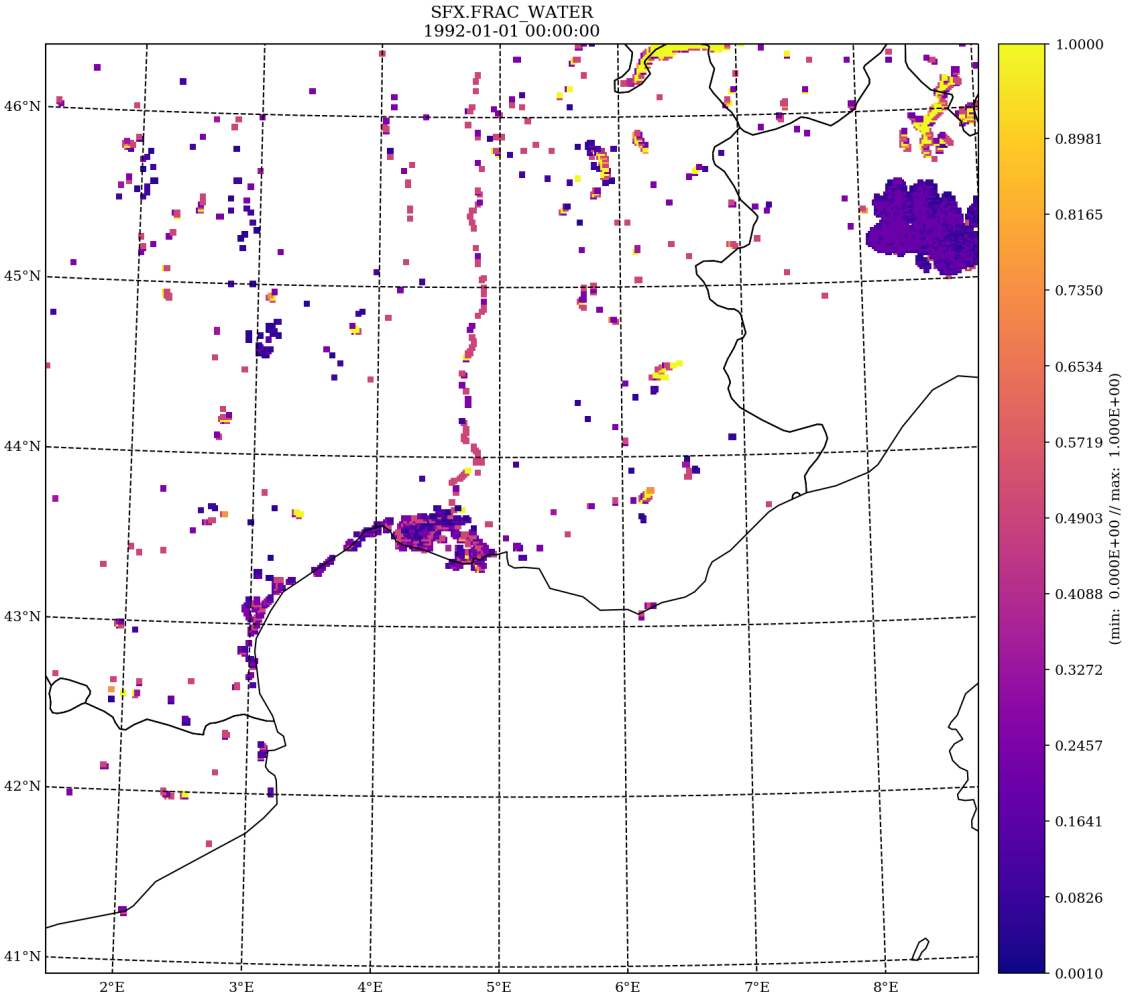
Outline :

- Current tests in AROME v81+
  - DIF+ES
  - DIF+ES+EcoSG
  - Sensitivity tests
  - **Flake**

First tests using FLAKE v8.1+
Strategy

- First tests are made with the small domain
- Simulation has been runing from september 2019 to march 2020
- Nothing is done with assimilation
- Simulation starts with homogeneous vertical profiles using operational TS tempearture
- 0,9 % of the land surface of AROME France domain (2.1 % in ARPEGE)
- In opertional mode lakes/rivers temperature is constant over the forecasrt and initialised folllowing:

1) If LSM is water : TS_WATER = OSTIA if available, T2M else
2) If LSM is land : TS_WATER = TG2 (force-restore)



First tests using FLAKE v8.1+
Namelistes

PGD

```
&NAM_COVER
  LRM_RIVER=.TRUE.,
/
&NAM_DATA_FLAKE
  YWATER_DEPTH='LAKE_DEPTH_ECO_I_V1.7',
  YWATER_DEPTHFILETYPE='DIRECT',
  XUNIF_EXTCOEF_WATER = 0.5,
  XMAX_DEPTH = 60.,
/
&NAM_PGD_SCHEMES
  CWATER='FLAKE',
/
```

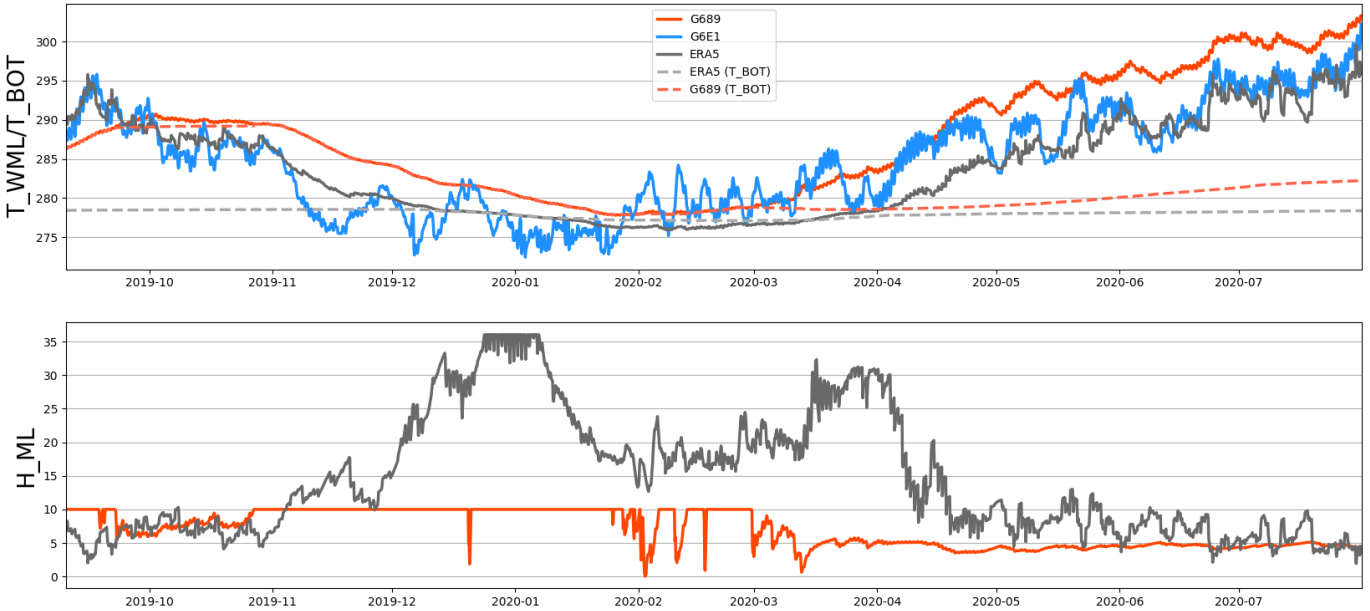
FORECAST

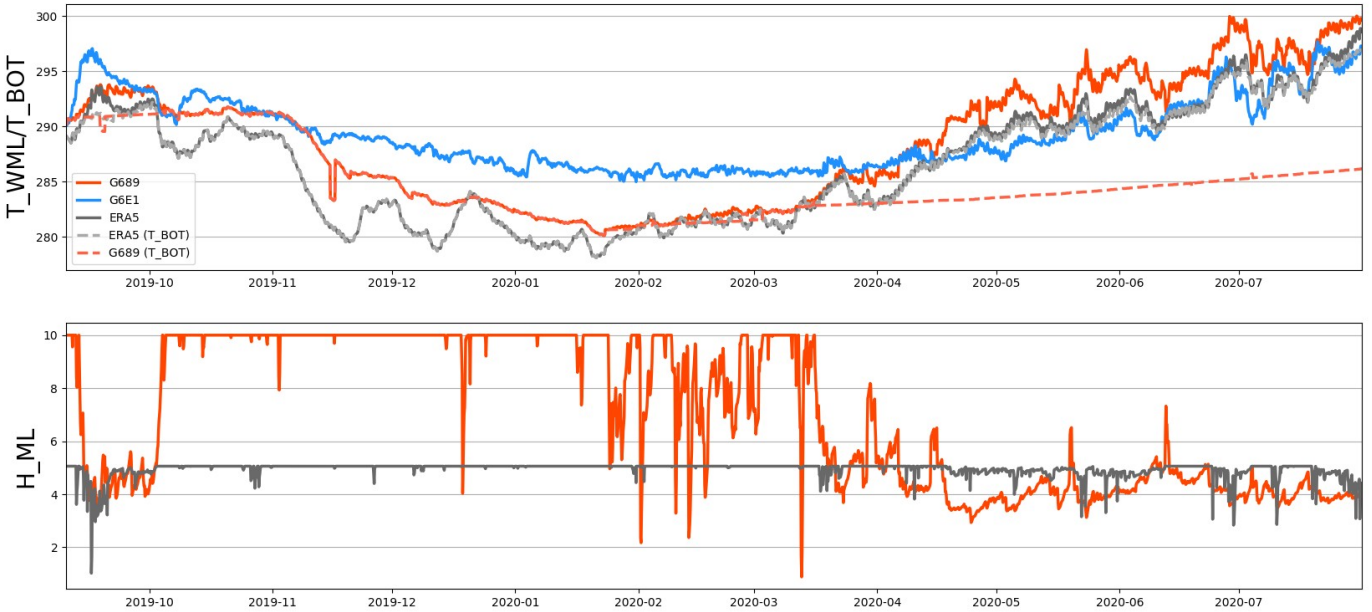
```
&NAM_FLAKEn
  CFLK_FLUX = 'FLAKE',
/
```

First tests using FLAKE v8.1+

Results

Legend : bourget lake





Legend : gravière lake

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Outline :

- Current tests in AROME v81+
  - DIF+ES
  - DIF+ES+EcoSG
  - Sensitivity tests
  - Flake
- Future tests
  - 2/3 Patchs
  - ARPEGE

Thank you for your attention !
Question ?