Phasing report

STUDIES ON THE LATEST DEVELOPMENTS IN ARPEGE/IFS (CY47T1)

Focus on single precision tests

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Introduction:

This report will summarized the single precision tests results performed on pre-CY47T1 version 02, with additional fixes from Ryad.

No single precision references: How to validate then?

Since we do not have yet any references for single precision, we'll perform simultaneously double precision and single tests, and then compare the results both to the same reference which is as usually the last validated cycle. So in our case, we've performed the tests based on pre-CY47T1 version 02, with additional fixes from Ryad (CY47T0_T1.02+Ryad modset) and compare the results to CY47T0 (Patrick's reference).

- **Reference (CY47T0_main):**

Executable:
~/martinezs/packs/cy47t0_main.01.IMPIFC1801.2y.pack/bin/MASTERODB

Mitraillette outputs:
~/saez/mitraille/cy47t0/mitraille_0500 (LAM)
~/saez/mitraille/cy47t0/mitraille_0498 (GM)

- **Double precision tests (CY47T0_T1.02+Ryad modest):**

Executable:
~/abdenoura/executable/cy47t0_t1.02.RYAD

Mitraillette outputs:
~/abdenoura/mitraille/cy47t1/mitraille_0055 (LAM)
~/abdenoura/mitraille/cy47t1/mitraille_0063 (GM)

- **Single precision tests (CY47T0_T1.02+Ryad modest):**

Executable:
~/abdenoura/executable/cy47t0_t1.02.RYAD.SP

Mitraillette outputs:
~/abdenoura/mitraille/cy47t1/mitraille_0061 (LAM)
~/abdenoura/mitraille/cy47t1/mitraille_0065 (LAM)
~/abdenoura/mitraille/cy47t1/mitraille_0062 (GM)

Status of LAM and GM tests for single precision: What doesn't work ?

Almost all LAM and GM tests that worked for double precision, worked also for single precision. The exception was noticed for the following tests:

* L3_FCST_NHE_SL2_VFD_AROPHYSFEX_GWADV2_PCCMADIOS_AROMALP1300
* L3_FCST_NHE_SL2_VFD_AROPHYSFEX_GWADV2_PCFMADIOS_AROMALP1300
* L3_FCST_NHQ_SL2_VFD_AROPHYSFEX_GWADV2_PCCMADIOS_AROMALP1300
* L3_FCST_NHQ_SL2_VFD_AROPHYSFEX_GWADV2_PCFMADIOS_AROMALP1300
* L3_FPOF_HYD_GPLELAM_CI_GRI1
* L3_FCTI_HYD_SL2_VFD_ALRPHYISBA_OLDLACE

The issue with AROME crashed tests was related to eccode compilation, we fixed it in mitraillette jobs by setting **OMP_NUM_THREADS=1**, but the problem will be reported to Ryad in order to fix it properly. The last two tests in the previous list (L3_FPOF… and L3_FCTI…) still crashing.

We mention that the following tests didn't work in both runs (DP and SP):

* L3_FCTI_HYD_SL2_VFE_ARPPHYSFEX_FRAN
* GM_FCTI_HYD_SL2_VFE_ARPPHYSFEX_SLT_RESTIOS_TL798S

Those remaining issues are currently under investigation by Philippe.

Comparison between single precision and double precision results:

Figures (Fig.01), (Fig.02), (Fig.03), et (Fig.04) represents the number of common digits in spectral norms between double precision run in Pre-CY47T1 and the reference CY47T0 (Patrick's reference) and between single precision run in Pre-CY47T1 and the reference CY47T0 (Patrick's reference), for the test: **L3_FCST_NHE_SL2_VFD_ AROPHYSFEX_GWADV2_ PCC_AROMALP1300**.

As expected, it shows clearly that we had generally more common digits in case of double precision. However, we can spot at few timesteps that single precision present more common digits, particularly for kinetic energy (Fig.02).

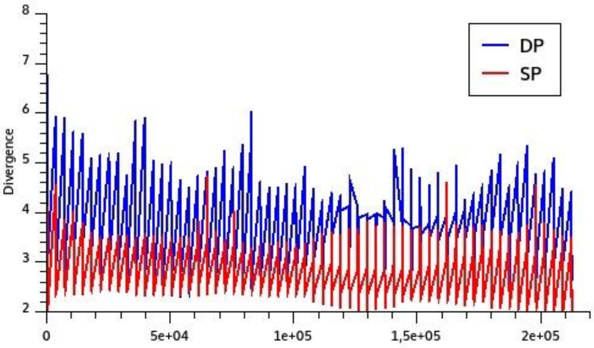

Fig.01: Comparison of the number of common digits for divergence SPNORMS between DP and the reference, and between SP and the reference.

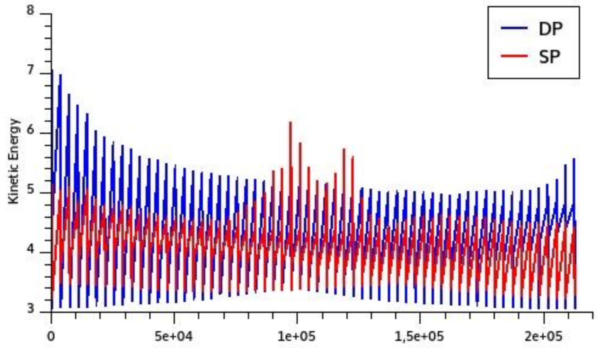

Fig.02: Comparison of the number of common digits for kinetic energy SPNORMS between DP and the reference, and between SP and the reference.

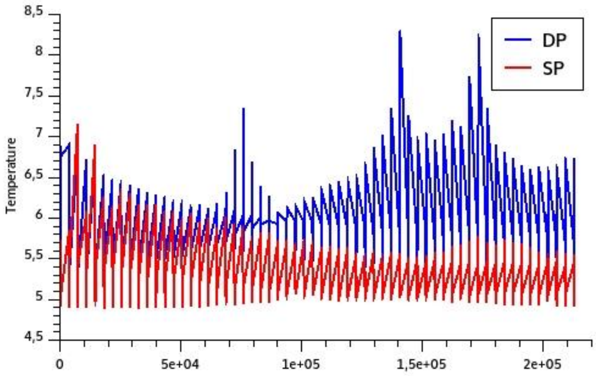

Fig.03: Comparison of the number of common digits for temperature SPNORMS between DP and the reference, and between SP and the reference.

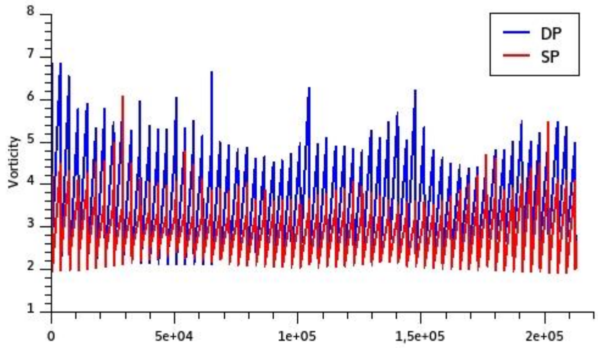

Fig.04: Comparison of the number of common digits for vorticity SPNORMS between DP and the reference, and between SP and the reference.

We made the same comparison for another test (**L3_FCST_HYD_SL2_VFD_AROPHYSFEX_MAD_AROMALP1300**), the next figures (05, 06, 07 and 08) represent the results. We can definitely notice the same remarks as the previous tests, with more common digits for DP run, except that in this case we spot sometimes more common digits in SP for temperature SPNORMS (Fig.07).

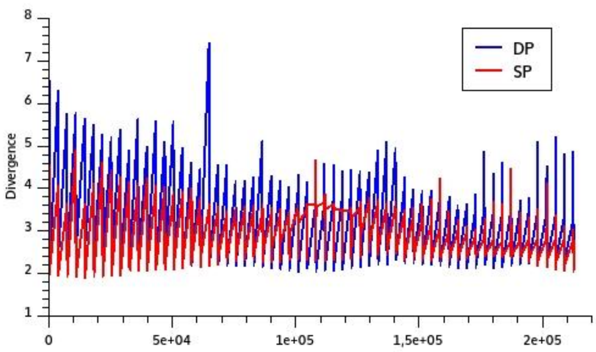

Fig.05: Comparison of the number of common digits for divergence SPNORMS between DP and the reference, and between SP and the reference.

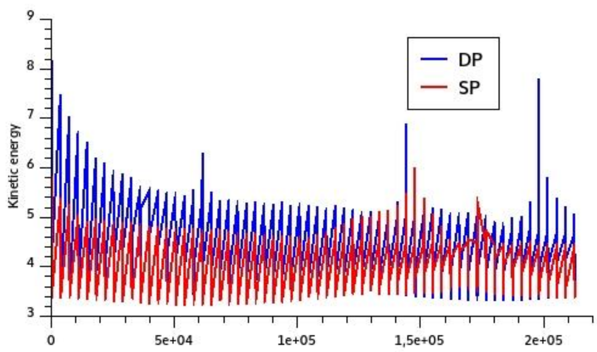

Fig.06: Comparison of the number of common digits for kinetic energy SPNORMS between DP and the reference, and between SP and the reference.

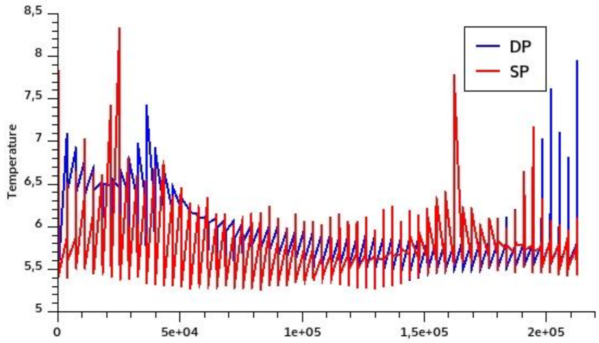

Fig.07: Comparison of the number of common digits for temperature SPNORMS between DP and the reference, and between SP and the reference.

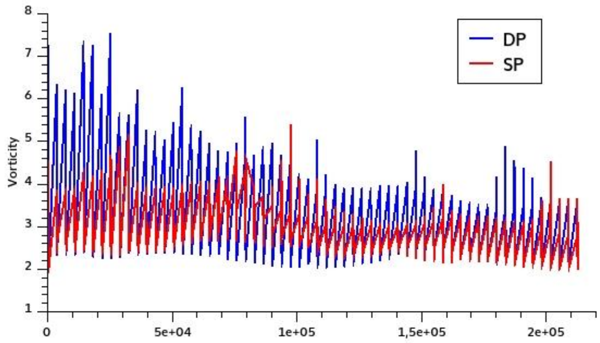

Fig.08: Comparison of the number of common digits for vorticity SPNORMS between DP and the reference, and between SP and the reference.

In the following part, we'll compare the spectral norms (SPNORMS) between double precision and the reference and between single precision and the reference with more details for the test: **L3_FCST_NHE_SL2_VFD_AROPHYSFEX_GWADV2_PCC_AROMALP1300**, by presenting some fields differences outputs of specific humidity, temperature and winds components (U, V).

As we said previously, the double precision runs are expected to provide the better results, which mean here lower SPNORMS differences. However, the single precision runs results look fairly good, since the SPNORMS differences obtained by SP run are quite similar to those obtained by DP run in term of intensity and spatiotemporal distribution (from Fig.09 to Fig.56).

Even if it's not often, but we notice that the SPNORMS differences are sometimes lower in SP run (Fig.12).

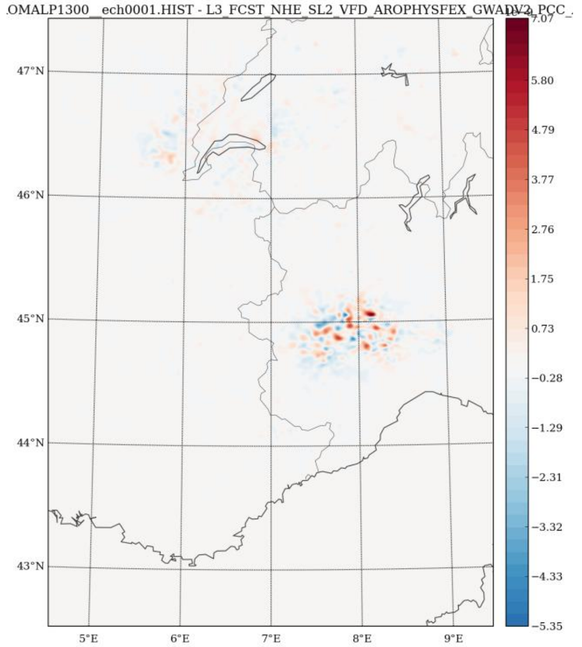

Fig.09: Differences of **S001.HUM.SPECI.ech0001** spectral norms between **DP** runs and reference.

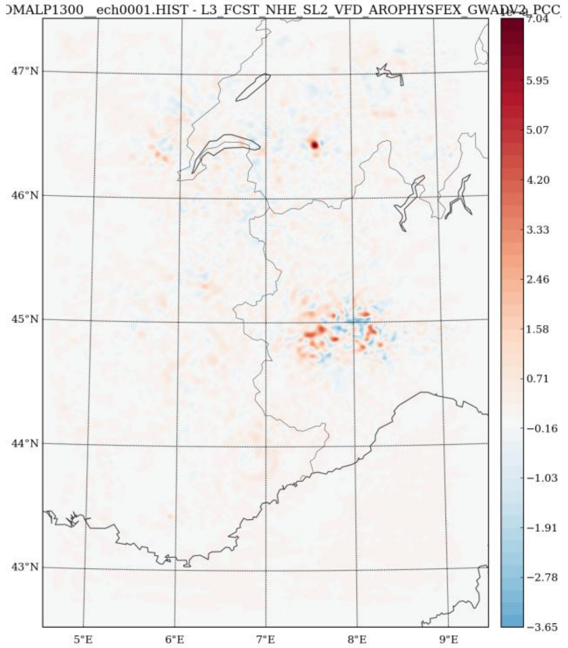

Fig.10: Differences of **S001.HUM.SPECI.ech0001** spectral norms between **SP** runs and reference.

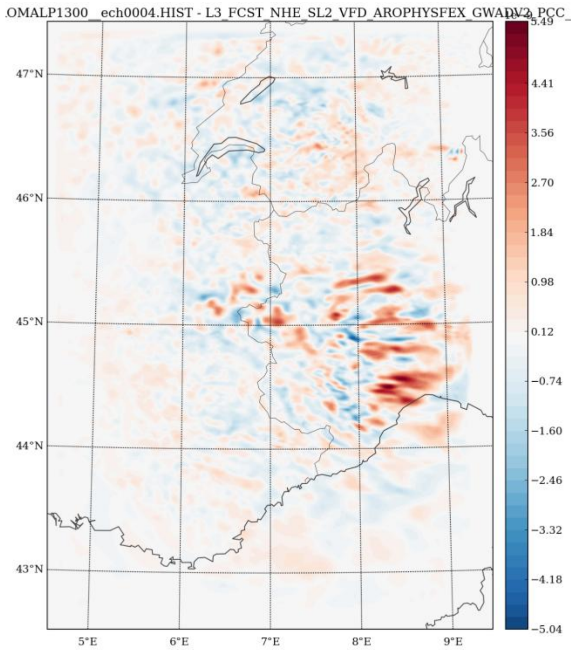

Fig.11: Differences of **S001.HUM.SPECI.ech0004** spectral norms between **DP** runs and reference.

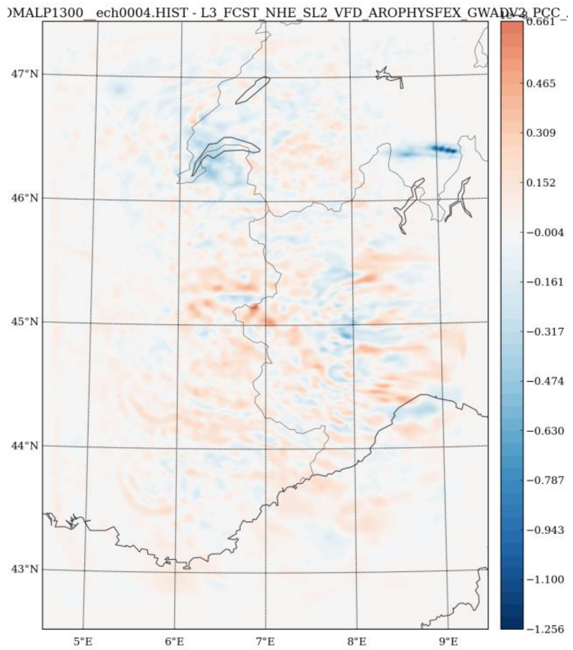

Fig.12: Differences of **S001.HUM.SPECI.ech0004** spectral norms between **SP** runs and reference.

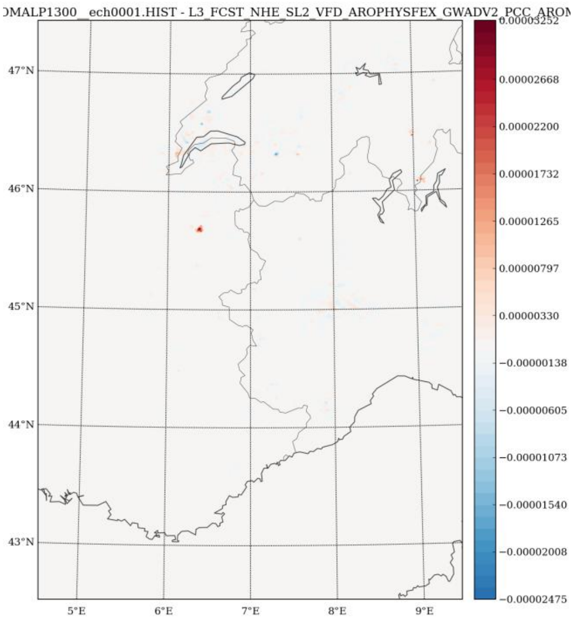

Fig.13: Differences of **S030.HUM.SPECI.ech0001** spectral norms between **DP** runs and reference.

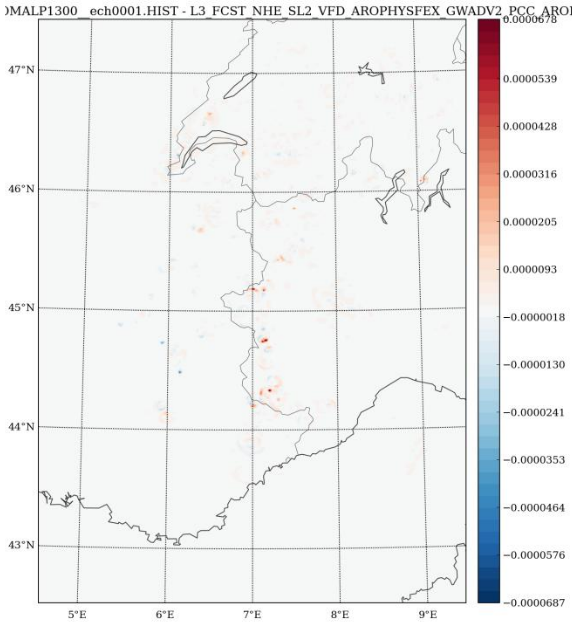

Fig.14: Differences of **S030.HUM.SPECI.ech0001** spectral norms between **SP** runs and reference.

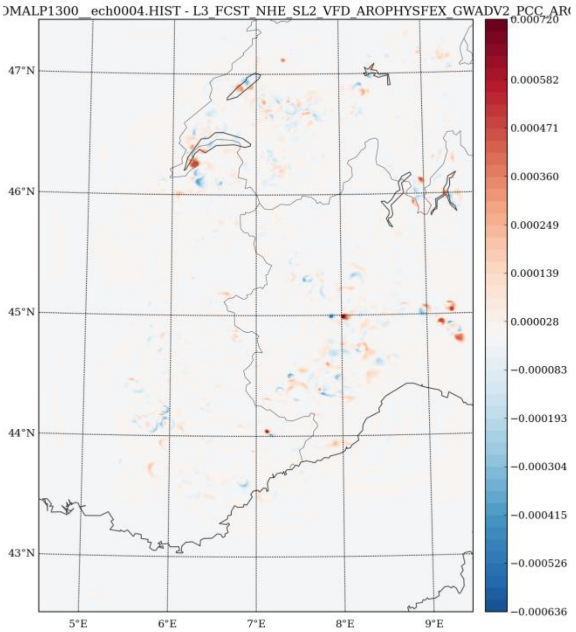

Fig.15: Differences of **S030.HUM.SPECI.ech0004** spectral norms between **DP** runs and reference.

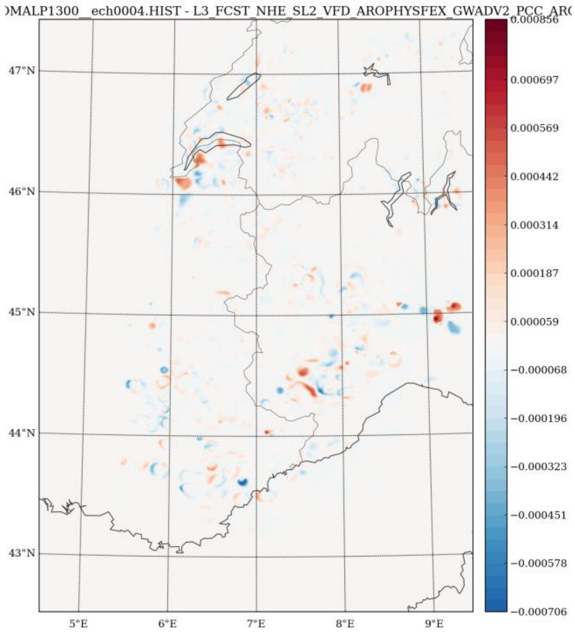

Fig.16: Differences of **S030.HUM.SPECI.ech0004** spectral norms between **SP** runs and reference.

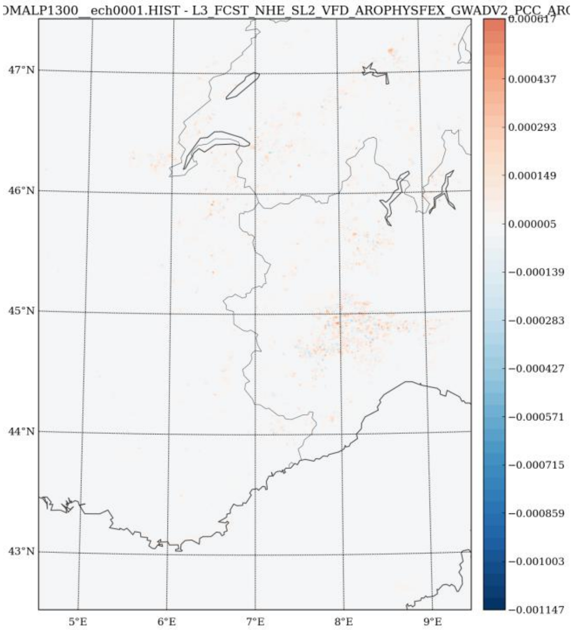

Fig.17: Differences of **S090.HUM.SPECI.ech0001** spectral norms between **DP** runs and reference.

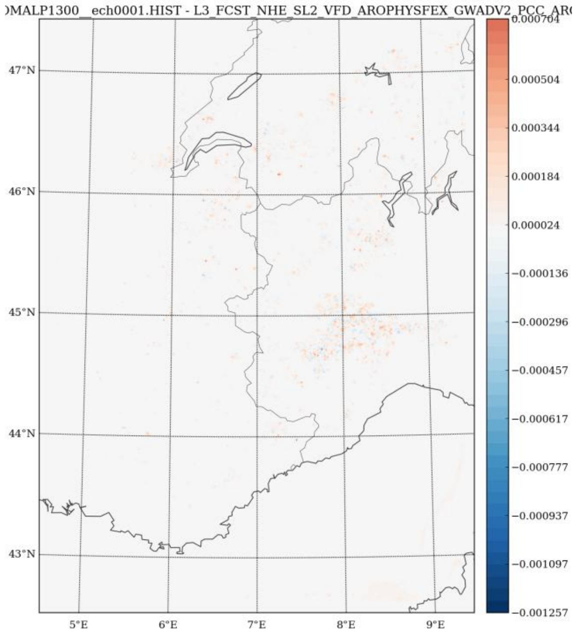

Fig.18: Differences of **S090.HUM.SPECI.ech0001** spectral norms between **SP** runs and reference.

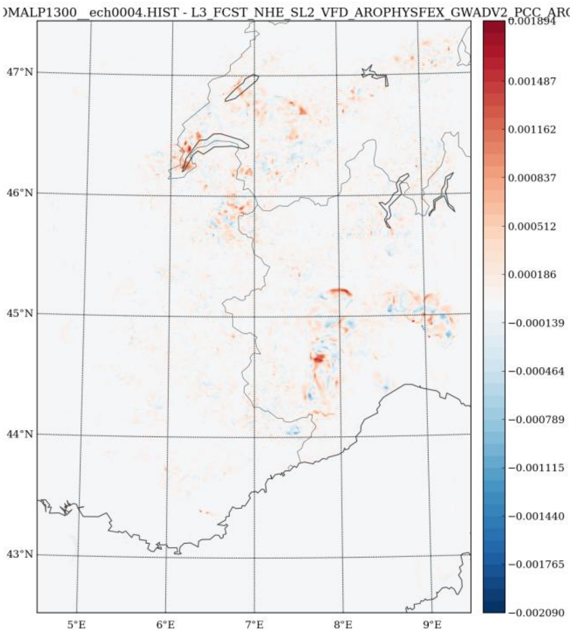

Fig.19: Differences of **S090.HUM.SPECI.ech0004** spectral norms between **DP** runs and reference.

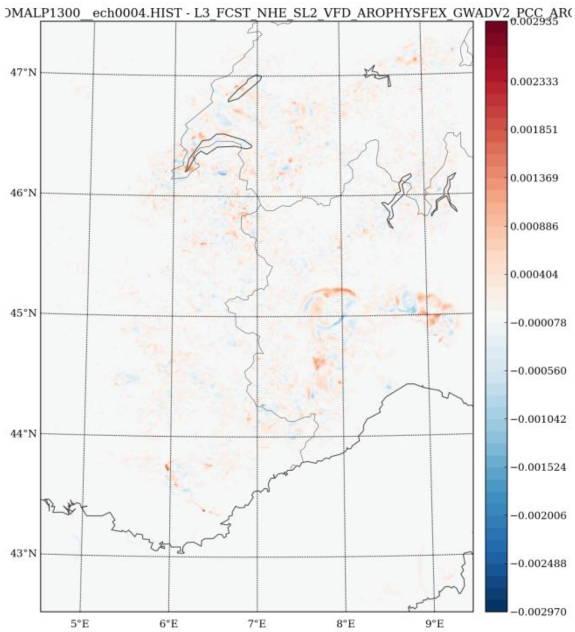

Fig.20: Differences of **S090.HUM.SPECI.ech0004** spectral norms between **SP** runs and reference.

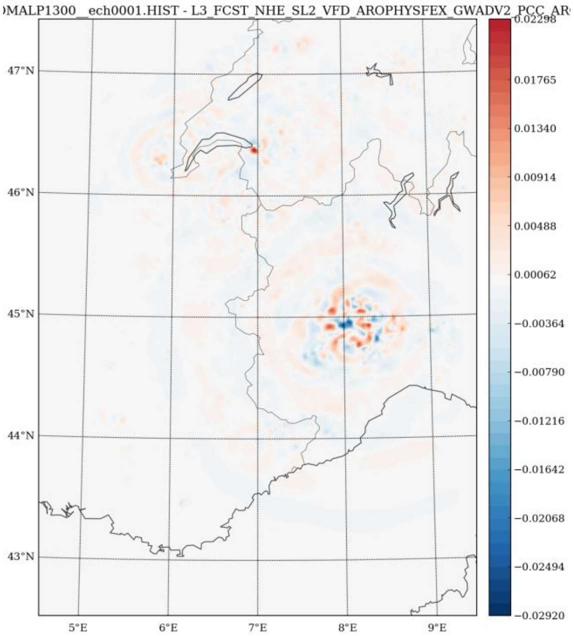

Fig.21: Differences of **S001.TEMPERATURE.ech0001** spectral norms between **DP** runs and reference.

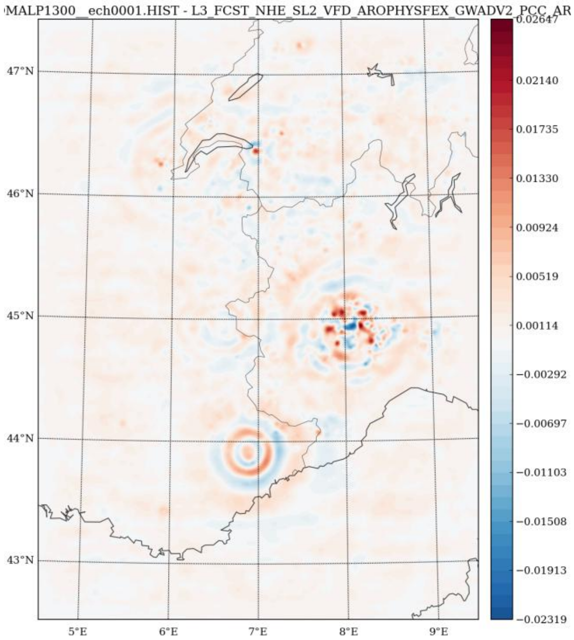

Fig.22: Differences of **S001.TEMPERATURE.ech0001** spectral norms between **SP** runs and reference.

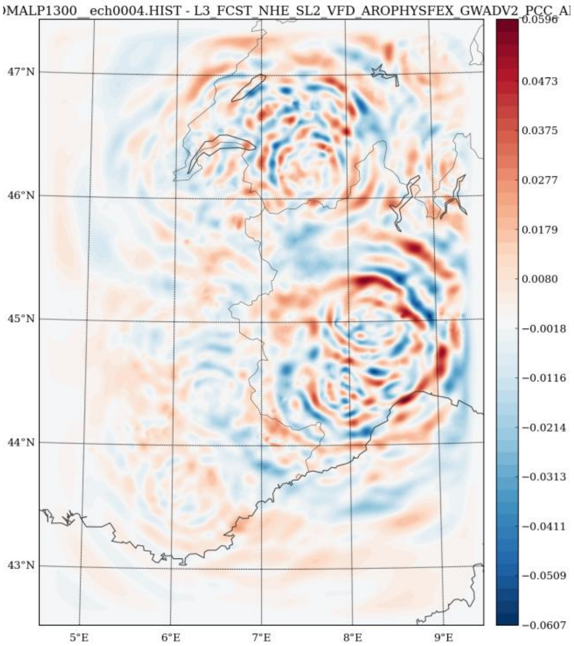

Fig.23: Differences of **S001.TEMPERATURE.ech0004** spectral norms between **DP** runs and reference.

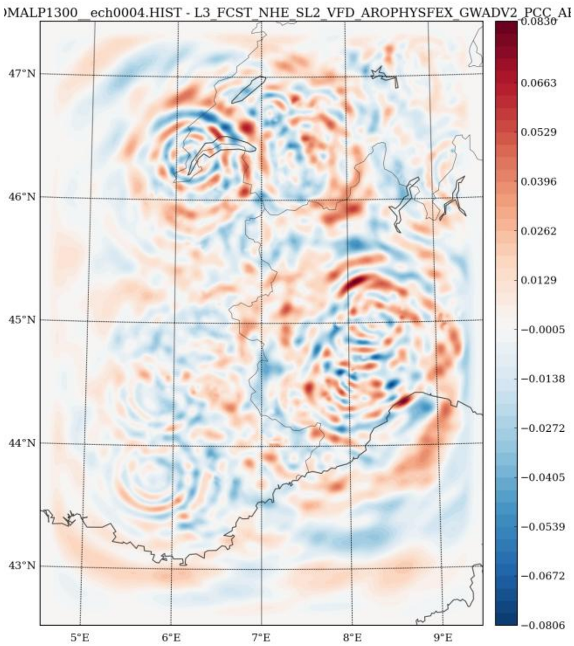

Fig.24: Differences of **S001.TEMPERATURE.ech0004** spectral norms between **SP** runs and reference.

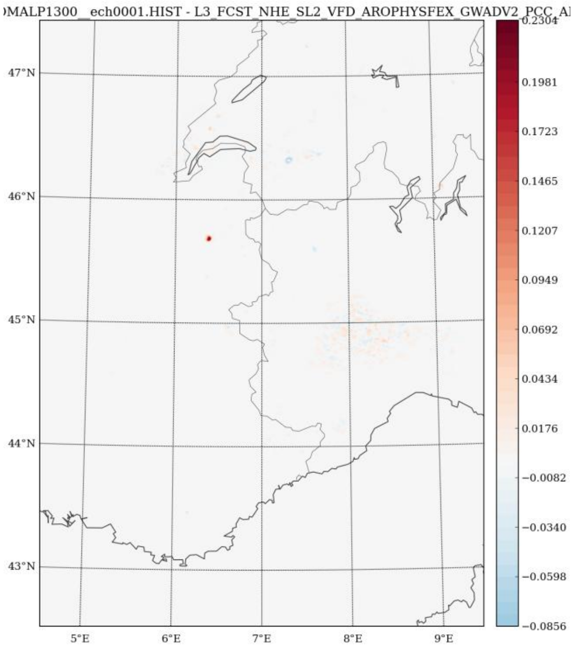

Fig.25: Differences of **S030.TEMPERATURE.ech0001** spectral norms between **DP** runs and reference.

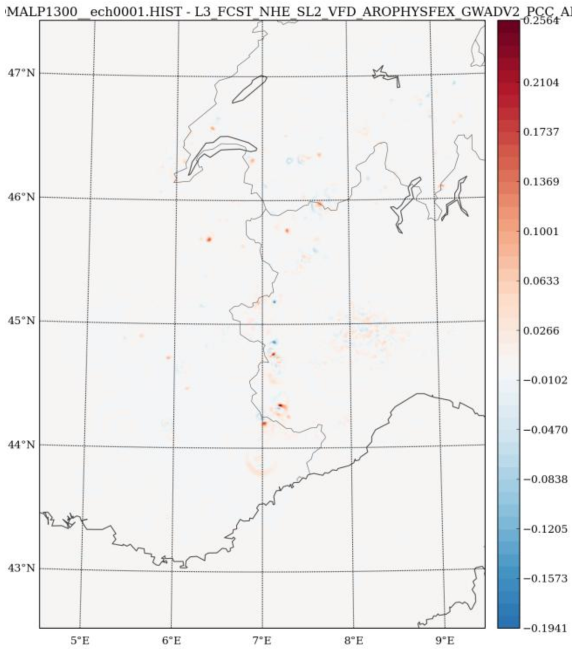

Fig.26: Differences of **S030.TEMPERATURE.ech0001** spectral norms between **SP** runs and reference.

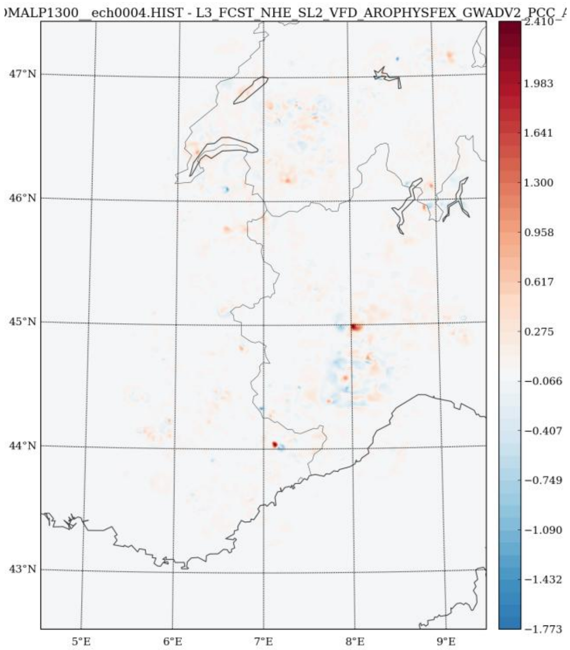

Fig.27: Differences of **S030.TEMPERATURE.ech0004** spectral norms between **DP** runs and reference.

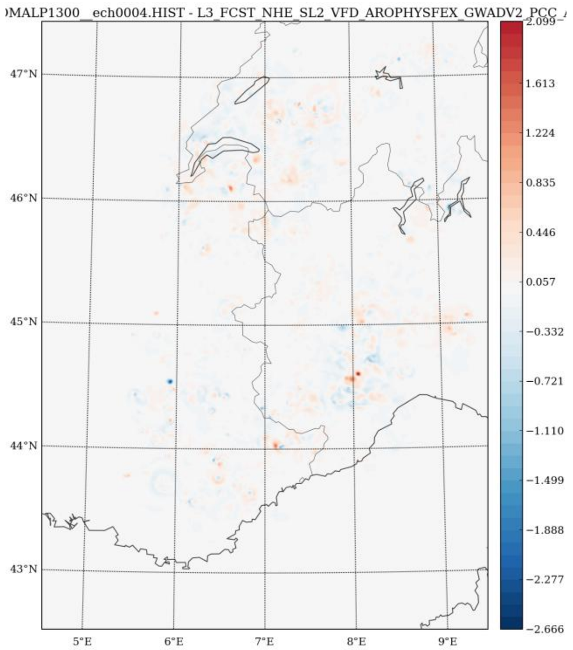

Fig.28: Differences of **S030.TEMPERATURE.ech0004** spectral norms between **SP** runs and reference.

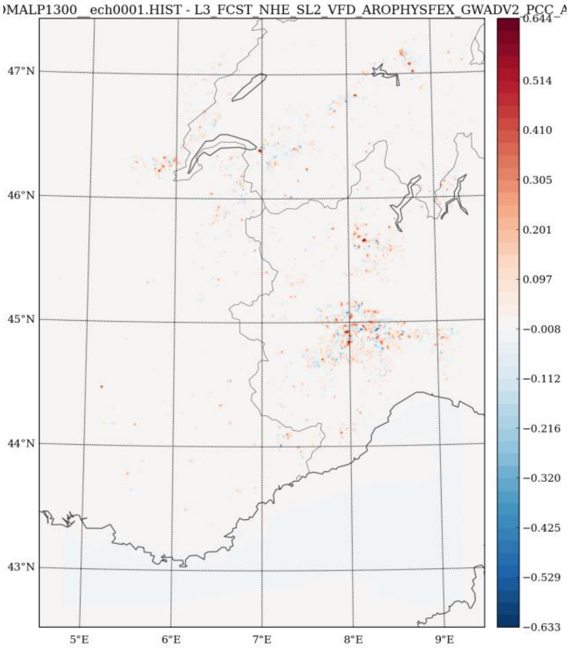

Fig.29: Differences of **S090.TEMPERATURE.ech0001** spectral norms between **DP** runs and reference.

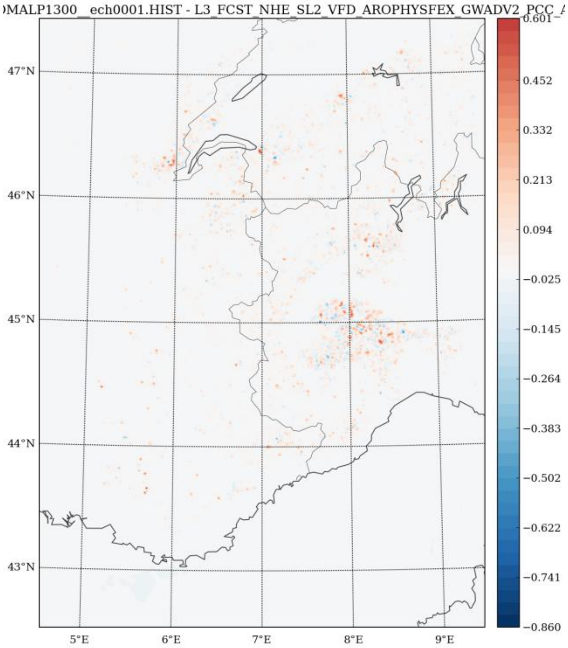

Fig.30: Differences of **S090.TEMPERATURE.ech0001** spectral norms between **SP** runs and reference.

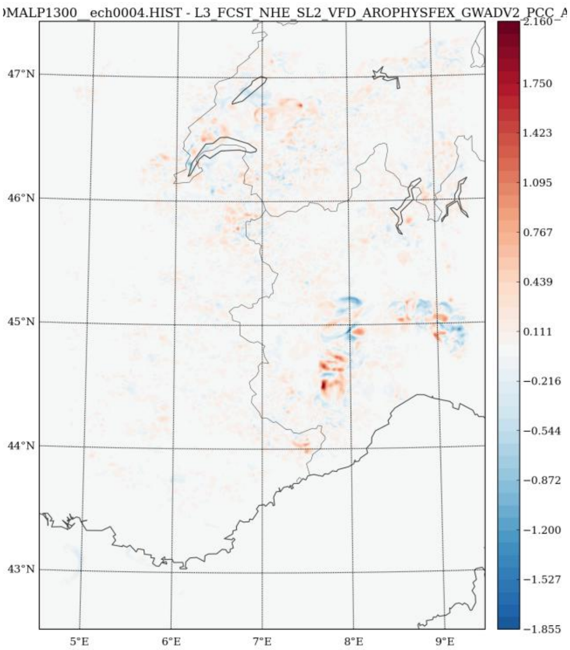

Fig.31: Differences of **S090.TEMPERATURE.ech0004** spectral norms between **DP** runs and reference.

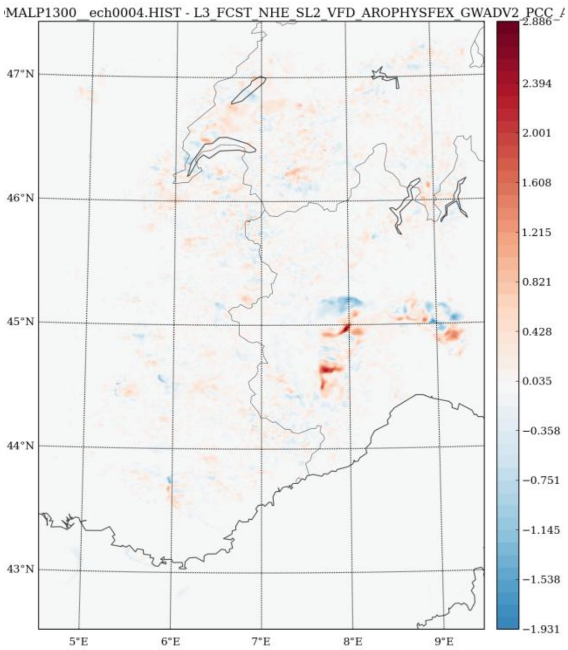

Fig.32: Differences of **S090.TEMPERATURE.ech0004** spectral norms between **SP** runs and reference.

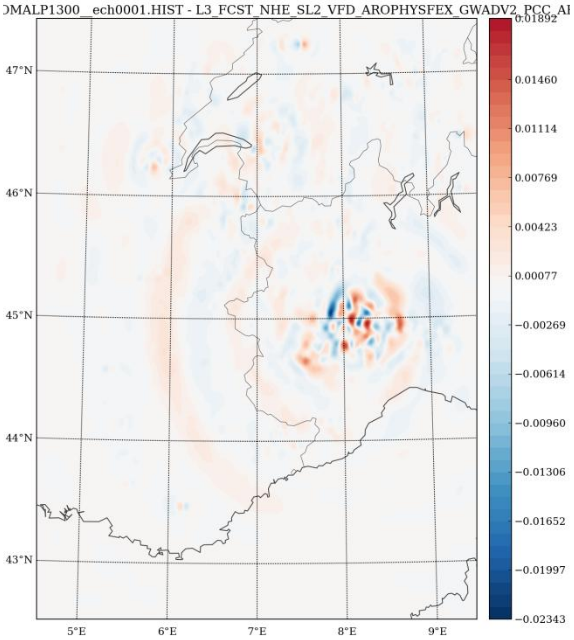

Fig.33: Differences of **S001.WIND.U.PHYS.ech0001** spectral norms between **DP** runs and reference.

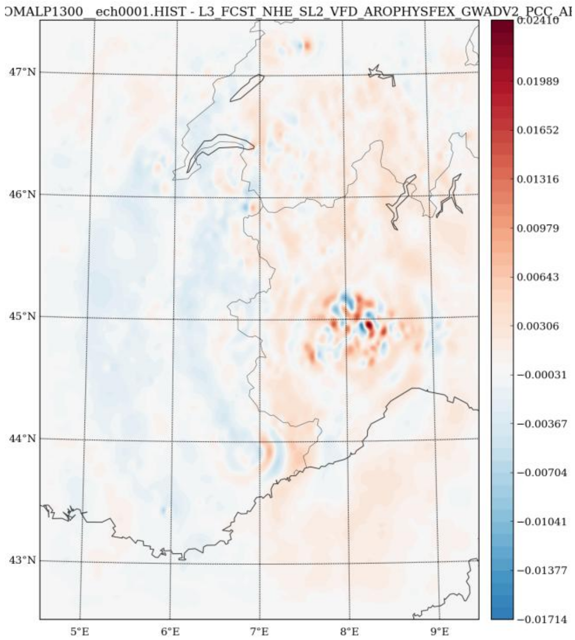

Fig.34: Differences of **S001.WIND.U.PHYS.ech0001** spectral norms between **SP** runs and reference.

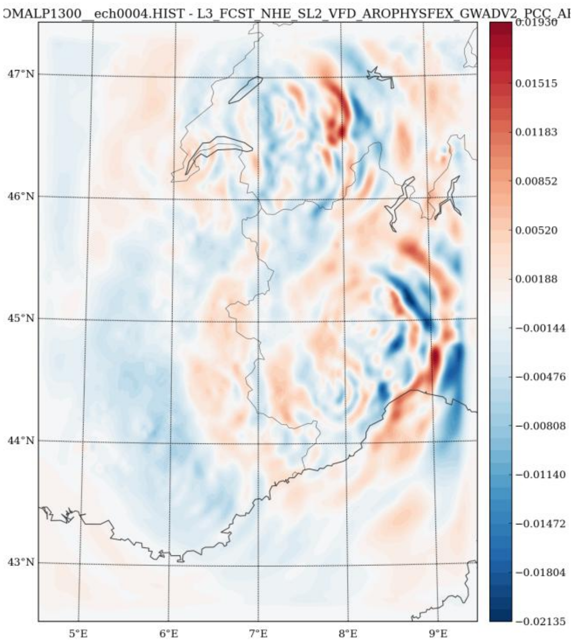

Fig.35: Differences of **S001.WIND.U.PHYS.ech0004** spectral norms between **DP** runs and reference.

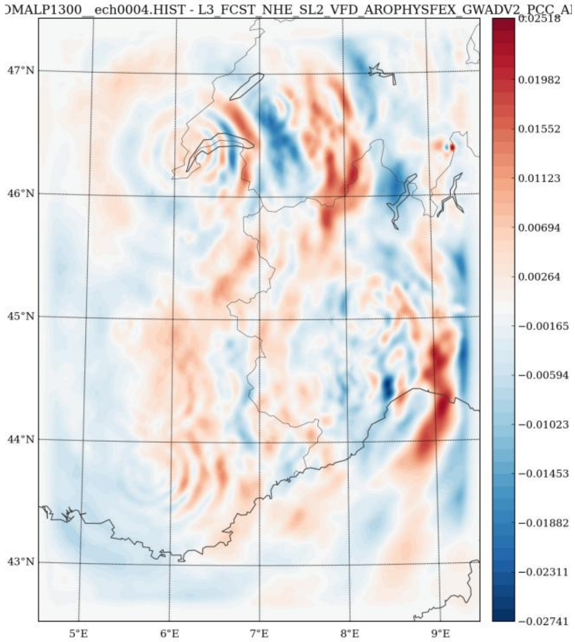

Fig.36: Differences of **S001.WIND.U.PHYS.ech0004** spectral norms between **SP** runs and reference.

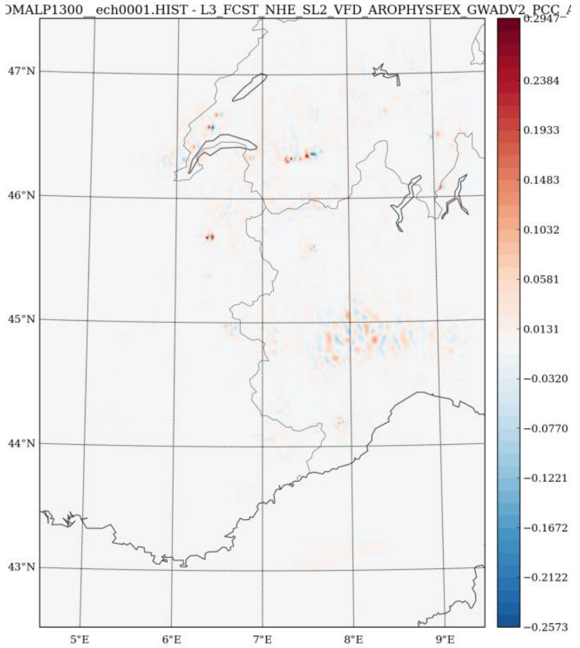

Fig.37: Differences of **S030.WIND.U.PHYS.ech0001** spectral norms between **DP** runs and reference.

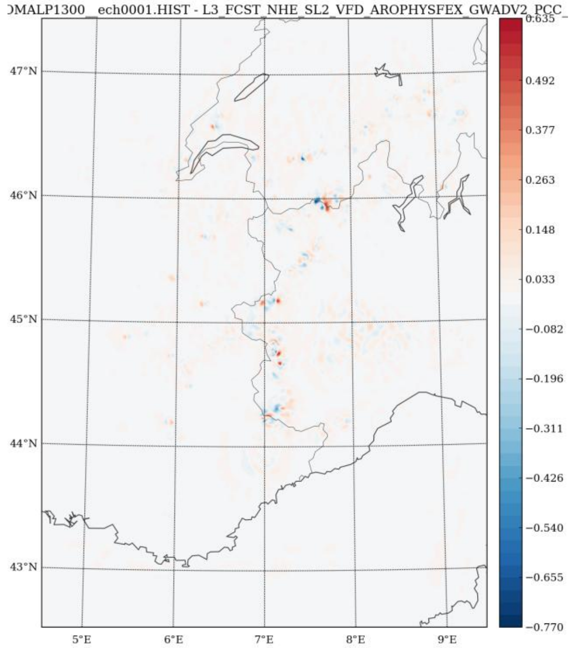

Fig.38: Differences of **S030.WIND.U.PHYS.ech0001** spectral norms between **SP** runs and reference.

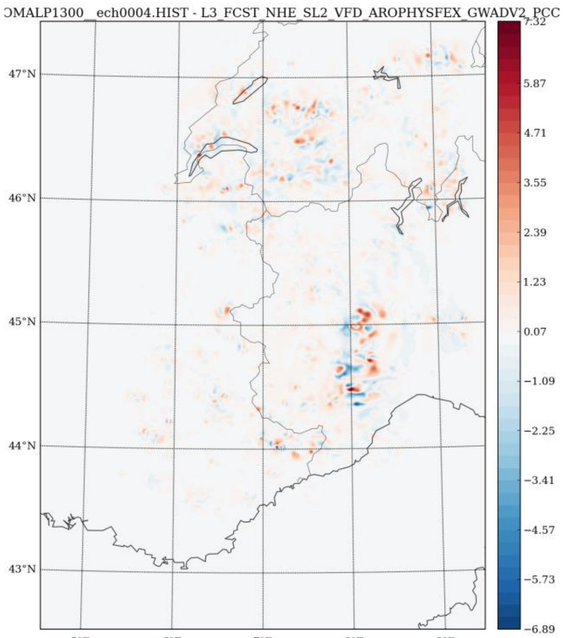

Fig.39: Differences of **S030.WIND.U.PHYS.ech0004** spectral norms between **DP** runs and reference.

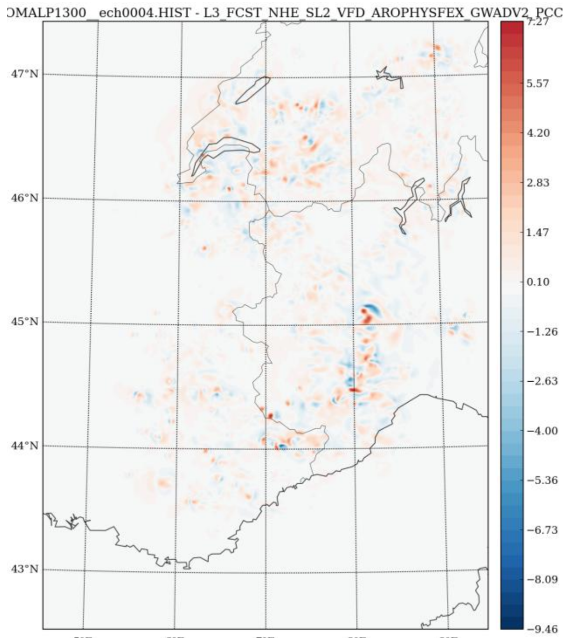

Fig.40: Differences of **S030.WIND.U.PHYS.ech0004** spectral norms between **SP** runs and reference.

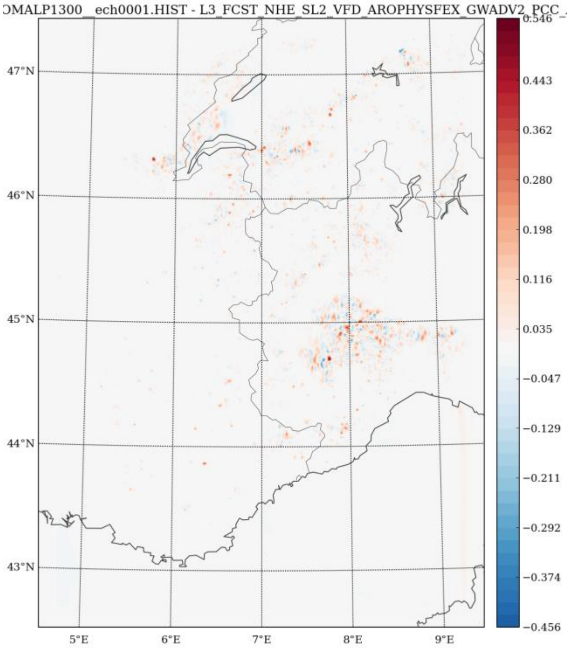

Fig.41: Differences of **S090.WIND.U.PHYS.ech0001** spectral norms between **DP** runs and reference.

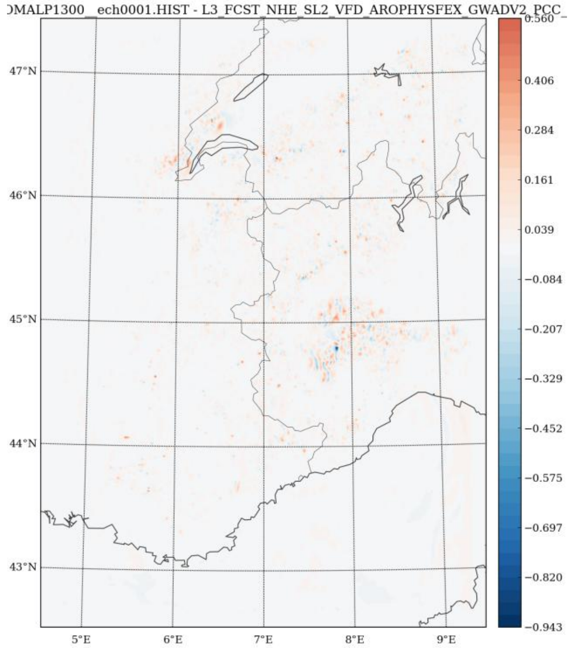

Fig.42: Differences of **S090.WIND.U.PHYS.ech0001** spectral norms between **SP** runs and reference.

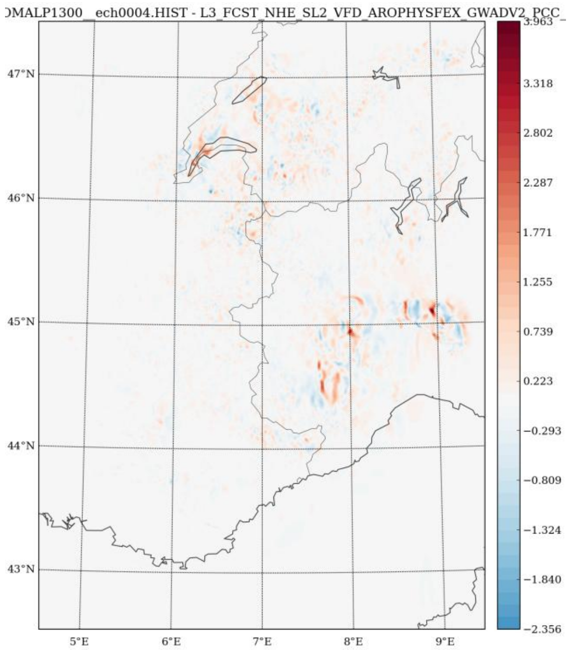

Fig.43: Differences of **S090.WIND.U.PHYS.ech0004** spectral norms between **DP** runs and reference.

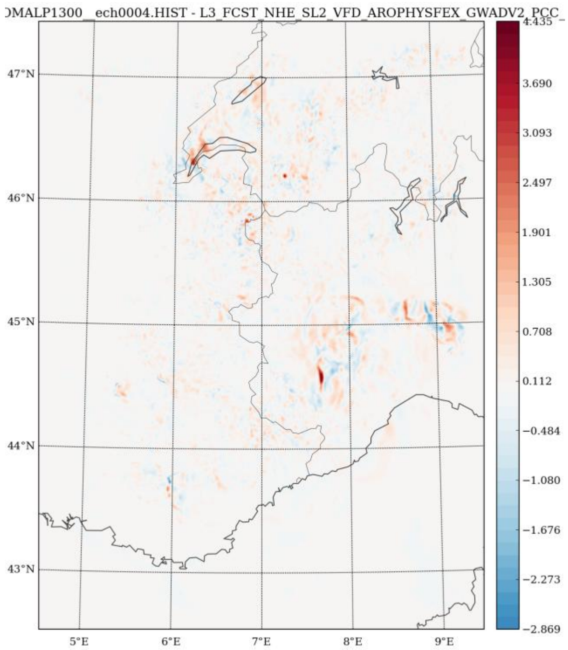

Fig.44: Differences of **S090.WIND.U.PHYS.ech0004** spectral norms between **SP** runs and reference.

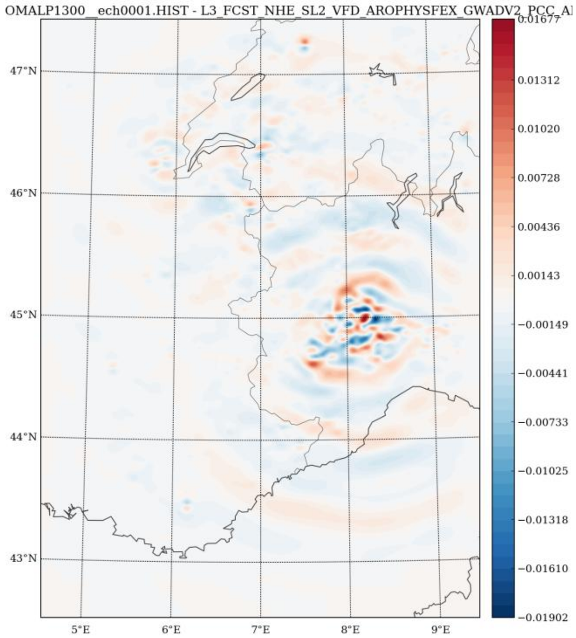

Fig.45: Differences of **S001.WIND.V.PHYS.ech0001** spectral norms between **DP** runs and reference.

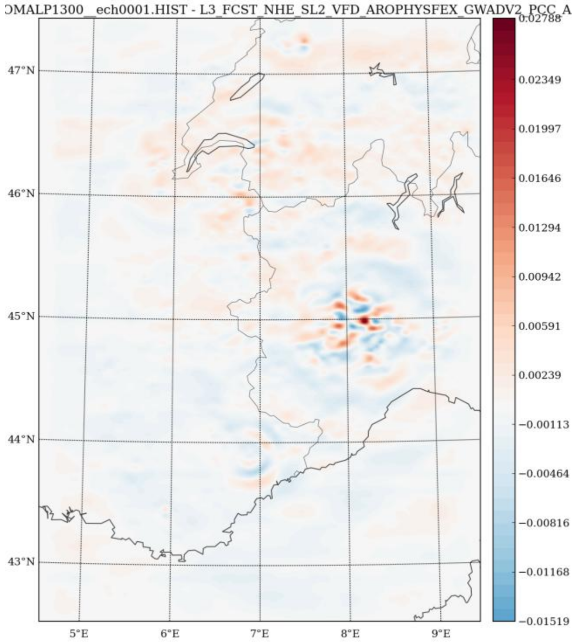

Fig.46: Differences of **S001.WIND.V.PHYS.ech0001** spectral norms between **SP** runs and reference.

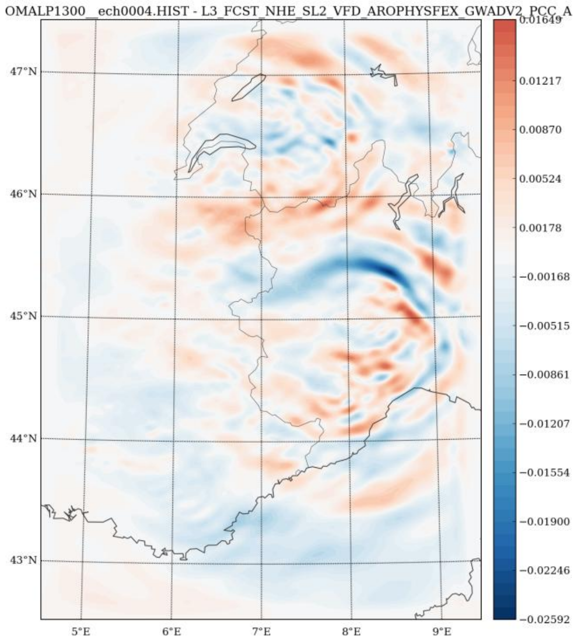

Fig.47: Differences of **S001.WIND.V.PHYS.ech0004** spectral norms between **DP** runs and reference.

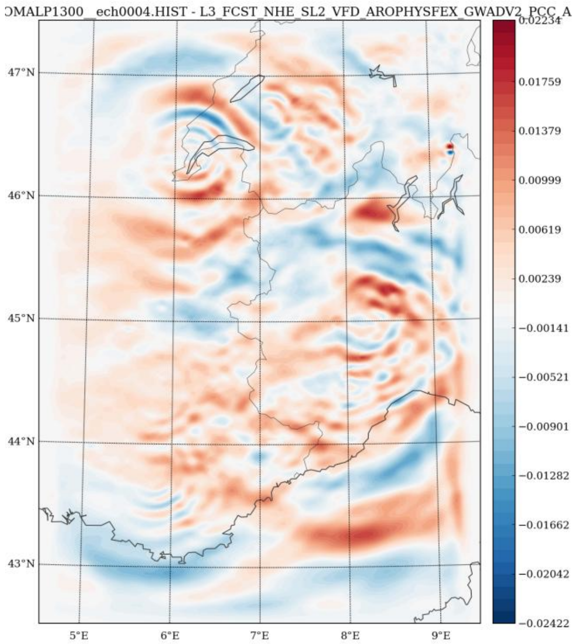

Fig.48: Differences of **S001.WIND.V.PHYS.ech0004** spectral norms between **SP** runs and reference.

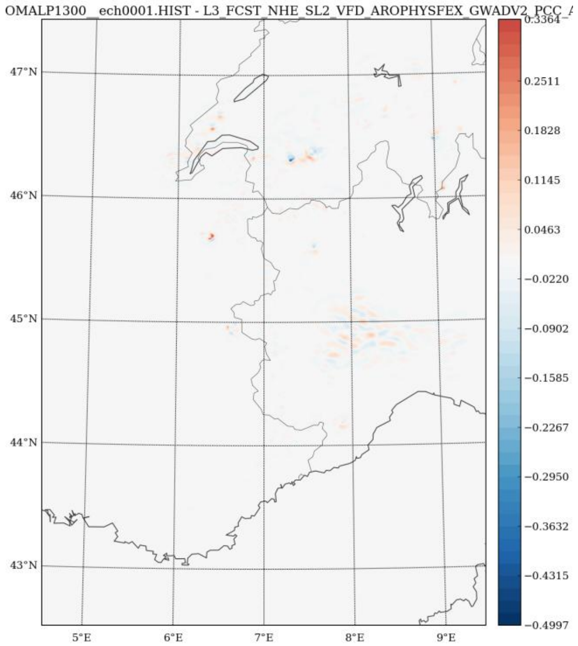

Fig.49: Differences of **S030.WIND.V.PHYS.ech0001** spectral norms between **DP** runs and reference.

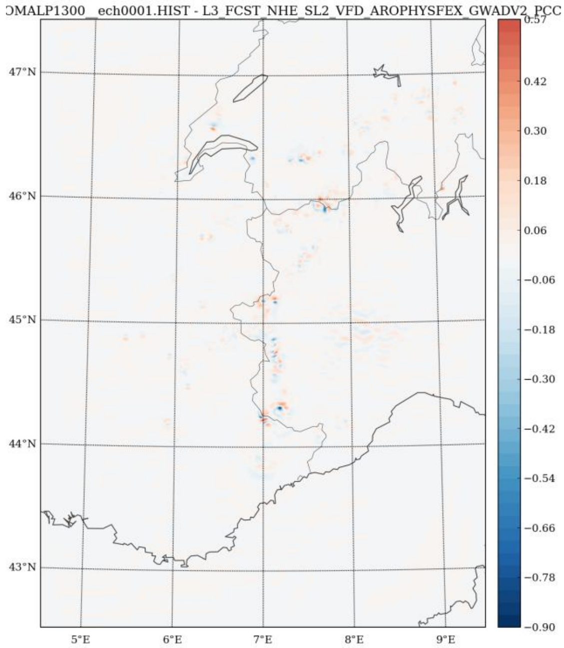

Fig.50: Differences of **S030.WIND.V.PHYS.ech0001** spectral norms between **SP** runs and reference.

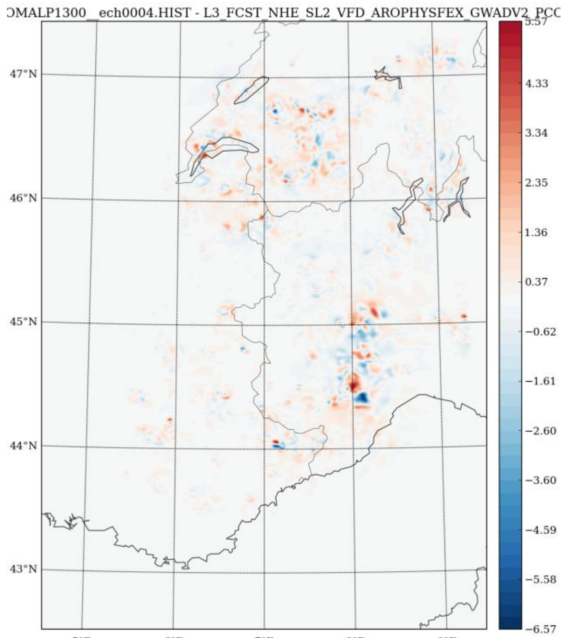

Fig.51: Differences of **S030.WIND.V.PHYS.ech0004** spectral norms between **DP** runs and reference.

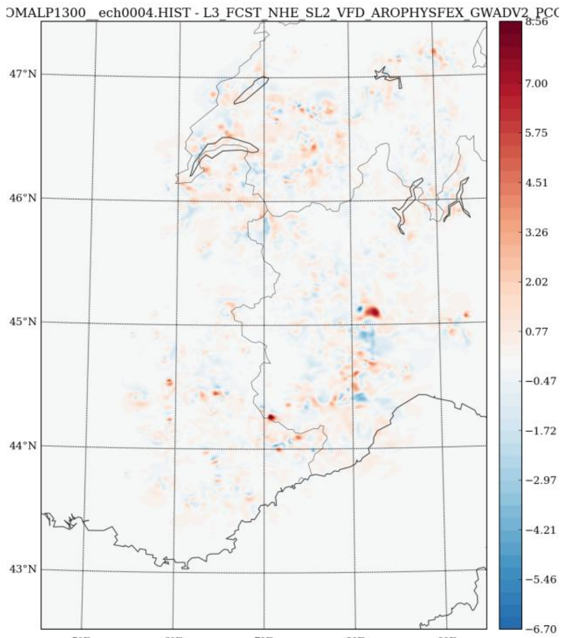

Fig.52: Differences of **S030.WIND.V.PHYS.ech0004** spectral norms between **SP** runs and reference.

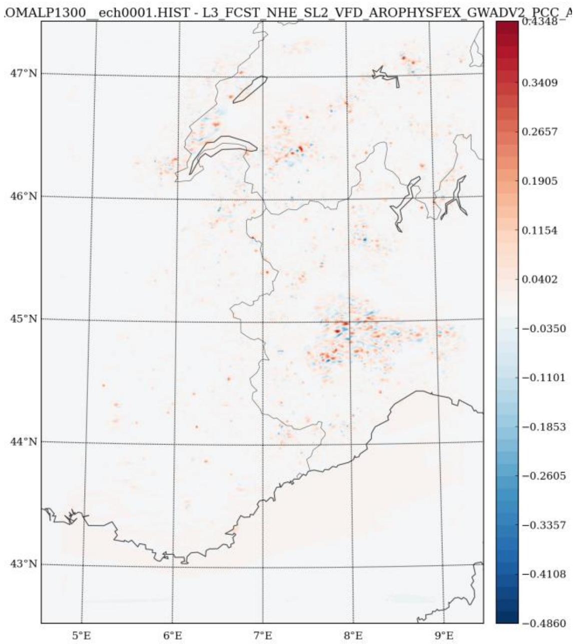

Fig.53: Differences of **S090.WIND.V.PHYS.ech0001** spectral norms between **DP** runs and reference.

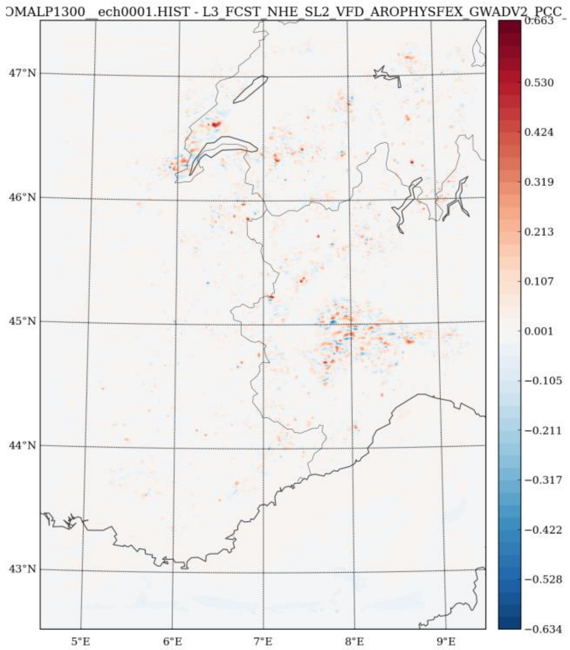

Fig.54: Differences of **S090.WIND.V.PHYS.ech0001** spectral norms between **SP** runs and reference.

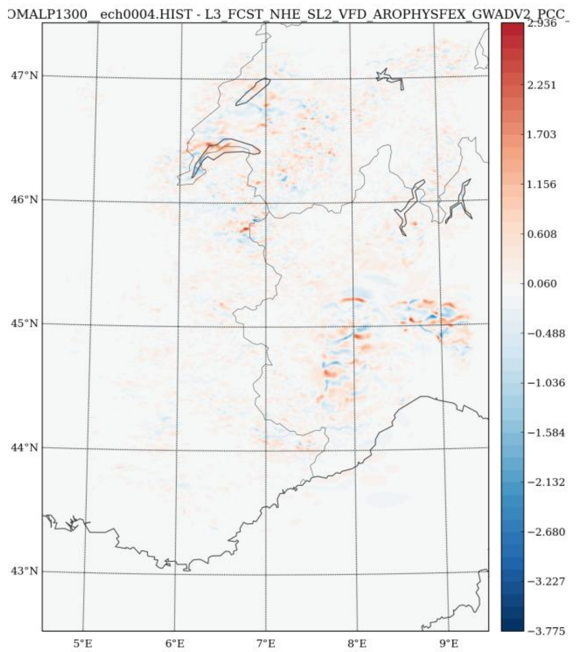

Fig.55: Differences of **S090.WIND.V.PHYS.ech0004** spectral norms between **DP** runs and reference.

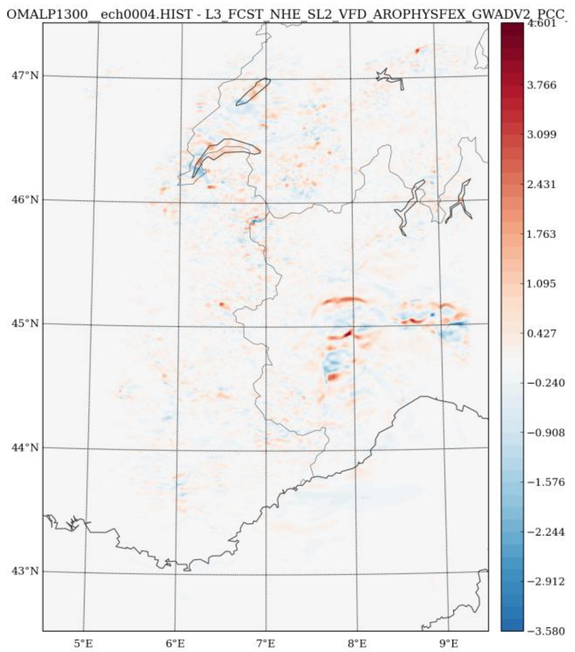

Fig.56: Differences of **S090.WIND.V.PHYS.ech0004** spectral norms between **SP** runs and reference.