

## TM5-MP - Feature #10241

Feature # 10231 (Closed): ERA5 meteo

### fast track ERA5 pre-processing

07/02/2018 10:27 AM - Philippe Le Sager

<b>Status:</b>	Closed	<b>Start date:</b>	07/02/2018
<b>Priority:</b>	Normal	<b>Due date:</b>	
<b>Assignee:</b>		<b>% Done:</b>	100%
<b>Category:</b>		<b>Estimated time:</b>	0.00 hour
<b>Target version:</b>	TM5-MP 3.0	<b>Spent time:</b>	0.00 hour
<b>Description</b>			
Testing / Processing ERA5 meteo at 1x1 / 137layers / 3hourly back to 1990.			

### History

#### #1 - 06/04/2019 01:35 PM - Arjo Segers

- Status changed from New to In Progress

Processed L137 on 1x1 for 1989-2018.

Data available in:

/nlh/TM/meteo-nc/ec/ea/

To be tested in TM simulation with full chemistry.

#### #2 - 06/05/2019 04:27 PM - Philippe Le Sager

- % Done changed from 0 to 50

I made few changes to get the code working (see [r1019](#) to [r1023](#)). I am able to run the full chemistry (CB05+M7) with both ERA-Interim and ERA5 with the ERA-5 branch. Using ERA-Interim I have the same results as in the trunk (good, nothing is broken). Walltime for the step run for a 10-day simulation is:

- 46 minutes with ERA-Interim
- 54 minutes with ERA-5

but these are highly variable on my system (even more with short runs due the extra weight given to IO). Longer runs needed for more useful numbers.

I will start a benchmark run.

#### #3 - 06/06/2019 10:51 AM - Philippe Le Sager

Would it be possible to also retrieve and process the wind speed at 10m instead of (or in addition to) u10m and v10m? We use the latter only to compute the former (see issue [#11771](#)).

#### #4 - 06/06/2019 10:52 AM - Philippe Le Sager

Arjo, I saw you added a "restart.ignore" key. What is it for? I cannot run two or more chunks in a row anymore, I wonder if this is the source of the problem.

**#5 - 06/06/2019 12:49 PM - Philippe Le Sager**

Philippe Le Sager wrote:

...you added a "restart.ignore" key. What is it for? I cannot run two or more chunks in a row anymore, I wonder if this is the source of the problem.

Ok, found it. That new key defaults to True! Just need to make sure it defaults to False, since it is already set to T for ERA5 preprocessing.

After closer look, this new key looks like a quick way of avoiding writing save file (in case it is not compiled with HDF4) when

```
restart.write : F
```

Correct?

This is ok for now, but we'll have to rethink the all logic around restarts. Note that option 32 for istart provides now all the functionality of a save file but with a restart file: remapping and missing tracers are handled.

**#6 - 06/06/2019 01:45 PM - Arjo Segers**

Think it was only introduced because I could not get the hdf lib working correctly ..

**#7 - 06/12/2019 08:14 AM - Philippe Le Sager**

- % Done changed from 50 to 70

Spinup + benchmark runs with full chemistry (CB05+M7) have finished. First look at the performance:

- 1y-spinup was 15% slower with ERA5 (spinup has no output)
- 1y-benchmark was 9% slower with ERA5 (benchmarks have a **lot** of output)

A closer look at the profiling output shows differences in reading the met fields (in seconds, for one month run):

	ERA5	ERA-In.	Explanation
tmm readfield 2D	608.29	147.89	more data: every 1h for ERA5, 3 or 6h for ERA-I
tmm readfield 3D	1060.52	887.86	same amount of data, but internally compressed in case of ERA5

**#8 - 06/14/2019 10:29 AM - Philippe Le Sager**

- File *comp\_with\_observations\_overall.pdf* added
- File *WINTER\_2006.pdf* added
- % Done changed from 70 to 40

The benchmark comparison between the two models for 2006 is available. While most of the comparisons look OK, there is a couple of **serious** issues that need to be resolved. Have a look at the O3 sondes comparisons in the [comp\\_with\\_observations\\_overall.pdf](#) (pages 9-14). And why is the solar zenith angle different between the two runs (see p.26 of [WINTER\\_2006.pdf](#))?

**#9 - 06/14/2019 11:50 AM - Arjo Segers**

How exactly was *sza* written out? The internal timestepping in the model might be different, if *sza* is written out as average over all timesteps instead of instant fields at regular times then the result might be different between *ei* and *ea*.

**#10 - 06/14/2019 03:46 PM - Philippe Le Sager**

Yes indeed, SZA is weighted by the actual timestep:

```
phot_dat(region)%sza_av = phot_dat(region)%sza_av + float(ndyn)/float(ndyn_max) * sza
phot_dat(region)%nalb_av = phot_dat(region)%nalb_av + float(ndyn)/float(ndyn_max)
```

and *sza\_av/nalb\_av* is written to file. Ok the differences are quite small, so it make sense that is due to the different time step. Quite surprised by the pattern...probably logical though.

**#11 - 06/20/2019 02:40 PM - Philippe Le Sager**

I still haven't find anything **in the code** what could explain the difference between the EI and EA. In the entire CB05 chemistry project nothing is different between the two cases when running with a subset of 34 levels, since I do not use MSR or O3DU options (both options require reading/remapping MSR data).

I run the model on 34 levels on both cases (as Henk did before with OD data, which are also provided on 137 levels). The 34 levels are slightly different in the two cases, but not by much since I followed [this correspondence](#).

So I decided to examine the met fields used by writing them out, and will compare them when time allows.

**#12 - 06/24/2019 04:08 PM - Philippe Le Sager**

- File *O3\_sondes\_comp.pdf* added

Arjo pointed out to me that the 34 levels of ERA-Interim and of ERA5 are not the same. Looking closely at the benchmark code that plots the ozone profiles at various stations, I came across this:

```
; DISCLAIMER
; currently works only for 34 out of 60 levels
```

The A's and B's pressure coefficients were hardcoded. Since there are differences between the 34 levels of ERA-Interim and those of ERA-5, it explains the problem in the O3 plots. I've modified the code to read the hybrid coefficients from auxiliary files, so that it can compare runs with different levels (including different number of levels). You can look at the updated comparison in the [O3\\_sondes\\_comp.pdf](#) file. Most of the time ERA-Interim and ERA5 give the same results. There are very few occasions where ERA5 gives better results, like over Hong Kong in JJA particularly.

**#13 - 06/25/2019 09:00 AM - Philippe Le Sager**

- File [SUMMER\\_2006.pdf](#) added

- % Done changed from 40 to 60

The annual cycle of aggregated NO2 columns are compared to OMI retrievals in the last page of the [comp\\_with\\_observations\\_overall.pdf](#). Large differences are found in some regions (Tropics, Africa, and South America), while the north hemisphere shows little changes from ERA-I to ERA5. The seasonal means (p.159-160 of [WINTER\\_2006.pdf](#) and [SUMMER\\_2006.pdf](#)), particularly the summer difference at 500 hPa, also show the larger NO2 South Hemisphere with ERA5.

**#14 - 06/26/2019 04:41 PM - Philippe Le Sager**

- File [eral-vs-era5-comp\\_with\\_observations\\_overall.pdf](#) added

- File [eral-vs-era5-comp\\_with\\_observations\\_satellite.pdf](#) added

- File [eral-vs-era5-SUMMER\\_2006.pdf](#) added

- File [eral-vs-era5-WINTER\\_2006.pdf](#) added

- % Done changed from 60 to 80

I've rerun the ERA5 benchmark with a different selection of 34 levels from the 137 original ones. This new selection was proposed by Arjo and gives levels that are closer to the selected one for ERA-Interim. The results are quite similar to those posted so far. I have attached these final results: [eral-vs-era5-WINTER\\_2006.pdf](#), [eral-vs-era5-SUMMER\\_2006.pdf](#), [eral-vs-era5-comp\\_with\\_observations\\_satellite.pdf](#), and [eral-vs-era5-comp\\_with\\_observations\\_overall.pdf](#).

Let us know if you have any concern or comment. If not, the code will be merged into the trunk.

**#15 - 06/27/2019 07:24 AM - Philippe Le Sager**

- File [eral-vs-era5-budget\\_comparison\\_2006.txt](#) added

[eral-vs-era5-budget\\_comparison\\_2006.txt](#) compares several budgets.

**#16 - 09/24/2019 12:38 PM - Philippe Le Sager**

- Status changed from *In Progress* to *Resolved*

The [implement-era5](#) branch has been reintegrated into the trunk in [r1065](#).

**#17 - 09/24/2019 12:39 PM - Philippe Le Sager**

- Status changed from *Resolved* to *Closed*

**#18 - 01/06/2020 12:44 PM - Philippe Le Sager**

- Target version set to *TM5-MP 3.0*

- % Done changed from 80 to 100

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**Files**

comp_with_observations_overall.pdf	347 KB	06/14/2019	Philippe Le Sager
WINTER_2006.pdf	45.3 MB	06/14/2019	Philippe Le Sager
O3_sondes_comp.pdf	138 KB	06/24/2019	Philippe Le Sager
SUMMER_2006.pdf	45.4 MB	06/25/2019	Philippe Le Sager
eral-vs-era5-comp_with_observations_overall.pdf	355 KB	06/26/2019	Philippe Le Sager
eral-vs-era5-comp_with_observations_satellite.pdf	6.25 MB	06/26/2019	Philippe Le Sager
eral-vs-era5-SUMMER_2006.pdf	45.4 MB	06/26/2019	Philippe Le Sager
eral-vs-era5-WINTER_2006.pdf	45.3 MB	06/26/2019	Philippe Le Sager
eral-vs-era5-budget_comparison_2006.txt	22.3 KB	06/27/2019	Philippe Le Sager