

[RegCNET] ALERT - Potential problem in your RegCM set up

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Dear RegCNETers

We wanted to alert you of a potential problem in your RegCM set up, which we just discovered. It concerns the calculation of the sun declination angle in relation to the length of the year in your boundary condition data.

The declination angle is calculated in Subroutine Solar1. If you go there you will find the variable "dayspy", which is the length of the year in days. The last version of the model on the web used a value of dayspy of 365, i.e. it assumed all years are 365 days long, i.e. it assumes there is no leap year. If your boundary conditions have the leap year (as in ERA40 or NCEP for example), this means that the declination angle will incrementally lag for one day every 4 years of simulation. In other words, for example in a 10 year run, the lag will be 2.5 days, in a 30 year run 12.5 days, 100 year run 25 days etc. 25 days lag time means that the declination angle is almost one month out of phase with the boundary conditions and this of course can cause a severe problem especially in the intermediate (spring and fall) seasons.

Now, you may or may not have a problem. This parameter has changed in the past since different global models assume different lengths of year (some have leap years, like ECHAM, some don't, like CCSM/CAM; some have 360 day years, like HADCM). So what you need to do is the following:

1) Go to Subroutine solar1.F and check the value of dayspy. The values should be

```
dayspy = 365      if no leap year is accounted for
dayspy = 365.24   if the leap year is accounted for
dayspy = 360     if every month is 30 day long
```

2) Check whether the LBC you are using have the same length of year as the dayspy value.

3) For future runs, make sure these values are the same.

4) For past runs, if these values are not the same you may have a problem. As I mentioned earlier, the problem is cumulative. In the case of the leap year inconsistency (one day every 4 years), you are likely not to have a substantial problem for relatively short runs (say up to 10-15 years), but for longer ones you might. To check the extent of the problem you can re-run the last year with the proper dayspy value and compare with the original last year. Anyways, the first 10-15 years of your simulations could still be ok. You are well advised to check all your runs, if at all possible.

5) This problem is zero-ed out every time you re-initialize (not re-start)

the model, so if you have time slices instead of a long continuous run this is good, because the problem depends on the length of the time slice.

we apologize if this issue might have created you a problem. In the present version dayspy has been now set to 365.24, but, again, previously it was 365, so you should check since a lot of moedls used for LBC have the leap year. For the future we plan to actually have dayspy as an external parameter to be set by the user, so that the user does not forget to check its value,

good luck to all with this, Filippo Giorgi and the RegCM team

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