Hi All,

We thought we would email to let you know of a potential bug in the solar insolation calculation that impacts all versions of the Hadley Centre model (including HadCM3 and HadGEM3). The bug was discovered by Pam Vervoort, Peter Hopcroft, and Michel Crucifix and been checked by others.

The problem is not directly with the Fortran code, but with the equation for the role of eccentricity on solar insolation. In technical document 23 (Radiation) equation 3.1.4 is incorrect:

S(t) = So ( (1+e2/2)\*(1+ecosv)/(1-e2))2

The equation should be:

S(t) = So ( (1+ecosv)/(1-e2))2

(i.e., the 1+e2/2 is incorrect).

The magnitude of the error is not too large for the modern orbit but can cause 1-2 W/m2 (global, annual average) for periods with high eccentricity, with larger errors locally (5W/m2 or more).

For HadCM3, the correction is very simple.

\*ID ORBIT\_BUGFIX

\*DECLARE SOLPOS1A

\*D SOLPOS1A.60

& E4=( 1./(1.-E\*E) )\*\*2 ! Updated constant for 3.1.4

If you are using a standard setup, this correction is in the following modset (can be found on puma):

~swsvalde/um\_updates/orbit\_bugfix

If you are using one of the HadCM3B or HadCM3BB setups, you will probably have a modset of the form orbital\_param……. Replace this with the same name but \_v2 near the end of the name. e.g.

orbital\_parameters-6.1\_real1950o.mod becomes orbital\_parameters-6.1\_real1950o\_v2.mod

The very latest version of this modset is now called solar\_orbit\_real1950.mod and you should replace this with solar\_orbit\_real1950\_ver03.mod.

If you are using FAMOUS, the standard modset is orbital\_parameters-6.1.mod and needs updating to orbital\_parameters-6.1\_v2.mod. However, this modset is stored in $UM\_HOME/famous/mods/source

So, someone with the correct privileges will need to install it.

In all cases, the only scientific difference is the bug fix. However, if you were using solar\_orbit\_real1950.mod, then there is also an expansion of the capabilities of the update. ver02 and ver03 allow a user to have a variable solar constant.

This latest issue with the bug fix has raised another issue that a few of us have occasionally talked about. Should we have an emailing list (and maybe website) to share these sort of things? There are quite a few model developments, technical fixes etc. which exist but not fully shared. For instance, the standard install of UM4.5 requires a particular flavour of ksh, pdksh. pdksh is getting hard to access/install, and I was pleased with myself when I was able to get the UM working without it. However, I then found that several other groups had already created their own fixes. It might be good to share such things!

I know that Robin Smith has done this with FAMOUS but maybe we should expand it to all users of UM4.5. Would people be interested if we setup an email and website support group?