EXERCISE N°1: Bug search (a true one, in real time !!!)

In order to validate the APLMPHYS code with respect to the current operational one of ARPEGE, it was requested that the 'geometrical' option of ACPLUIZ be 'mimicked' in APLMPHYS, without caring for the induced computing costs.

Let us first recall the said option: no distinction between cloudy and non cloudy environments for collection and evaporation-melting/freezing processes. For auto-conversion, 'fractal' choice: the input cloud water quantities are divided by a cloud amount in input and the conversion rates are multiplied by the same quantities in output, but there is no true geometrical consideration (the 'partial cloud' is spread over the whole mesh).

The mimicking (under option LCLFRCT=.TRUE.) has been done in forcing the local (to APLMPHYS) 'cloud cover' to be systematically equal to one, without imposing anymore that the 'cloud' be saturated (evaporation is allowed). Additionally the division/multiplication operations around the call to ACACON have been (successfully after correcting a first bug) emulated.

No problem seems to appear at the level of ACCOLL.

There is however *a remaining bug around the use of ACEVMEL* (evaporation & melting of falling precipitations). In sub-cloud layers the snow evaporates BUT NOT THE RAIN! This is diagnosed when using the ARPEGE type code within ACEVMEL (option LLARPSC=.T.) but there is no reason why it should be linked with this option, which works perfectly well when LCLFRCT=.F..

The possible reasons for the bug can be listed:
- mistyping (unlikely because nothing special distinguishes the two types of evaporation in APLMPHYS);
- 'sleeping' contradiction between APLMPHYS and ACEVMEL, woken up by the activation of the LCLFRCT switch;
- something linked with falling precipitation melting/freezing; indeed when doing budgets of snow & rain species, the latter term adds to one of the evaporation terms, while it is subtracted from the other one; the securities against negative fluxes are built (at the end of ACEVMEL) around this concept;
- basic algorithmic deficiency, following an error of logic in the implementation of the LCLFRCT 'clone of the ACPLUIZ situation' (unlikely, given the very simple choices made there, but one never knows!).

The available material is:
- the graphical documentation of APLMPHYS (aplmphys.jpg);
- the code of APLMPHYS with the extra developments corresponding to the introduction of LCLFRCT; in the .rtf version those are put in bold face, in order to ease their identification; the .txt version is of course without this facility;
- the code of ACEVMEL;
- the most recently updated scientific documentation (ACPLUIE_prog_octa) of APLMPHYS, ACACON, ACCOLL & ACEVMEL (of course one cannot find anything about code organisation and/or securities, thresholds, etc. in this text).