ACCORD

A Consortium for COnvection-scale modelling Research and Development

Steps toward common surface environment in ACCORD and surface activities

Patrick Samuelsson, 2022-04-04, All Staff Workshop, Ljubljana

ACCORD NWP SURFEX training in Budapest in May

We are kindly invited by OMSZ to enjoy a May week (9-13) in Budapest for our NWP SURFEX training. It is a hybrid meeting. **[Link to wiki page here](#)**.

The agenda includes a number of lectures, training activities and discussions on how to proceed with SURFEX for our NWP needs.

At the moment some 30 participants have signed up (10 on site). There is room for more participants, on site and virtual. Please sign up via the wiki page.

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Common ACCORD NWP SURFEX repository in GitHub

A common ACCORD SURFEX code based on SURFEXv8.1 is soon available under the ACCORD GitHub environment for the purpose to be a common SURFEX environment for ACCORD SURFEX applications and developers.

The first version is based on a merge between the HARMONIE-AROME version of SFXv8.1 (branch SURFEX_NWP in the SURFEX repository used in cy43h) and the AROME-France version of SFX8.1 (branch NWP_81plus in the SURFEX repository used in cy48t). The intention is that cy49t will be based on this common version.

Acknowledgements to Alexandre Mary and Adrien Naoply for the merging initiative. And to Adrien and Yurii Batrak for assistance in taking us through the merging process.

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Current status:

- **The branch compiles and runs in the SURFEX offline environment.**
- **Applying the branch in HARMONIE-AROME cy43h environment reproduce both summer and winter performance compared to default cy43h setup (based on MetCoOp domain Monitor validation).**
- **Goes through PGD and PREP steps in cy48t environment but crashes in Forecast step (MASTERODB) for still unknown reason…**

Next steps:

- **Create a development methodology workflow in the ACCORD GitHub environment.**
- **Merge in SFXv8.1 development done by others (and also NWP development in older SURFEX versions that we wish to bring in) and later development in t- and h-cycles.**
- **To be used in the upcoming NWP SURFEX training week in Budapest/Hybrid in May.**

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The current content of the common NWP SURFEX version, in addition to the original SURFEX8.1 code, is e.g.:

- **ORORAD - Orographic influence on radiation processes.**
- **Toucans - Surface layer exchange processes related to the Toucans turbulence scheme.**
- **Sea ice schemes SICE (operational in HARMONIE-AROME) and improved Gelato (applied in Arpege).**
- **OROTUR - Orographic induced drag (an additional CROUGH option).**
- **Improved FLake behaviour and compatibility to latest Lake Depth Database.**
- **Open-land roughness adjustments needed for ECOSG activation.**
- **Corrected Rh2m diagnostics for below 0degC conditions.**
- **SODA adjustments to allow for NPATCH>1 and both D95 and ExplicitSnow snow assimilation.**
- **Single precision adjustments.**

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As a NWP SURFEX developer **you need your own GitHub account**. As soon as you have that you can be invited to join the ACCORD GitHub SURFEX repository.

Please note that **this repository follows the SURFEX offline directory structure** which is different from the ACCORD NWP structure. Thus, the integration of this offline structure and the NWP code structure is yet another challenge. Please see presentations by Alexandre Mary and Daniel Santos for more info on plans to build a cycle from different repositories.

Please note that the setup of this branch under the ACCORD GitHub environment is a **temporary solution** to allow for a smooth development environment for NWP colleagues. The official SURFEX repository will also be moved to GitHub eventually and then we will follow since one big purpose of this NWP offline SURFEX branch is to stay close to the SURFEX team development. In meantime some careful synchronisation is needed between repositories.

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How do we proceed with surface activities in ACCORD:

- **Physiography**
- **Physical processes**
- **Observations and data assimilation**

Physiography

All versions of ECOCLIMAP are used in the consortia, i.e. first generations (ECOCLIMAP I and II) and second generation (ECOSG). **In principle the details become more realistic with later versions, but the gain does not come automatically!** Tuning is needed in any step!

The 1st and 2nd generations are, in principle, global which is good since any domain can be supported. But, high latitude domains in combination with ECOSG are problematic since we lack parameter values (albedo and LAI). Work on that is ongoing. Also, existing ESA CCI land cover database is under correction and complementation in a C-SRNWP project.

Beyond that we just saw the plans by Geoffrey et al. to create a **high-resolution European version of ECOSG**. At local and regional scale there are nowadays plenty of land-cover databases available and we see applications of such in our consortia. However, we also see that more details don't automatically create better results (can also be a validation problem).

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Physiography questions and comments

All operational services, where a change in ECOCLIMAP version is taken onboard, need to go through a tuning procedure. The methods we apply for this are now independent. **Should we invest in more common tuning procedures?** What could such procedures be?

We can also gain by documenting tuning! Lack of documentation leads to many reinventing-the-wheel exercises or even remaining biases that could have been avoided.

New surface physics requires additional physiography databases, e.g. soil-organic carbon for the diffusion scheme or urban characteristics. What is the quality of these databases?

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Physical processes

For the land tile, beyond the classical ISBA processes (ForceRestore and D95), **the multi-layer processes now starts to be heavily evaluated as well as the prognostic LAI** (represented by the A-gs processes). MEB is considered mature for forest VEGTYPES but is now also evaluated for short vegetation VEGTYPES.

For the urban tile we see beneficial modifications of some physiography aspects (roughness and ECOCLIMAP versions) and on research basis fascinating skyscrapers - atmospheric levels coupling to account for tall city centres in a more realistic manner. The garden option is gently examined.

For the sea tile coupling activities to wave models are well proceeded. More advanced SST updates are considered (forecast products or 1D ocean models).

For lakes FLake is operational in some setups and is evaluated and considered by more.

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Physical processes questions and comments

Now 1-2 patches are used in different setups. **2-3(4) patches are considered**, meaning forest, open-land, bare soil (glaciers). The surface assimilation is a challenge if only SYNOP is used as observations...

The urban tile and TEB scheme offers many advanced processes, but they also put a heavy demand on physiography (e.g. building characteristics). Databases which are not generally or globally provided. How does activities look here...

We lack wetland processes which requires handling of water table depth.

SURFEX albedo parameters (e.g. ECOSG VIS and NIR for soil and vegetation) do not necessarily represent the same wavelength intervals as the atmospheric radiation schemes... And albedo as function of direct and diffuse radiation and zenith angle seems not to be satisfactory taken into account. Since SW radiation is our major source of energy at the surface we should be careful.

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Surface data assimilation

Operationally OI surface assimilation is still our working horse in all setups with assimilation.

Circumstances decide how short-medium term solutions beyond OI look in our consortia:

Ensemble NWP system: OI for soil with EPS-coeff.	Ensemble NWP system: EnKF-based solution	Deterministic NWP system: (S)EKF-based solution	Crowd-sourced focus: TITAN/gridPP spatialisation	Less weakly coupled atm-surface assimilation
Météo-France	**H2O-project at MetNorway**	**MetHungary MetAustria HARMONIE-AROME**	**MetCoOp nowcasting system (pySurfex and Netatmo)**	**Roel and Katya leading RT9 Coupled Atmosphere-Surface DA**

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Surface data assimilation questions and comments

How do we do **preprocessing of satellite products or radiances for surface applications**? Now separate and specific solutions in each individual setup. Can we join here around a common framework? E.g. an extension of the satellite handling performed for the upper atmosphere data assimilation…

The long term strive is a strongly coupled atmosphere-surface assimilation system where today's surface applications are not longer used (CANARI, Soda, …) but can we also join around a medium-term framework supporting CANARI, Soda,...

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Hvala lepa!

Thank you very much!

View from Paris-Ljubljana flight Sunday afternoon