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HARMONIE and SURFEX

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HARMONIE

- Based on mini-SMS as HIRLAM
 - Boxes and families
- Reference script system around source code and namelist collaboration with Meteo-France/ALADIN/LACE/(ECMWF)
- Two surface schemes/models
 - Built-in ISBA [old_surface] (similar to HIRLAM before NewSnow)
 - SURFEX (External Surface model)



The heart of the model

- `sms/config_exp.h`
 - Should contain most user settings
 - Similarities to `Env_expdesc` in HIRLAM
- `scr/include.ass`
 - More detailed data assimilation settings
- `(Env_system)`
 - Host specific settings
- `(Env_submit)`
 - Batch processing settings



sms/config_exp.h

I: Domain

- Model geometry
 - DOMAIN=DENMARK
 - Domains defined in the bottom of the file
 - VLEV=65
 - HIRLAM_60,ECMWF_60,HIRLAM_40,40,MF_60,65,BOUNDARIES



II: Physics and dynamics

- DYNAMICS="nh"
 - hydrostatic dynamics (h)
 - non-hydrostatic dynamics (nh)
- PHYSICS="arome"
 - aladin
 - arome
 - alaro
- SURFACE="surfex"
 - old_surface
 - **surfex**



III: Data-assimilation

- ANAATMO=3DVAR
 - 3DVAR
 - 4DVAR
 - Blending (Upper air from boundaries)
 - None (not recommended)
- ANASURF=CANARI_OI_MAIN
 - CANARI : Old style CANARI
 - CANARI_OI_MAIN : CANARI + SURFEX OI
 - CANARI_EKF_SURFEX : CANARI + SURFEX EKF (experimental)
 - none : No surface assimilation
- ANASURF_MODE="before"



SURFEX

Offline SURFEX calling sequence

- Generate forcing from atmospheric model

PGD (Physiographical data set)

=> PREP (Initialization)

=>OFFLINE (SURFEX model run)



SURFEX in HARMONIE (inline)

- src/surfex (code)
 - Same source code as the offline version
 - sfx.vN and sfx.vN.bfD are merged to SURFEX and OFFLINE
 - No scripts for generating forcing and compilation with required offline libraries (e.g. netcdf)
 - HPROGRAM=='AROME '
 - HFILETYPE=='BUFFER'



SURFEX setup and start in HARMONIE (I)

- PGD (physiographical data set)

mini-SMS Family:

- MakeCycleInput/Hour/Climate/PGD
 - Prepare_pgd_lfi
 - Prepare_pgd_fa
 - Both uses scr/Prepare_pgd
- Namelist (OPTIONS.nam)
 - Generated in scr/Prepare_pgd
 - Defines grid, tiles and covertypes and schemes to use on the different tiles.

Example:

```
&NAM_PGD_SCHEMES CNATURE='ISBA ', CSEA='SEAFLX', CWATER='WATFLX',  
CTOWN='TER ' /
```



SURFEX setup and start in HARMONIE (II)

- PREP (Initialization)

mini-SMS Family:

- MakeCycleInput/Hour/Boundaries/Prep_ini_surfex
 - Uses the script scr/Prep_ini_surfex
- Namelist (OPTIONS.name) generated in script scr/Prep_ini_surfex
 - E.g: Canopy model is selected here



SURFEX setup and start in HARMONIE (III)

- Forecast(OFFLINE)

mini-SMS Family:

- Cycle/Hour/Forecasting/Forecast
 - Uses the script scr/Forecast
- Namelist (OPTIONS.nam) generated in script scr/Forecast
 - Diagnostics
 - Fluxes
 - Canopy drag