

A Consortium for CONvection-scale modelling
Research and Development

Tactus - a common scripting for ACCORD

Outline of this session

- Background information from the ACCORD strategy, roadmap, and RWP 2026 (Ulf)
- Some more details and ideas on tactus (Ulf)
- Data assimilation aspects and needs in Tactus (Benedikt)
- EPS aspects and needs in Tactus (Inger-Lise)
- Plenary discussion (All!)

We need to end 14.45 to allow everyone to get ready for the excursion. The buses leaves 15.00 sharp!

[Tactus presentation from Monday](#)

Steering documents: from [ACCORD strategy 2026-2030](#)

- The design of a common development environment, including a common scripting system, will become another strategic and fairly new goal in phase 2 with the aim of increasing the overall efficiency of collaborative R&D in ACCORD
- The design of ACCORD common scripting system will start from the DEODE scripting system and adopt a co-analysis and co-development strategy leading to a stepwise development and to a genuine co-ownership of the tools, also leveraging on existing knowledge and tools that can accelerate the development.

Steering documents:

Roadmap to an ACCORD common scripting system_v0

GROUP 1

Task 1.1. First Knowledge Transfer from DEODE to ACCORD.

Task 1.2. Use of the DEODE scripts to run a forecast of each of the 3 CSCs using an IAL-code version.

GROUP 2

Task 2.1. Enable Coupled Experiment Creation (LAM from Global or LAM).

Task 2.2. "Clim" and PGD File Configuration Testing.

Task 2.3. Establish a Static Data Portal ("quick solution")

GROUP 3

Task 3.1. Second Knowledge Transfer from DEODE to ACCORD.

Task 3.2. Local Implementation of Scripts.

Task 3.3. EPS Configuration.

Task 3.4. Observation Handling Prototyping.

GROUP 4

Task 4.1. Data Assimilation baseline configuration.

Task 4.2. Establish a Static Data Portal (Final solution)

GROUP 5

Task 5.1. Regular Knowledge Transfer of the ACCORD common scripting.

| Quarter | Task | Milestone |
|--------------------|---|---|
| Q4 2025 | T1.1 | 1st knowledge transfer done |
| Q1 2026 | T1.2 | Run each CSC with the same IAL code base |
| Q2 2026 | T2.1 / T2.2 / T2.3 | Coupled experiment enabled / PGD/clim file creation validated / First static data portal established |
| Q4 2026 | T3.1 / T3.2 / T3.3 / T3.4 (these tasks could be done in parallel, with different people) | 2nd knowledge transfer done / Local implementation of scripts / EPS config prototyped / Obs handling prototyped |
| Q4 2026 or Q1 2027 | T4.1 Note: the analysis of the DA configuration could start in Q3 or Q4 2026, once the analysis of the obs handling functionality is enough advanced | DA baseline config analyzed |
| Q4 2026 | T4.2 | Final solution of static data portal implemented |
| Q2 2027 | T4.1 | DA baseline config prototyped |
| From Q3 2026 on | T5.1 | Via online tutorials or dedicated working days etc. |

Groups indicates approximate order of implementation

Steering documents: [RWP 2026](#) (In particular SY4)

- SY4.1: Use of the DEODE scripts to run a forecast of each of the 3 CSCs using an IAL-code version
- SY4.2: Enable Coupled Experiment Creation (LAM from Global or LAM)
- SY4.3: “Clim” and PGD File Configuration Testing
- SY4.4, 4.10: Establish a Static Data Portal (“quick and final solution”)
- SY4.5: (Second) Knowledge Transfer from DEODE to ACCORD
- SY4.6: Local Implementation of Scripts
- SY4.7, E8.14: EPS Configuration
- SY4.8: Observation Handling Prototyping
- SY4.9: Data Assimilation baseline configuration

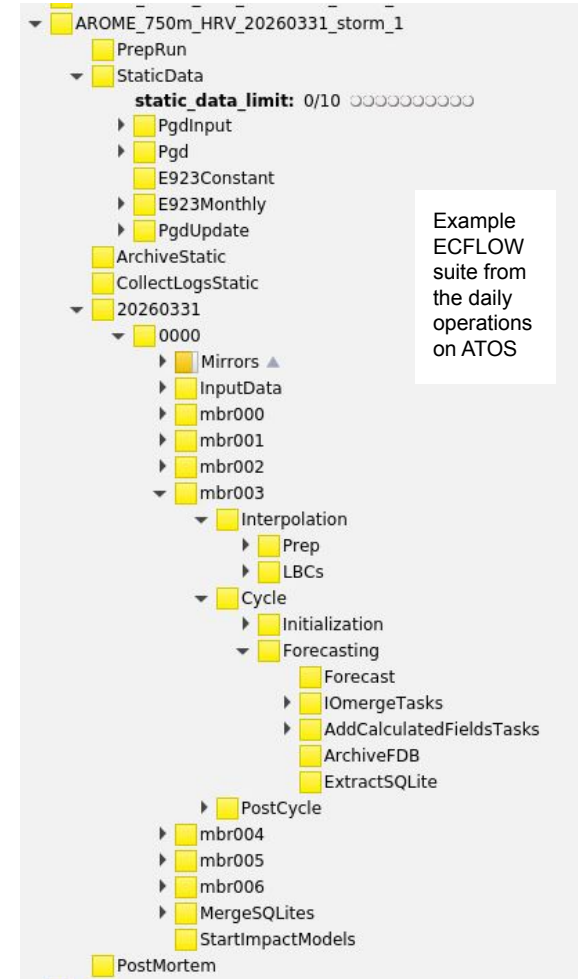
Plans based on the status and knowledge at the time

Current capabilities of Tactus in DEODE

For any of the CSCs in ACCORD we can:

- Generate physiography files
 - SURFEX and E923 ones
- Interpolate boundaries from IFS or any CSC
- Run a forecast, deterministic or as an EPS
- Start a run from any time and output with any frequency (down to the timestep)
- Additional postprocessing in python
- Produce sqlite files suitable for harp
- Launch various downstream applications

The implemented functionality is tailored for DEODE needs and the CSC configurations for sub kilometre resolutions



Tactus in ACCORD, the first steps





Build a workhorse for ACCORD-NWP research and for future operational use

- **Bring tactus to ACCORD and combine it with CY50T2**
 - Choose CY50T2 to stay at the front and make synergy with DEODE phase 3 activities
- **Implement the three CSCs reflecting the current usage in ACCORD**
 - ALARO as defined by ALARO users
 - AROME as defined by AROME users
 - HARMONIE-AROME as defined by UWC
- Keep the DEODE CSC setups as reference and for sub kilometre research
- Make it work on ECMWF atos and Meteo France HPC belenos

Status of <https://github.com/ACCORD-NWP/tactus>

- Separate DEODE specific and core functionalities
 - Stay in sync with latest DEODE development
- Connect to IAL@develop (CY50T2) with e.g. compilation support
- Started to work our way through the configurations on atos and local platform(s)
- Will require updates in the IAL develop branch and possibly some more frequent technical tags

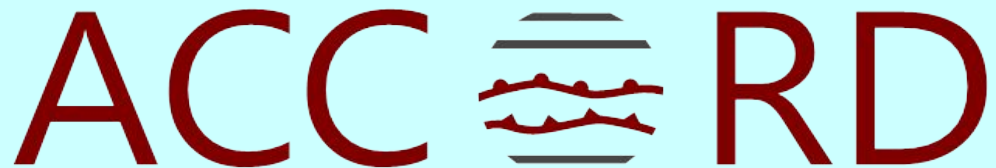
Selection of current issues

| <input type="checkbox"/> | Author | Label | Projects | Milestones | Reviews | Assignee | Sort |
|--------------------------|---|--|----------|------------|-----------------|----------|----------|
| <input type="checkbox"/> |  | Feature/fix deploy docs workflow ✓ | | | | | |
| | | #22 opened 3 days ago by mfroelund Member | | | Review required | | 22 tasks |
| <input type="checkbox"/> |  | Support multiple searchpaths for namelist files through TACTUS_CONFIG_DATA_DIR ✓ | | | | | |
| | | #20 opened 4 days ago by mfroelund Member | | | Review required | | 22 tasks |
| <input type="checkbox"/> |  | Config files for Fahrenheit ✗ | | | | | |
| | | #16 opened last month by trygveasp Member | | | Review required | | 22 tasks |
| <input type="checkbox"/> |  | Add CY50t2 config files ✗ | | | | | |
| | | #14 opened on Mar 12 by uandrae Member | | | Review required | | 22 tasks |

 **ProTip!** Check team mentions with [team:ACCORD-NWP/ial-contributors](https://github.com/ACCORD-NWP/ial-contributors).

Back to SY4 in [RWP 2026](#) (DA and EPS in the coming slides)

- **SY4.1: Use of the DEODE scripts to run a forecast of each of the 3 CSCs using an IAL-code version (CY50T2)**
- SY4.2: Enable Coupled Experiment Creation (LAM from Global or LAM)
 - Add connection to ARPEGE on belenos, opens up to test interfacing with vortex
- SY4.3: “Clim” and PGD File Configuration Testing
 - **Make sure we produce the files as ACCORD would like to see it. Can we replace climake at some point?**
- SY4.4, 4.10: Establish a Static Data Portal
 - Ongoing, not for discussion today
- SY4.5: Knowledge Transfer from DEODE to ACCORD
 - Need a training week in late autumn or early 2027
- SY4.6: Local Implementation of Scripts
 - First focus on a version running on one of the common platforms, for 2027



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Introducing data DA functionalities in Tactus

Implementation of DA in Tactus - why?

Strategic priority to enhance **collaboration, transparency, traceability and knowledge sharing** across the ACCORD community.

- Structuring and documenting DA workflows and configurations
- Providing clearer link between scientific concepts and code implementations (scripting level)
- Facilitating onboarding of new contributors and cross-partner collaboration
- Supporting reproducibility of developments and experiments
- Clearer definition of reference configurations
- Providing a powerful tool for DA feasibility studies

Implementation of DA in Tactus - data acquisition and preprocessing

Observation dataflows are **heterogeneous** and **specific** to members or subconsortia. Some datasets are **not shareable**.

Possible choices for Tactus:

- 1) assume availability of the data in standard formats (obsoul, bufr, netcdf, hdf5) with expected naming and contents, such as those processed by OPLACE, UWC, MF, SAPP installations ...
- 2) support observations provided by ECMWF (mars and/or extract for Member states)
- 3) later - consider centralized obs. data exchange ?

Most straight-forward approach: it is mainly user responsibility to ensure access to standard input observation datasets.

Implementation of DA in Tactus - what should come first?

Surface DA

Surface DA is prioritized for Tactus from MQA perspective

=> **alleviates differences** between host model and LAM surface scheme and allows for Tactus evaluation

Features:

- Large availability of screen-level observations (ECMWF mars, regional preprocessing)
- Optimal interpolation (OI) computationally cheap
- Flexible implementation across different domains

Requires:

- Initial implementation of data preprocessing (observation handling and ODB creation)

Opportunity:

- Possibility for ACCORD to unify surface DA framework in the later steps

Implementation of DA in Tactus - towards upper-air DA

Upper-air DA: **3D-Var** (OOPS) as a **baseline** algorithm

Opportunities:

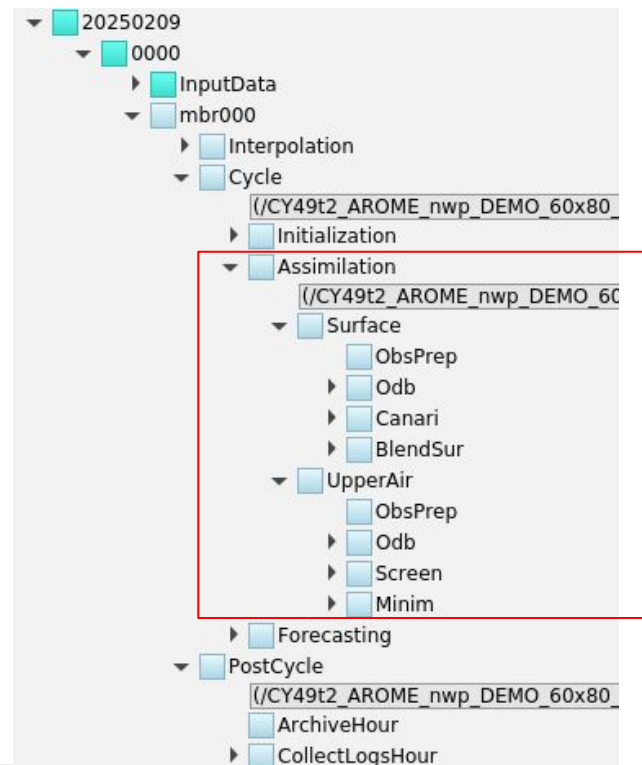
- Computationally inexpensive
- Supports testing a wide range of observations
- Consistent with operations at most centers

Requires:

- Implementation of B-matrix computation, expensive but needs to be done only once per setup

Opportunities:

- Extension to BlendVar version
- Further extension to 4D-Var (in OOPS)



Implementation of DA in Tactus - towards upper-air DA

Upper-air DA: **3DEnVar** (OOPS)

Features:

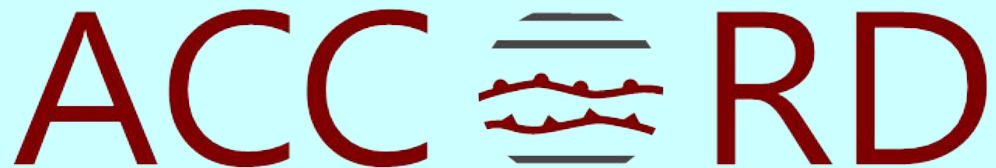
- Fully flow-dependent
- Relatively easy to implement across different domains, but computationally more expensive
- Advanced use of observations (information projected onto additional prognostic variables, e.g. hydrometeors in radar and all-sky satellite DA)

Requires:

- Implementation of an underlying ensemble of sufficient size (at the same or lower resolution)

Opportunities:

- Extension to **4DEnVar** to account for temporal evolution, without dependence on TL/AD model availability



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Introducing EPS functionalities in Tactus

Introducing EPS functionalities in Tactus

- Strategic priority to enable closer cooperation in the area of EPS
- EPS design and (some) components was done from scratch in Deode phase 2 -> less than two years ago and first runs possible was less than one year ago
- Tactus was restructured so that a deterministic run is treated as member 0 -> no distinction between deterministic and EPS runs
- Currently we can do:
 - Boundary uncertainty with
 - IFS ENS - nesting each Tactus member in IFS ENS members
 - IFS HRES using SLAF - the lateral boundary perturbations are computed as scaled differences between previous forecasts from a coarser-resolution deterministic model
 - Model uncertainty through SPP (Stochastically Perturbed Parameterizations) for Arome and Harmonie-Arome
- We need to complement with remaining EPS capabilities
 - The perturbation methods we will work on and that we believe will be used in operations in the future when Tactus is ready for this
 - but also all perturbations we currently have in order to compare old with new system

Introducing EPS functionalities in Tactus

- We will make an inventory of wanted features for Arome, Alaro and Harmonie-Arome and make priorities
- Scripting WW in May to finalize this and to work on the common DA/EPS design needs



Discussions during
lunch break on Monday :)

Photo: Xiaohua

Introducing EPS functionalities in Tactus

- Missing EPS components - list not exhaustive
 - Ensemble of Data Assimilations (EDA) - observation perturbations for both upper air and surface
 - PertSFC - perturbation of surface state and parameters (AROME, HARMONIE-AROME)
 - PertAna/blending - initial perturbations from the forcing model e.g. IFS (HARMONIE-AROME, Alaro)
 - Randomly Perturbed Parameters (RPP - model uncertainty scheme used by MF)
 - Ensemble Jk
 - Model uncertainty through multi-physics (used by Alaro)
 - SPPT upper air and surface (Arome, Alaro)
 - Flow dependent SPP
 - ...

Other non-DA non-EPS components

- There are for sure functionality missing that falls outside of the discussed areas
 - DFI, blending, various postprocessing, ...
- Suggestions needs to be put on the table accompanied with resource assignment from those who needs it
- **We probably have several local variations of doing almost the same thing, perhaps we don't need all of those?**
- First focus on components important for common research

How to contribute?

Everything we do or need isn't always described in the RWP, especially not in the beginning

“I want to introduce my fancy method”

- Take contact and suggest. Join a SY4 meeting and discuss.
- Will this require changes in [IAL](#), [SURFEX](#), [PHYEX](#) or [OOPS](#)? Requires a wider discussion and more pull requests!
- Create a github [issue](#) for a bug or an enhancement.
- Create a [pull request](#) and suggest reviewers. Follow [agreed practices](#) and make required tests
- Once well working the code will be merged by someone*

The usage of github guarantees transparency and traceability. When properly used it will also help us automate the boring testing!

How do we bring in our existing code?

We want to keep the system coherent and homogeneous so we do not interface existing code by

```
os.system(python3 my_old_code.py --tweaked_arguments)
```

we do

```
import tactus.core.stuff
class NewMainFunctionality():
    new_readable_code()
```

or something like

```
import tactus.core.stuff
from some_external_package import best_method
class ExistingFunctionality():
    def my_new_sub_functionality():
        best_method()
```

Who will be allowed to merge code to tactus?

- Everyone are welcome to contribute!
- At the moment restricted to a small group actively working with the code (key DEODE developers)
- Should be widened to cover a larger group, to be established
- Should never allow everyone/anyone to merge code. Protect ourselves from ourselves
- Should never restrict to a single integrator. Not efficient enough and puts to much burden on a single person (trying to protect the SYSTEM AL :-)

Governance lead by: ACCORD SYSTEM AL, UWC system PL, LACE system PL, ACCORD integration AL, DEODE representative(s), NN?

About portability

- Main platform is ECMWF HPC
- Second platform is Meteo France HPC

Is there any group without any access to any of those platforms?

- Local platforms will be supported, but it's up to everyone to work it out and us together to build something portable
- Ecf flow setup might be a concern for some local platforms (versioning and version updates will be needed), as for other dependencies ...
- Remember that portability is not only about the scripting, it's about the IAL part as well.

How to kick-off the common Tactus work in ACCORD?

- System WW in Brussels (agree on first tasks and general design for non-existing DA and EPS components)
- Encourage members to commit resources
- Progress tracked at SY4 meetings or other regular meetings
- For RWP 2027 make Tactus specific work visible as subtasks in e.g. DA, EPS and other concerned WPs

Plenary discussion

Time for questions comments and discussion!