



A Consortium for CONvection-scale modelling  
Research and Development

**Advanced DA algorithms and DA-EPS cross-cutting  
topics - questions for discussion**

## DA and EPS - questions for discussion

- What are the advantages and disadvantages of running a dedicated EPS for assimilation? Should priority be given to increasing the number of members or enhancing resolution?
- Are all EPS perturbations (e.g., observation perturbations, initial condition perturbations such as BRAND/BREND/ETKF/EVIL, singular vectors, and large-scale physics perturbations) suitable for EnVar?
- Which system components (observations, models) need to be perturbed for DA and which short-term forecast EPS. Optimizing the perturbations for sufficient spread in assimilation cycle (1-6 h forecasts) and ensemble forecasting (beyond 6h)
- Single precision vs. double precision, e.g. in DA cycling vs. forecasts

# EnVar and EPS - questions for discussions

- How should the EPS be designed to ensure a sufficient number of members for DA (in the EnVar framework)?
- Hybridization of Envar for different ensembles (e.g. LAM EPS and global EPS part)
- Can a flow-dependent  $J_k$  be designed based on global perturbations?
- Would EPS benefit from replacing 3D-Var with EnVar?
- What are the best methods to diagnose EnVar performance? Should covariance diagnostics be used, or is forecast verification required?
- What are the best techniques for localization in EnVar, and how can optimal localization length scales be efficiently diagnosed?

# EnVar and EPS - questions for discussions

- How do observation density requirements for EnVar compare to those for 3D/4D-Var, considering the smoother analysis increments in Var?
- How can existing tuning and diagnostic procedures (in Var) be adapted or extended for EnVar?
- Can we integrate/combine functionalities like cloud data assimilation through penalty function and Gaussian integrals into the EnVar framework?
- What are the different ways ensembles can be utilized in 4D-assimilation approaches, and what are the associated pros and cons?
- Challenges and opportunities with ensemble approaches when going to future coupled Earth systems.