

# **Working Group on Data Assimilation & Predictability Transversal Issue**

The aim of the Working Group

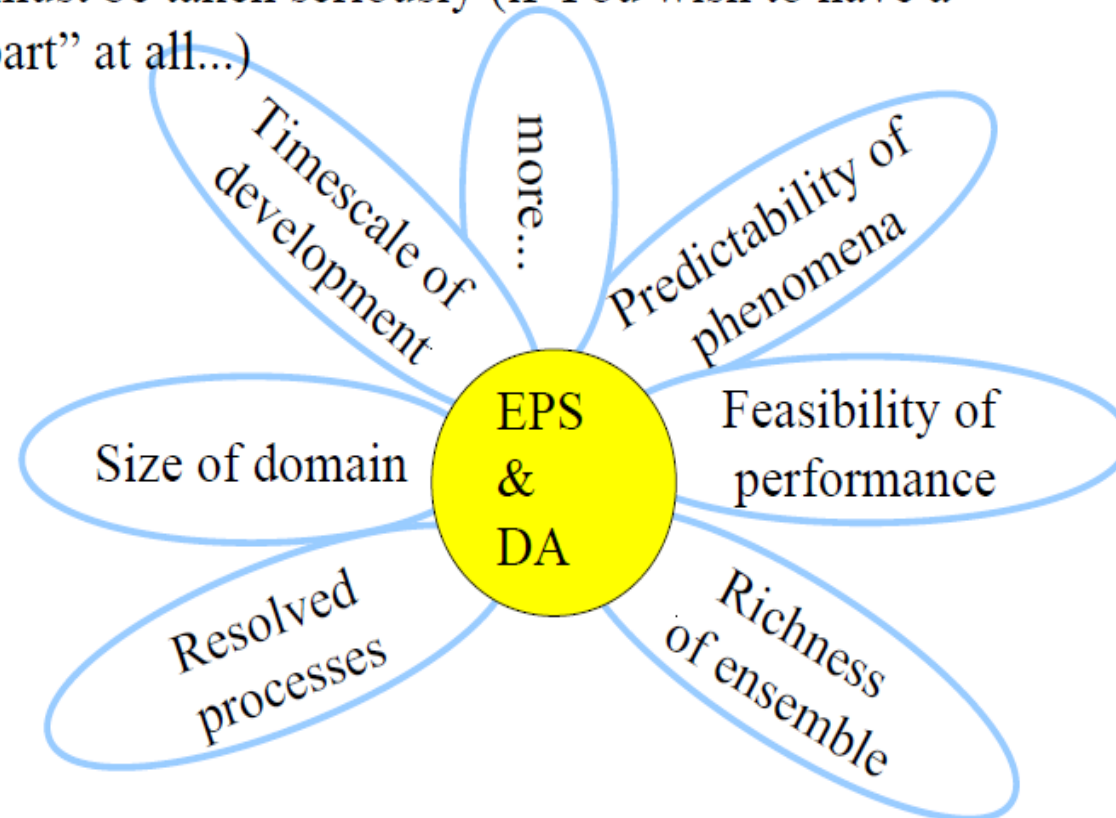
To design a number of experiments that should carry be carried (hopefully together) to come closer to a “practically feasible” realisation of the efficient data assimilation system

## Predictability is a “paraply (“unbrella”)” project of NWP :

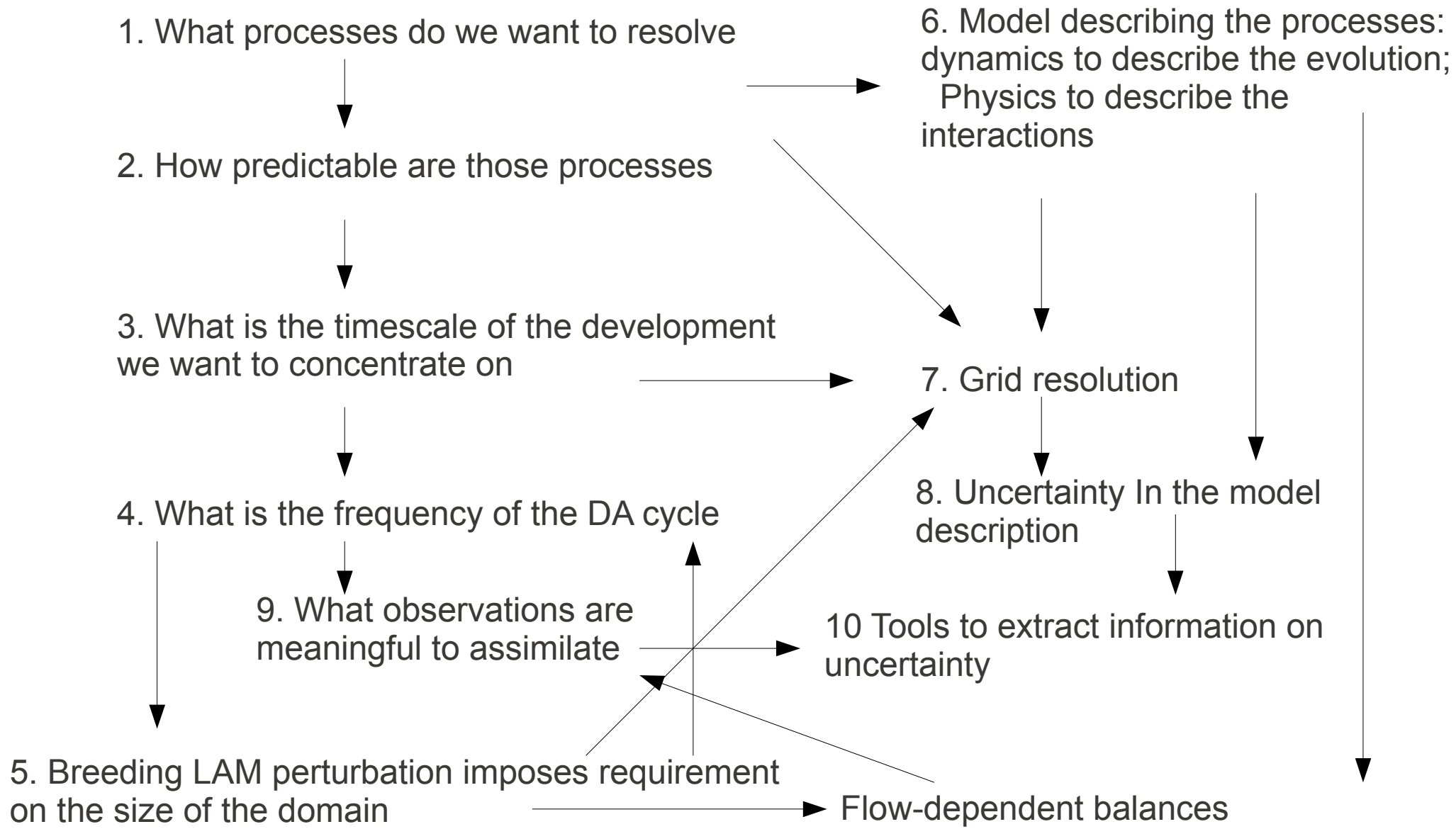
It gathers together all efforts in “Predicting” weather

Data assimilation is a “tool” what allows to extract the useful for “The Model” stuff from observations

In reality there are constraints imposed by the “counterpart” and they must be taken seriously (if You wish to have a “counterpart” at all...)



# Predictability on meso-scale processes



*Do You agree....*

## An extended box for “size of domain”

group velocity of disturbance propagation (Norman Phillips, 1990: 850km  $\Leftrightarrow$  6h)

freedom developing the position and the intensity for the phenomena of interest

the age of lateral boundary conditions;

Other factors

ability of lateral boundary conditions to propagate information through lateral boundaries;

deformation of information through lateral boundaries due to differences in model resolution, physics, orography;

intrinsic limitations of LAM DA schemes

practical limitation of the “small institute” groups

meteorologisk institutt [met.no](http://met.no)

***For other boxes it is no simpler by no means.***

## Practical organization of work

- All scientists look so differently: it is impossible to find two similar to each other. How can they manage to work together ?
- Because we have the common goal : we all want to improve weather predictions
- And do you put all these efforts only in order to be able to say a bit earlier that it will be bad weather tomorrow?
- Yes, but we have so much fun together at the same time

## Configuration of the “optimal” EPS : Important questions to answer

- 1) Does a lower resolution ensemble able to provide information relevant for the interpretations of a higher resolutions model ;
- 2) Or should an ensemble system be run on deterministic scales;
- 3) Should “deterministic thinking” be abandon or do we need a high resolution deterministic model



***“Skoda” is an excellent family car: Should we still keep an opportunity to drive Jaguar ?***

The basic aim of an EPS is to provide an estimate of the inherent predictability of the atmosphere. In our deterministic models we can describe smaller and smaller features, but these are not predictable. An EPS can be used to filter out these features.

*Jan Barkmeijer*

Do observations themselves impose balance if you have enough of them? Or can one get out of balance by frequent assimilation of certain variables? Some observations have more “dynamical” constraints “built into them” than others.

*Jeanette Onvlee*

We should use models with "converging" behavior of the physics across the range of scales. This way an ensemble with coarser horizontal resolution than the deterministic model grid could be explored as an option for representation of the model uncertainty associated with model physics

*Lisa Bengtsson-Sedlar*

## General discussion:

We need to focus on those phenomena we would like to forecast well, this should give us guidance on what we wish to assimilate and how often.

*Jan Barkmeijer*

As the available observations are limited in spatial resolution, the initial model state can also only describe the relatively larger scales.

*Nils Gustafsson*

..Hydrometeors have a fast adjustment time scale (less than an hour). Therefore, in terms of priority for the prediction skill of meteorological phenomena (such as severe precipitation events few hours in advance) it is more useful to initialize accurately the dynamics and the humidity than the hydrometeors... .

*Jean-François Mahfouf*

...With a flow dependent update (e.g the hybrid method) of the presently used balances (between humidity, temperature and wind, which are the more predictable variables) we might do well...

*Gergely Böllöni*

## **Low -resolution EPS versus high-resolution deterministic model :**

The density of the observation network does not require to go for higher resolution model. Assumptions made deriving statistics for background error covariance will kill every signal beyond 10 km

### **What processes do we want to study and what models do we want to use:**

**One needs to use models with very similar, preferably identical physics.**

**Phenomena of interest:** polar lows and severe summertime convection

**Experimental design:** Ensemble system 10km, 5km, 2.5km horizontal resolution

Meso-scale deterministic model: 2.5km horizontal resolution

DA: 3DVAR, 4DVAR; later on hybrid

Physics: ALARO

**Detailed setup of the experiments should be outlined later on:** what surface DA, should one try to constraint cloud information, how to compute the climatological B covariance

### **Do we support Jose-Antonio proposal to perform Fabry&Sun experiments for Mediterranean conditions**

Yes, the moist total energy norm (MTEN) can be used as a tool in this study



## Actions agreed

The group has agreed to try to obtain answers to the imposed questions on the optimal configuration of the consistent EPS-DA system by means of a sensitivity study

1) Run EPS on three different resolutions : 10km, 5km and 2.5 km using the same physics package (ALARO). Run 10km and 5km ensembles on correspondingly larger domains than 2.5km

2) Select small number of phenomena what we aim to forecast: summer time severe organized (supercell?) convection in Mediterranean and winter time polar low for high amplitudes. It is important that the phenomena to be described occurs clearly and that there are many good observations.

3) Run deterministic model on 2.5 km to forecast the phenomena (DA : first 3DVAR and 4DVAR; later on in the hybrid form; before hybrid is available use “climatological” B matrix based on different resolutions; investigate impact of the extend control vector to allow cloud information if possible (MF research))

4) In order to perform the sensitivity study one should setup a working group which will settle the details around the experiments (what surface model to be used; what surface DA to be used; what observations to be assimilated; configuration of the UA DA; what diagnostic to be used; time constraints for the experiments ) and distribute the work among partners

HMG-CSSI Meeting has proposed to create a working group from the EPS, DA and Physics experts from HIRLAM/ALADIN on the realisation of the proposal for the sensitivity study

## **“whom will do what and how”**

### ***Whom:***

**EPS** : Therese Gorgas, Alex Deckmyn, Inger-Lise Frogner

**DA** : Jelena Bojarova, Maria Derkova, Jan Barkmeijer

**Physics:** Radmila Brozkova, Laura Rontu, Jean-Francois Mahfouf, Neva Pristov, Lisa Bengtsson

**Dynamics:** Piet Termonia

- The responsibility of this group is to coordinate between themselves and to contact the corresponding staff in order to make the decision on the actual configuration of the experiments carried during the sensitivity study.
- Alex Deckmyn will coordinate this work through the E-mail exchange and a video-conf.
- Time constraint : the more or less well elaborated draft experimental setup for the sensitivity study should be ready before the EPS-PHYS Workshop in Madrid in the middle of June (final polishing of the proposal).